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The Engineering and Mining Journal

ISSUED WEEKLY

VOLUME XCVIII

July 1 to December 31, 1914

137132
21/11/15

Hill Publishing Co.
HILL BUILDING
10TH AVENUE AT 36TH STREET
NEW YORK

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THE ENGINEERING AND MINING JOURNAL

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The Engineering and Mining Journal

VOLUME 98 JULY 4, 1914 NUMBER 1

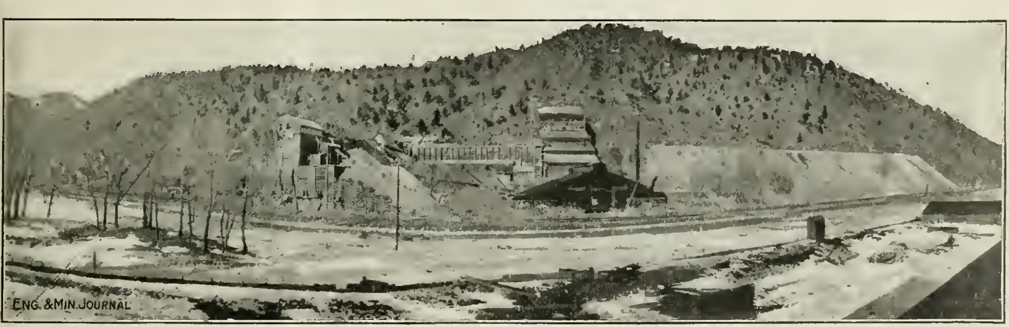
Ore Treatment at the Argo Mill

By A. H. Roller* and H. T. Curran†

SYNOPSIS—A mill for treating the custom ores of the Idaho Springs district of Colorado, in which the principal features are amalgamation in cyanide solution, concentration, continuous agitation of slimes and rejection of concentrated sand. Continuous decantation of slime is followed and the residue is dewatered in a Portland filter. Electrolysis proved the best way of avoiding the action of reducing agents.

⁂

The Argo mill started operations Apr. 1, 1913, and much interest has been manifested in it since that time. With several changes and additions it has proven its worth. Rejection of the sands after concentration, the use of an electric cell to compensate the effects of reducing agents, and the addition of ammonium salts, are the three distinctive features which have helped make possible the successful application of the cyanide process on the refractory low-grade sulphides of this district. Aside from the possible elimination of amalgamation, or a change in the manner of practicing it, a successful system is established in the Argo mill, and any future changes will be small details governed by convenience and not by a distinctive metallurgical change.



The Argo Mill, Idaho Springs, Colo.

The ores treated are complex sulphides concentrating 4.9 tons into 1. The average heads for the first six months' period assayed 0.25 oz. gold; 3.01 oz. silver; 0.60% copper; 0.75% lead. The construction of the plant throughout is of steel and concrete, with the exception of wood for the ore bins.

Receiving Crude Ores

The receiving bins, 22 in number, with a total capacity of 1600 tons, are connected with the tracks of the Argo (Newhouse tunnel). The cars from the tunnel, carrying three tons each, are run, three at a time, into a revolving tipple, mounted on a movable carriage, all self-contained, and moving on a track over the top of the receiving bins, so that the ore can be dumped where desired. All ores are crushed, sampled and purchased from the shipper upon assay value on a stated schedule, after which they are stored and treated at the convenience of the company.

Crushing and Sampling

Running along the bottom of the 22 receiving bins, is a 24-in. Jeffreys pan conveyor, which delivers the ore over a 1½-in. grizzly into a No. 4 Gates gyratory crusher, dropping by gravity through three Snyder samplers, each taking out a 20% cut. Between each sampler the ore is recrushed, once by a Eureka crusher and once by a set of rolls. The final sample is sent to the bucking room, where four pulps for assay are used. Twenty per cent. of the ore is retained for resample until final settlement is made with the shipper. The balance of the ore goes to two 50-ft. elevators and is discharged onto a 24-in. conveyor belt, with reversible tripper, distributing in the 1600-ton storage bin at the top of the mill. The elevators are of 14-in. Jeffrey belt with 5x7-in. malleable buckets set staggered, 7-in. centers. So far this arrangement has proved satisfactory.

The sampling plant uses four men on shift, and handles from 100 to 200 tons per nine hours, according to the physical condition of the ore. Power is furnished by three electric motors using a total of 35.5 hp. Total costs in the sampling department amount to from 20c. to 25c. per ton of crude ore.

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†Mill superintendent, Argo Mill.

Stamping and Concentrating

From the 1600-ton bin, improved Challenge feeders deliver this ore to twenty 1050-lb. stamps, in two batteries of 10 each, making 110 drops per minute through 6 in. Stamp crushing is done in ½-lb. cyanide solution, using from five to six tons of solution to one of ore, with a cyanide consumption of ½ lb. per ton of ore. Twelve-mesh woven-wire screens are used on the batteries, the stamp duty being over six tons per stamp-day, or a total of over 120 tons per 24 hr. The pulp from the stamps flows over four 48x54-in. copper plates. So far amalgamation in cyanide solution has not proven the success that was expected of it. The reasons are discussed later.

After passing the plates the pulp is led to a duplex Dorr classifier, where the overflow slimes are removed, running to a 4x4-ft. spitzkasten, followed by a 14x22-ft. Dorr thickener, while the sands from the classifier are dewatered and delivered to a distributing barrel for table concentration. Solution titrating about ½ lb. cyanide is here mixed with the sands to give them the right consistency for proper table work.

There are five standard Card tables now used for the first sands concentration, with provision for installing a sixth table on the same floor. Two finished products are cut out on these tables, a lead and an iron concentrate. The middlings flow by gravity to a 4x10-ft Stearns-Roger tube mill and a half-size simplex Dorr classifier, operated in a closed circuit. This is made possible without pumping by an extra large scoop for feeding the tube mill.

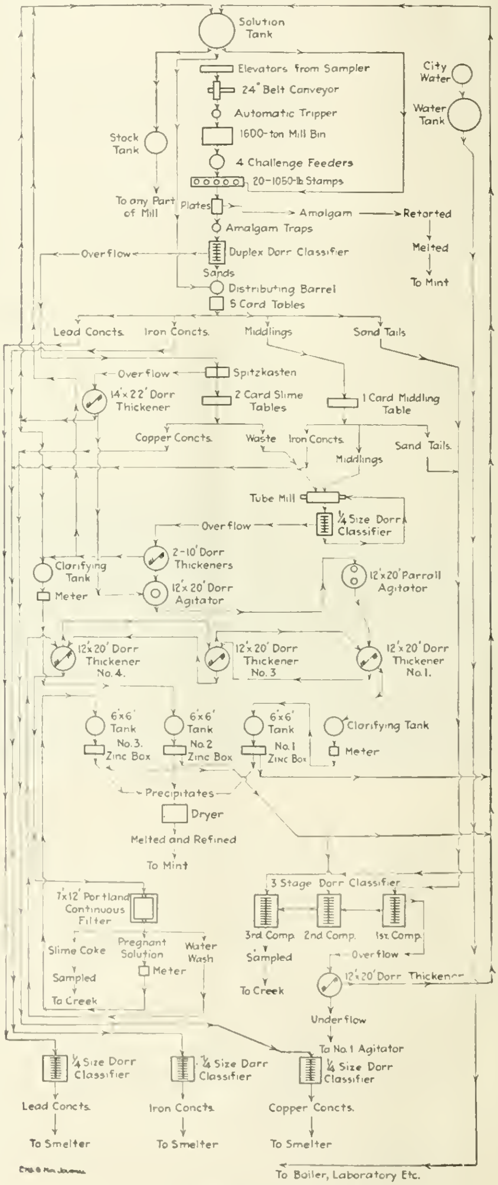
Sands from the middlings table join the sand tails from the first five tables and flow by gravity to a three-compartment Dorr dewatering and washing machine. The pregnant solution with the small percentage of collodial slimes contained with the sands is removed in the first compartment. This product flows into a 12x20-ft. Dorr thickener, the clear overflow from which is pumped back to the head of the mill. The thickened underflow from it is lifted by a diaphragm pump into No. 1 agitator, a 12x20-ft. Dorr machine. In the second and third compartments, respectively, of the triplex Dorr classifier, a barren solution and a water wash is given the sands, which are then discharged at 15% moisture, carrying a trace in KCN and dissolved values, and run to waste as tailings, thus eliminating on an average of 56% of the mill tonnage without further treatment. Under normal conditions the gold extractions in the sands averages 90% and the silver well above 85%. The character and grade of the ore treated would make further handling a losing commercial treatment in a mill of this size.

Treatment of Slimes

A ¾-in. spigot underflow from the spitzkasten is concentrated on two Card slime tables, placed on the same floor as the middling table. A clean concentrate is here cut out and shipped as a copper product, thus eliminating a large percentage of the copper before agitation and contact with the stronger solutions. This spigot underflow also removes 90% of the +200-mesh product from the slimes entering the spitzkasten. The whole remaining product from the above two tables gravitates to the tube-mill circuit, together with the middlings from the middling table. The slimes from this classifier have a screen analysis as follows:

	Per Cent.
+150	1.0
+200	5.0
—200	94.0
Total	100.0

They flow to two 10-ft. Dorr thickeners operated in tan-



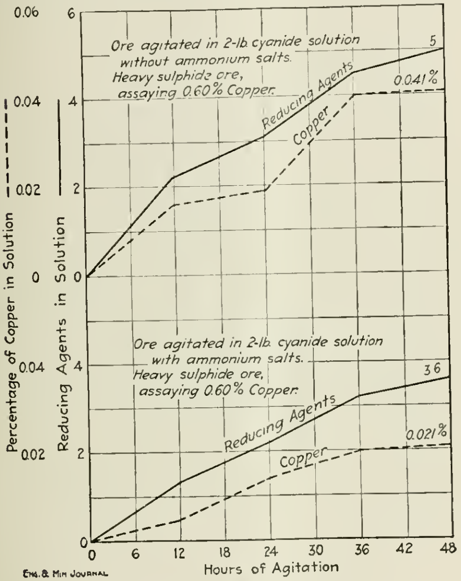
Flow Diagram of Argo Mill

dem. The thickened overflow from these tanks flows to the Dorr agitator. The clear overflow can either be sent to precipitation via the clarifying filter, a simplex excelsior filter, or may be pumped directly to the head of the mill.

The overflow from the 14x22-ft. Dorr thickener is handled through the same channels as the overflow from the 10-ft. thickeners. The underflow, which is thickened to about 34% solids, and has the screen analysis given in the following table, goes to the Dorr agitator.

	Per Cent.
+80	Trace
+100	0.5
+150	1.75
+200	4.75
—200	92.5
Total	99.50

The combined pulp entering for agitation comprises about 26% of the mill tonnage. The underflow from the 10-ft. Dorr thickeners is considerably more dilute than the underflow from the other thickener, and will thin the total pulp agitated to 2½ of solution to 1 of dry slimes. This is made up to 1½ lb. cyanide and 0.6 lb. lime per ton of solution in the No. 1 or Dorr agitator, which is connected in continuous agitation with a 12x20-ft. Parral agitator. The cyanide consumption passing these two agitators is about ½ lb. per ton of slimes.



EFFECT OF AMMONIUM SALTS

The overflow from the Parral tank passes to Dorr No. 1, the first of a series of three 12x20-ft. thickeners, arranged for continuous decantation, the underflow pulp being passed on by Goulds diaphragm pumps, while the returning clear overflows run by gravity.

The water used for washing the sands on the third deck of the triple Dorr classifier is raised 2 ft. by an air lift, and used as a wash for the last thickener. The barren solution used to wash the sands on the second deck, flows by gravity to the second thickener, and is here used as a wash. The clear overflow from the first thickener is sent to zinc-box precipitation by way of an excelsior clarifying filter.

Under first arrangements, the underflow from the last Dorr thickener was concentrated on two Card slime tables, making a clean mineral, and the balance sent to the slime filter for final treatment. But this arrangement proved useless, as the amount and value of the mineral made was not worth considering. Therefore, the thickened underflow, 35 to 40% solids, is pumped by a diaphragm pump direct to a 7½x12-ft. Portland continuous-type drum filter, which is given a barren solution and a water wash, and from which the pregnant solution is combined with the barren solution wash by both being pulled through a 12x10-in. Gould vacuum pump, and then returned to the head of the mill, or passed first through an available zinc box if desired. The wash water is passed through the filter by a 4x6-in. triplex pump and used as a wash for the last Dorr thickener. The discharged slime cake, containing 0.20 lb. KCN and 10c. in dissolved values, falls into a launder and is sluiced into the creek.

SOLUTIONS AND PUMPS

There are generally two different strengths of solutions going to precipitation. The strong heads, being the overflow from the first Dorr thickener following the agitators, titrates above 1 lb. KCN, and carry 60c. to $1 in gold and silver. The weak heads, being either the overflow from the two 10-ft. thickeners behind the tube mill, or the 14x22-ft. thickener below the batteries, titrate about ½ lb. KCN and carry 30c. to 60c. in gold and silver. The zinc-box tails assay from 4c. to 8c. A portion of the weak tails is used as wash in the sand-tails classifier and slime thickeners, the balance joining the strong tails and being sent to the head of the mill.

The feed tank at the head of the mill is divided into three compartments simply as a device to keep the table washes clear in case of temporary muddying of solutions below. They are connected and any overflow is automatically taken care of, running back to a 12x20-ft. stock tank set on the table floor, where it can be discharged to nearly any part of the mill.

A general mill sump is located on the lowest floor, so as to receive by gravity the spills from any part of the mill, and a 2-in. centrifugal pump returns any such solution to the stock tank.

All other pumps are Goulds triplex power machines. The three return pumps located on the lower floor are so connected that in case one is overloaded, the excess solution is automatically taken care of by the others and the system kept in balance. The Goulds diaphragm pumps transferring slimes give excellent service, the only real expense being a new diaphragm on an average of once a month, taking only 20 minutes to change.

Precipitation is by zinc shavings, both weak and strong solutions being precipitated in the usual way. The boxes are cleaned up every two weeks. Anything not passing a 30-mesh screen is put back. After drying, the precipitate is smelted direct without acid treatment. A No. 60 crucible in a Case oil tilting furnace is used.

HEATING THE SOLUTIONS

The solutions throughout the mill are warmed by a 70-hp. boiler, under 40 lb. pressure, from which lead two lines, the first going through radiators on the battery floor, thence through coils in the 14x22-ft. Dorr thickener and discharging the condensed water into the last compartment of the sand-tailings classifier, and the second a line going through coils in the three thickeners following agitation, discharging into the last. No other heat is used in the mill, except one line of steam going to radiators in the superintendent's office, a radiator at the solution man's titrating desk and radiators in the bucking room of the sampling department. An appreciable increase in extractions is shown by keeping the solutions above 60° F.

Lime is added at three places in the mill; the amount is varied and is regulated according to the ore treated. A small amount of slacked lime is first added at the batteries with the feed solution. Over the 14x22-ft. thickener a continuous lime feed is made from a common whiskey barrel, mounted on a shaft, and belt-driven, filled with crushed lime. The barrel makes 6 r.p.m. and the feed is regulated by adjusting a slide over a small rectangular opening. A few small tube-mill pebbles are placed in the barrel, keeping the discharge opening free. The balance of the lime is fed by slacking it in the water used to wash the last thickener.

As already mentioned, enough cyanide is added at the Dorr agitator to bring the solution up to the desired strength. Just enough cyanide is added at the tube mill to keep the weak solution at ½ lb. per ton at zinc-box head.

The ammonium salts are added at the Dorr agitator, as experience has shown the zinc boxes will be kept free from precipitated copper by so doing, and the salts have the effect of increasing the extraction. The accompanying curves, Fig. 2, show the experimental results of the use of ammonium salts on the copper and reducing agents.

ELECTROLYSIS OF SOLUTION

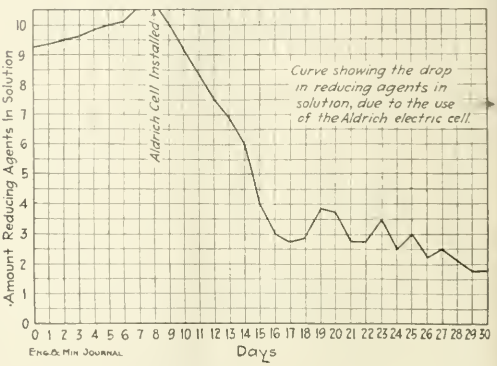
An interesting feature of the treatment is the use of electrolytic oxygen to overcome the effect of reducing agents. It is according to a modification of the method advocated by T. H. Aldrich, Jr., of Birmingham, Ala. The accompanying curve, Fig. 3, gives the reducing power of the solutions with and without the cell installed. A hard-rubber cell, containing fifty 4x5-in. lead plates ⅛ in. in thickness and ½-in. centers, is placed in the head compartment of each zinc box. A 110-volt alternating current is used, and the cost if this current is less than 1c. per ton of crude ore milled.

Lead salts in varying quantities have been used to offset the reducing agents, and while they had the desired effect, it was at a cost far greater than the Aldrich electric cell. Litharge was also tried in the tube mill and agitators as a possible aid to silver extraction, but showed absolutely no assistance. Precipitation, however, is materially assisted by dipping the zinc in a weak solution of lead acetate.

HANDLING CONCENTRATES

The three concentrate bins, one for each product, are placed on the lower floor so located that the concentrates can be weighed and wheeled into railway cars for shipment. Each class of concentrates from the upper floors gravitate to a one-fourth-size simplex Dorr classifier, placed over the bins and used as a dewaterer. The concentrates are discharged from the classifiers, averaging 12% moisture, on a sloping cement floor, allowing further solution to drain off to the general mill sump. The concentrates are sold under contract to the Globe plant of the American Smelting & Refining Co., at Denver.

The total milling process requires about 110 actual hp. outside the sampling department. The mill is electrically driven throughout. Each 10-stamp unit is belted directly to a 25-hp. back-geared motor. A 25-hp. motor drives the balance of the upper part of the mill, which includes eight Card tables, one duplex Dorr classifier, one one-fourth-size classifier, one distributing tub for table feeds, one 4x10 tube mill, three Dorr thickeners, one set 6x6-in. rolls for lime crushing, and the lime-feed barrel. A 20-hp. motor is directly belted to a 14x8-in. Blaisdell compressor, carrying 20 lb. pressure, which furnishes all the air needed in the mill, although air connections are made with the Newhouse tunnel compressor for emergency. Another 20-hp. motor situated on the lower floor drives the balance of the mill machinery, with the exception of one direct-connected pump, which has a 5-hp. motor. The mill employs 12 men in all, superintendent, night foreman, repair man, oiler, six shift men and two laborers.



EFFECT OF ELECTROLYSIS

The mill costs per ton of ore treated during 1913 operations, when the mill never exceeded two-thirds of its capacity, owing to lack of ore receipts, are as follows:

	Per Ton Ore Milled
Office and overhead expense	$0.138
Milling	1.092
Marketing products	0.802
Sampling	0.225
Total	$2.257

These figures cover all repairs and up-keep, but do not cover depreciation.

Operations during 1913 have shown mill extractions of 83% of the gold, 63% of the silver, 80% of the lead and 10% of the copper. The consumption of cyanide was 1.52 lb. per ton of ore treated, and lime, 5.09 lb. per ton.

With the "breaking-in" period of the mill passed, and the usual mechanical troubles adjusted, there is no reason to doubt that the mill will reach an extraction of 90% of the gold and 75 to 80% of the silver on the ores of the district.

The matter of amalgamation will probably receive further consideration. Plating in cyanide solution shows only a small recovery and does not pay for the time and trouble. The main difficulties are due primarily to a comparatively small amount of metal amenable to amalgamation (about 15%), and second to the rapid formation on the plates of a black scum which stops all amalgamation.

Experimental work and local operations before this mill was constructed show that by stamping in water, about 15% of the value can be amalgamated with the average sulphide ore of the district. This point was kept in mind in designing and constructing the Argo mill and it is therefore only a matter of a few days' shut down, for rearrangement of pipes and minor details, to enable one to stamp and plate in water, and complete the milling process in cyanide solution.

This stamping in water means, besides the 15% extraction on the plates, a saving of nearly ½ lb. cyanide consumption. Offsetting these two advantages, is the prompt extraction of certain values in the batteries when stamping in cyanide solution. So at present it is still an open question as to which is the best procedure at this point.

The mill is a necessary adjunct to the Newhouse tunnel, and is proving itself a great benefit to the mine operators along its line. It is now under the management of Otto F. Heizer, of California, with Richard A. Parker, of Denver, as consulting engineer.

The Independent Engineer of To-Day

The following letter lately received from a correspondent in the West, contains so much of interest that it is worth printing:

After retiring from the management of the S——— mine, I conceived the idea that I might grow suddenly rich out of irrigated lands and farming. But alas! our good friend Bobby Burns certainly was right in his remark about the plans o' mice and men, and that other chap—the one that said something about the shoemaker and his last—he, also, made a bull's eye; for soon I found that the rules of the game play as conspicuous part in all business as in bridge.

So I returned to more familiar fields of endeavor and offered my services in a consulting capacity, reckoning that 15 years in management and half as many more in practical day labor entitled me and my opinion to a certain respect.

Nor have I done badly, either, considering that the great business slump struck us about two years ago and, also, that when one gets up to the box-office window and then steps out to see a friend, he generally finds the line ahead of him extended a mile or so by the time he gets back.

So I have been doing examinations and reports and making tests, in fact performing the functions of the office whenever so commanded, but the good old days that you read about have departed, or nearly so, as far as concerns the business of consulting-engineers-at-large; the principal reasons are three in number as, doubtless, you know. Pardon me, then, if I enumerate as follows:

(1) The consolidation of mining operations. This results in the formation of complete staffs of engineers, picked from the surplus stock on hand, the members of which perform the offices of consulting engineers to individual members of the controlling syndicate or company. In mining as in meats, there has been an elimination of the individual. Where there used to be 500 buyers at the Chicago stock yards, now there is one. And the same in mining. No new districts have been discovered for years and almost all the old ones have become "one-man camps." The prospector is disappearing and with him goes the small operator. The big fellows have their cruisers everywhere all of the time and the regularly organized staff is assigned to the work of examination. True, there is yet work for those that reached the top-notch shelf before we entered this transitional epoch, but most of the work offered the profession in general is of the "chicken-feed" type, i.e., it is small, intermittent and unprofitable.

(2) Mexico has turned loose a small army of capable men who are willing to work for less than their due; in fact, in this region there are many competent engineers that are earning less per day than laborers are getting from the city of D——— for managing the bald-headed ends of shovels, at $3 per eight hours and at half-efficiency.

(3) The technical schools continue to pour out a stream of bright young men, cubs that will work for nothing except "experience." This last is not a new condition, of course, but when added to the first and second it very often proves the last straw in the utter demoralization of fees hitherto commanded by the really experienced. The general public seldom discriminates, or not until too late.

I do not say, please remember, that mining has gone all to pot, but I do say that the long business depression and present disinclination of capital to venture outside of the line of sure things, added to the conditions above described, have made the business of engineering a very precarious one for the independent, at least in mining in the West. Many have been driven out of it and into other lines. Irrigation is under a cloud and railroad work is uncertain; the rest of the tale you know as well as I and if I have told you nothing new about our own line of work, believe me when I say that I did not expect to do so when I started to express my opinions. Nor is this a jeremiad for it is merely the fact.

For the very young and very capable, a change from one line to another is not as serious as it is to those that have spent half a lifetime in learning that experience is but the dregs of failure.

Effect of Foreign Metals on the Corrosion of Zinc

This was studied by E. Prost (*Bull. Soc. Chim. Belge*, p. 94. 1914), who states that the presence in zinc of lead, cadmium or iron in larger proportion than usually found in refined zinc leads to increased corrosion by acids. Minute quantities of arsenic, antimony, copper or tin, especially the two former, accelerate very pronouncedly the rate of corrosion, more or less independently of the actual percentage of impurity present.

For the effect of impurities on the rolling of zinc, see the JOURNAL of Nov. 1, 1913, p. 819.

⁂

South American Gold Production in 1912 is given in a recent report of the Mining Department of Peru as follows: Colombia, 160,750 oz.; Venezuela, 17,682; Ecuador, 12,860; French Guiana, 144,675; British Guiana, 42,566; Dutch Guiana, 13,953; Brazil, 102,365; Peru, 46,135; Chile, 19,290; Bolivia, 1125; Uruguay, 3215; Argentina, 14,467; total, 579,083 oz., or $11,969,645 in value.

Sectional Buildings for Drilling Camps

By George S. Rollin*

SYNOPSIS—Drilling on the Michigan iron ranges remote from settlements requires the establishment of a camp to take care of the men. Great advantages attend the use of buildings made up of portable sections which are largely interchangeable. Method of constructing and erecting the sections described. Four types of building provided for.

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Exploration work on the Lake Superior iron ranges consists for the most part of drilling. Such work when conducted in the more remote regions involves the establishment of a temporary camp for the accommodation of the drilling crew or crews. The design and erection of the buildings for such a camp are frequently left to the discretion of the foreman and in most cases when a drilling job is completed, the buildings are a total loss, not being of a type which can be moved. In order to be able to use such buildings over again, the plans for portable sectional buildings here illustrated were drawn. By the use of such standard sections, buildings of any necessary dimensions and proportions can be had; they can be readily assembled and torn down; they become, in fact, part of the regular drilling equipment, shipped with the machinery and returned therewith to the central warehouse. The net result is a considerable saving in time and material.

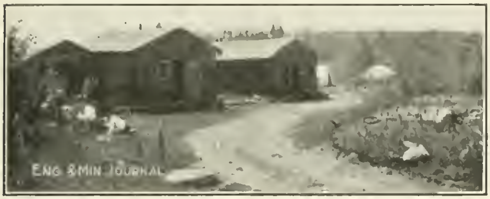

Fig. 1. Camp Buildings Set Up

The principal buildings to be provided for are the bunkhouse, and the eating house, shown in Fig. 1, the drilling shed, Fig. 2, and the diamond-setting shed. The walls, roofs and floors are divided into panels or made of 2x4-in. framing with 1-in. sheathing. The height and width are thus determined, the length can be varied to suit conditions. Special sections provide for doors, windows, corners, ends, etc. The whole building is covered with a tar felt when erected.

The principal building is made 20 ft. wide with an 8-ft. wall. Into this there enter eight different sections. In case new sections have to be made, the man in charge of the establishment of the camp is given an erecting sheet shown in Fig. 11, of which one is prepared for each of the four types of buildings mentioned. This shows the layout of the building and by its aid the necessary sections can be ordered and all supplies and materials specified exactly.

Erecting Sheet for Principal Building

The instructions which accompany the erecting sheet are as follows:

Determine first the number and position of doors and windows desired. Mark their sections on the erecting sheet by the proper number, thus indicating where the sections will appear in the assembled building. The sheet will then show the number of plain wall sections, the window sections, the door sections and the corner end sections entering into the building. In the same way determine and mark on the sheet the end roof sections and inside roof sections, designating those to be provided with stovepipe holes, and the floor and gable sections. You can now turn over to the carpenter the construction sheets, Figs. 3 to 10, and specify how many of each section are required. The erecting sheet should accompany these detail sheets as an aid to the carpenter.

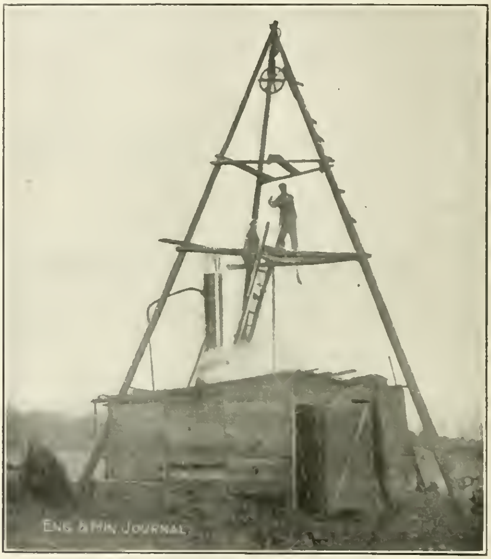

Fig. 2. Drilling Rig and Shanty

To erect the building: Cut first the five sills from neighboring trees and flatten them on one side at least; lay them lengthwise of the building and level the flat sides with a spirit level. Splice 2x6-in. by 12-ft. pieces for the floor beams and lay them across the sills as shown, leveling both ways. Lay the floor sections, Fig. 10, lengthwise of the camp and nail them with a few short nails, preferably finishing nails, at each end. This completes the floor.

Set up the wall sections, Figs. 3, 4, 5 and 9, in their proper positions as outlined on the erecting sheet. Bolt them together in all cases; if bolts are not at hand, wait

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*Formerly district superintendent, E. J. Longyear Co., Crystal Falls, Mich.

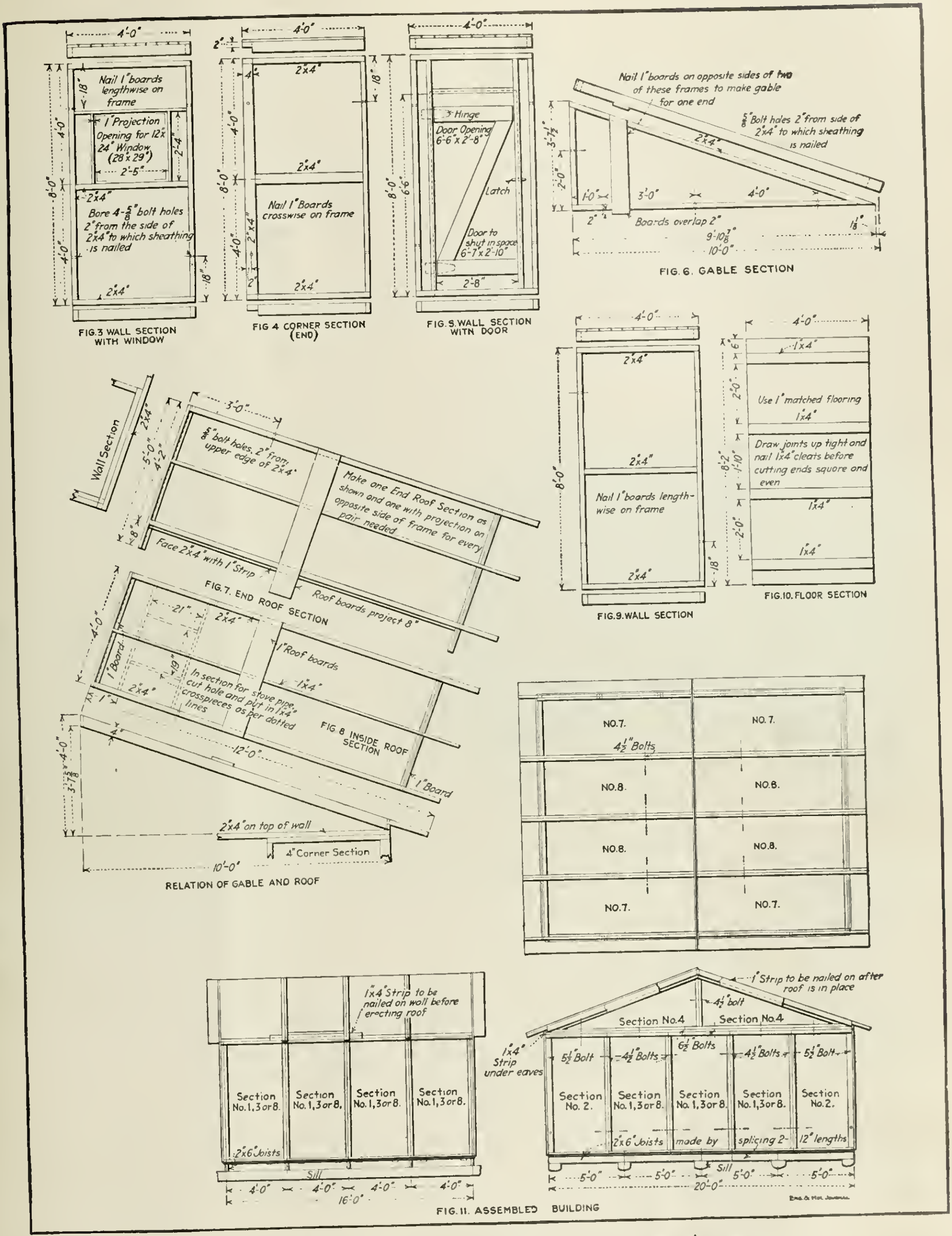
FIG. 3 WALL SECTION WITH WINDOW
Nail 1" boards lengthwise on frame
1" Projection
Opening for 12 x 24" Window (28 x 29")
2'-5"
2 x 4"
Bore 4-5/8" bolt holes 2" from the side of 2 x 4" to which sheathing is nailed
4'-0"
8'-0"
18"
FIG 4 CORNER SECTION (END)
2" x 4"
Nail 1" Boards crosswise on frame
FIG. 5. WALL SECTION WITH DOOR
3" Hinge
Door Opening 6'-6" x 2'-8"
Latch
Door to shut in space 6'-7" x 2'-10"
2'-8"
6'-6"
FIG. 6. GABLE SECTION
Nail 1" boards on opposite sides of two of these frames to make gable for one end
5/8" Bolt holes 2" from side of 2 x 4" to which sheathing is nailed
3'-1½"
2'-0"
1'-0"
3'-0"
4'-0"
Boards overlap 2"
9'-10⅞"
10'-0"
1⅛"
Wall Section
3'-0"
5'-0"
4'-2"
5/8" bolt holes, 2" from upper edge of 2 x 4"
Make one End Roof Section as shown and one with projection on opposite side of frame for every pair needed
Face 2 x 4" with 1" Strip
Roof boards project 8"
FIG. 7. END ROOF SECTION
21"
1" Roof boards
1" Board
19"
In section for stove pipe, cut hole and put in 1 x 4" crosspieces as per dotted lines
1 x 4"
FIG 8 INSIDE ROOF SECTION
12'-0"
3'-7⅞"
2 x 4" on top of wall
4" Corner Section
10'-0"
RELATION OF GABLE AND ROOF
FIG. 9. WALL SECTION
Nail 1" boards lengthwise on frame
FIG. 10. FLOOR SECTION
Use 1" matched flooring
Draw joints up tight and nail 1 x 4" cleats before cutting ends square and even
8'-2"
1'-10"
NO. 7.
NO. 8.
4½" Bolts
1 x 4" Strip to be nailed on wall before erecting roof
Section No. 1, 3 or 8.
2 x 6" Joists
Sill
4'-0"
16'-0"
1" Strip to be nailed on after roof is in place
4½" bolt
Section No. 4
1 x 4" Strip under eaves
5½" Bolt
4½" Bolts
6½" Bolts
Section No. 2.
2 x 6" Joists made by splicing 2-12" lengths
5'-0"
20'-0"
FIG. 11. ASSEMBLED BUILDING
Eng. & Min. Journal

One of the Larger Buildings. Sections in Detail and Assembled for them, and never nail. Square up the walls. Put stays across between the walls at every second section to keep the walls from spreading when the roof is put on. For this purpose, use 2x4-in. by 20-ft. pieces, or 2x6-in. by 12-ft. pieces spliced. The stays may be fastened to the wall sections just below the top by spiking with 40-penny nails, three to each end. Bind the tops of the four sides with 2x4-in. pieces. If necessary to break these along the side walls, see that the break comes over the center of a wall panel. See that the binding 2x4-in. pieces come exactly over the 2x4-in. pieces forming the tops of the wall panels. Fasten with two 10-penny nails spiked to each panel. The ends must measure 20 ft. over all, in order that the roof section may fit easily.

The gable end sections, Fig. 6, should be next erected. They are to be bolted on with 6½-in. bolts; for this purpose, bolt-holes will have to be bored through the 2x4-in. pieces forming the wall top, so as to correspond with the bolt-holes already in the gable-bottom piece. Next nail along the top of the side wall the 1x4-in. strip, shown in Fig. 11 under the eaves and so marked; it should be of good material and should project about 2 in. above the 2x4-in. pieces so as to serve for the lower crosspieces of the roof sections to butt against. It may be necessary to plane off a little of the top of this strip so that the lower crosspieces of the roof sections will rest on the side walls and not be held up by the projecting portions which form the eaves, resting on the 1x4-in. strip.

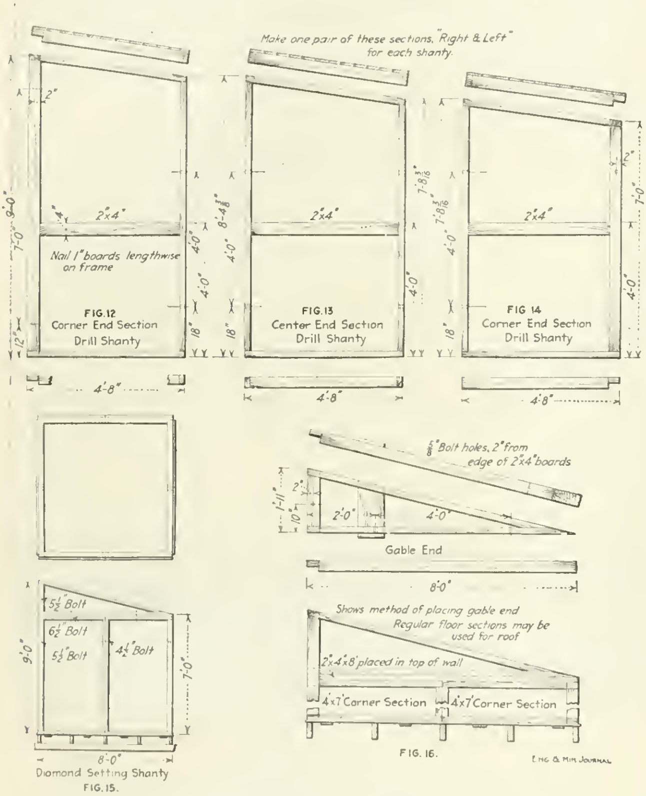
Make one pair of these sections, "Right & Left" for each shanty
2"
9'-0"
7'-0"
12"
2x4"
Nail 1" boards lengthwise on frame
4'-0"
18"
8'-4 3/8"
7'-8 3/16"
4'-8"
5/8" Bolt holes, 2" from edge of 2x4" boards
2'-0"
4'-0"
1'-11"
10"
Gable End
8'-0"
5½" Bolt
6½" Bolt
5½" Bolt
4½" Bolt
Shows method of placing gable end
Regular floor sections may be used for roof
2"x4"x8' placed in top of wall
4'x7' Corner Section
4'x7' Corner Section
Eng & Min Journal

FIG. 12 Corner End Section Drill Shanty

FIG. 13 Center End Section Drill Shanty

FIG. 14 Corner End Section Drill Shanty

Diamond Setting Shanty FIG. 15.

FIG. 16.

SECTIONS FOR DRILLING AND DIAMOND-SETTING SHEDS

The roof is next to be put on. Begin at one end, raising two opposite end sections, Fig. 7. The 1-in. board used to face the outside 2x4-in. piece of the roof section should be set flush with the outside boards of the gable section and then the inside edge of the roof section will be flush with the edge of the side wall section on which the lower end rests. In this way the roof and wall sections will correspond for the length of the building. The inside roof sections, Fig. 8, are next raised in pairs and are bolted together on the sides with the one bolt, as shown. Care must be taken to get the stovepipe section in the right position. The lower crosspieces of these sections, as stated, butt against the 1x4-in. strip along the top of the side walls. Add the inside sections until the end of the building is reached, when a pair of end sections must be put on. The completed roof may have four cracks between the 2x4-in. pieces of its end sections and the top 2x4-in. pieces of the gable sections. These may be covered with a board 5 to 8 in. wide, fitted as shown. The whole building is then to be covered with tar felt held on with lath. With the dimensions shown, the floor sections will not fit for a building over four sections long. For a longer building it is advisable to cut off enough on one row of floor sections to prevent their projecting beyond the walls, as a projection tends to allow moisture to run in on the floor. The cut sections can be put next the door which is ordinarily in the end of the building. They receive there the most wear and being cheap can be discarded as worn out when the building is moved.

THE OTHER BUILDINGS

The second building is similar to the one described except that it is 16 ft. wide and the walls 7 ft. high. The manner of erection is identical. The drill shanty is 14x16 ft., with a 9-ft. front wall and a 7-ft. back wall, and a shed roof. For the front wall panels similar to those of Figs. 3, 5 and 9 are used, but with the vertical dimensions increased to 9 ft. For the end walls, the panels shown in Figs. 12, 13 and 14 are used. It will be noted that these are wider than the wall panels heretofore described. The back walls are made of sections similar to those of Figs. 3, 5 and 9, but with the vertical dimensions only 7 ft., as in the case of those used for the walls of the second building. The floors and roof are usually made of loose planks with tar paper on the roof. Two 16-ft. plank stays are used to support the roof planks, and hold the ends together. The style of the building conforms so closely to that used all over the Michigan ranges that no erecting instructions are necessary.

The fourth building provided for is a shanty for the diamond setter. This is 8 ft. wide with the 9-ft. front and 7-ft. back walls of the drilling shanty; the length may be as desired. The ends are made of two panels each similar to those of Fig. 4, but 7 ft. high. The floor sections are made 8 ft. 2 in. long, as shown in Fig. 10 and are laid according to the method illustrated in Fig. 15. More floor beams may be used if it is desired to make the shanty firmer for setting purposes, or for the same reason, heavy sills may be cut and used lengthwise of the shanty directly under the floor, instead of the 2x6-in. floor beams shown. The triangular areas over the end walls are filled with the gable sections made as shown in Fig. 16. The tops of the side and back walls are bound with 2x4-in. pieces as described for the first building. The front of the shanty should be well supplied with windows, and the doors placed at the back. One end of the shanty may be used for a storehouse and for the stove. For the roof, floor sections may be used and covered with tar paper, but it is best to have them a little longer, say 9 ft., which can be shortened to 8 ft. 2 in. if they are used for a floor later.

On each erecting sheet is given a list of supplies and equipment as shown in the table, with blank spaces where the number or quantity can be filled in. When the size of building has been decided upon, the bill of materials is made out exactly and the possibility of a shortage of material is thus minimized.

TABLE OF SPECIFICATIONS

Windows—12x24-in. (2 lights)	No.
Stove pipe saddles (22x24-in. rise 4 in 8)	No.
Bolts, ½x4½-in.	No.
½x5½-in. (usually 8)	No.
½x6½-in. (usually 8)	No.
Hinges	No. pr.
Door latches	No.
Nails, 40-penny	Lb.
10-penny	Lb.
shingle	Lb.
Tar felt	Rolls
Lath	Bundles
Boards—1x4 in.	Lin.ft.
Boards, extra	
2x6-in. by 10-ft.	No.
2x4-in.	Lin.ft.

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New South Wales Mineral Production in 1913[1]

The report of the New South Wales Department of Mines for 1913 has just been issued, and gives the figures of production shown in the accompanying table.

NEW SOUTH WALES MINERAL PRODUCTION, 1912 AND 1913

Substance	Unit	1912	1913
Alunite	tons	3,425	2,235
Antimony (metal and ore)	tons	63	18
Bismuth (metal and ore)	tons	6	9
Coal	tons	9,885,815	10,414,165
Coke	tons	241,159	298,612
Copper (ingots, matte and ore)	tons	11,034	9,461
Diamonds	carats	2,239	5,573
Gold	oz.	165,295	149,657
Iron	tons	32,677	46,563
Iron, "oxide"	tons	3,757	3,204
Ironstone flux	tons	1,093	.....
Lead (pig, etc.)	tons	17,251	23,554
Lime	tons	35,657	33,272
Limestone flux	tons	33,186	42,663
Molybdenite	tons	57	79
Platinum	oz.	610	442
Silver (ingots and matte)	oz.	2,389,195	2,194,871
Silver-lead, ore, concentrates, etc.	tons	345,307	391,262
Shale (oil)	tons	86,018	16,985
Scheelite	tons	56	44
Tin (ingots and ore)	tons	2,073	3,021
Wolfram	tons	172	126
Zinc (spelter and concentrates)	tons	520,519	506,661

The output of minerals and metals during last year is valued at £12,095,084, which sum exceeds that of the previous year (itself a record) by £453,649.

Freedom from serious industrial troubles and the consequent, almost continuous working of the mines, have contributed to this very satisfactory state of affairs. The only products showing a decrease in value of production were gold, zinc and kerosene shale. The number of men employed during the year is estimated at 38,880, an increase of 1022 over the previous year.

In addition to the above, marble valued at £991, opal (£29,493), portland cement (£402,249) and sundry minerals and ores valued at £11,689 were produced in 1913.

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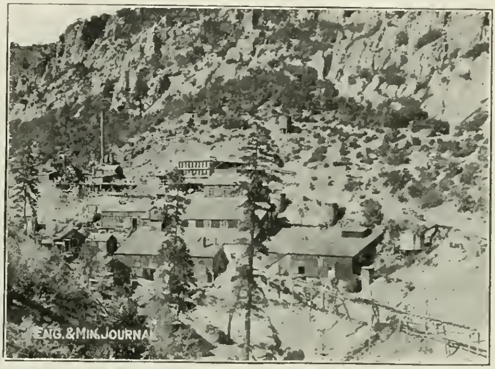
The Fuel Oil Engine in Mining

By John W. Kniffin*

My first experience with oil engines was at the Deadwood mill, at Mogollon, N. M., from 1910 to 1911. At this time all of the power developed in the camp was by steam plants burning wood, the cost of which was $8 per cord. This made the cost for fuel under the best conditions 3.7c. per brake horsepower-hour, making the total cost when labor and upkeep are added about 4.7c. per brake horsepower-hour.

After carefully investigating the power question, the owners of the Deadwood mill decided to install a 140-hp. De La Vergne "FH" engine. I gave the details of the operation of this engine in an article on the Deadwood mill in the Engineering and Mining Journal of Oct. 14, 1911.



Deadwood Mill, Mogollon, N. M., of Cleveland & Weatherhead

The engine is now developing 120 hp. with an oil consumption of 140 gal. of 27° Bé. fuel oil per day. The cost of this oil is 14⅓c. per gallon at Mogollon, 9c. of which is the wagon freight charge on the 90-mile haul from Silver City. This makes the cost of fuel 0.7c. per brake horsepower-hour, or about one-fifth the cost of wood as fuel.

The following table shows the cost of power at the Deadwood mill:

POWER COSTS AT DEADWOOD MILL, MOGOLLON, N. M.

	Gal.	Cost per Gal.	Cost per Day	Cost per B.hp.-Hr.
Fuel oil	140	$0.1432	$20.06	$0.0070
Lubricating oil	6	0.5350	3.21	0.0011
Labor (2 men @ $4, 1 man @ $5	...	......	13.00	0.0041
Totals	...	......	$36.27	$0.0122

This cost is high, compared with oil engines operating on or nearer to the railroad or oil fields. However, the saving of an oil engine over a steam plant is great, being 3½c. per brake horsepower-hour. This engine now runs 35 days without a shutdown.

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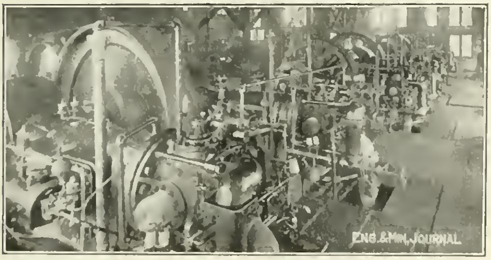
*Metallurgical engineer, Presidlo Mining Co., Shafter, Tex.

The Socorro Mines Co., after carefully observing the work of this engine for several months, installed one twin 200-hp. and two twin 280-hp. engines, and has recently added another twin 280-hp., making a total of 1040 hp. in De La Vergne engines. The Ernestine Mining Co., at about the same time, installed one single 90-hp. engine and one twin 200-hp. engine, and recently added a 280-hp. single engine, making a total of 570 hp. in their plant. The total horsepower in De La Vergne engines at Mogollon is 1750 hp.

I am at present operating a 140-hp. De La Vergne engine of the same type for the Presidio Mining Co., of Shafter, Texas, and I am also installing a second unit of 100 hp. for this company. The 140-hp. engine now in operation replaced a Reynolds 16x36-in. corliss engine and boiler plant, oil having been used as fuel. The saving effected by this engine is shown by the following table:

	De la Vergne	Corliss
Oil, gal. per day................	171.78	1029.42
Gal. per b.hp.-hr................	0.055	0.373
Cost per day....................	$10.43	$62.50
Cost per b.hp.-hr................	$0.0033	$0.0226

The oil engine shows a saving in fuel of 1.93c. per b.hp.-hr. The cost of fuel oil is, therefore, one-fifth of the cost of oil with the steam plant. This engine makes a saving of $52.07 per day, or $15,355 per year. The oil used in the engine is the Texas crude oil, the gravity of which is 21° Bé., and which costs $1.71 per bbl. of 42 gal., f.o.b. Marfa, Texas. The mine is located at Shafter, 45 miles distant. The engine is shut down once each month for general overhauling and for the past year has been operating at full-load for about 97% of the total time.



Oil Engines at Socorro Mining Co.'s Plant

All of the engines to which I have referred are of the "FH" type and operate on the four-stroke constant-volume cycle. To complete this cycle, four strokes of the piston or two revolutions of the crankshaft are necessary. On the first outward stroke, air is drawn into the cylinder. The next inward stroke compresses the air into the space between the air and exhaust valve and into the vaporizer. At the end of this stroke, the highly atomized charge of fuel is injected into the same chamber, being propelled by compressed air, forming an explosive mixture. The heat generated by the compression of the air in the cylinder, together with the heat furnished by the hot walls of the vaporizer, causes ignition, and the expansion of the gases forces the piston on its second outward or working stroke. The cycle is completed by the second return stroke, called the scavenging stroke, which expels the burned gases from the cylinder. The air for spraying the oil is supplied by a two-stage air compressor driven off the crankshaft by an eccentric. The air is compressed by the first stage, to 150 lb. per sq.in., and by the second stage to about 600 lb. per sq.in. The quantity of air, however, is very small. The regulation of speed of the engine is effected by a Hartung governor operating by gears from the camshaft. The governor is sensitive and actuates the oil-supply pump, lengthening or shortening the stroke in accordance with the load.

The combustion obtained with this engine is remarkably complete even when operating under wide variations of load and on the heaviest grades of fuel oil. The exhaust is colorless and there is no carbon deposited in the cylinder or the vaporizer. The advantages of this type of engine over any other type are: Low fuel expense; simplicity; flexibility; no stand-by losses; minimum attendance charge.

*

Rubberglass

An experienced constructing engineer has communicated the following about a useful new building material:

I have been using rubberglass in mill construction and other industrial buildings during the last seven or eight years. The skylights at the Miami Copper Co.'s concentrator were equipped with rubberglass and in the Inspiration plant it was decided to place rubberglass in the side-lights as well as in the skylights. The Miami rubberglass has now been in use for four years, and to date has given complete satisfaction.

The particular advantages of rubberglass are that it is pliable, and owing to the peculiar construction of the frames to which it is attached, it can easily be made water-tight without the use of putty or other materials of similar nature. It cannot be broken and while it is not transparent, it is very translucent, and the light admitted by it is of a pleasing nature, making a splendid light for mechanics to work by, etc.

I have used a large quantity of this material during the last seven or eight years in Arizona, and for that region, at least, I have no doubt that it will continue to prove very satisfactory indeed.

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Westphalian Platinum

A correspondent, writing to the *Mining Journal*, London, from Düsseldorf, says: Preparations for the exploration of the platinum mines of the Schlägelsberg company, near Meuden, in Westphalia (belonging to the German platinum works at Düsseldorf) are so far advanced that they have commenced to construct the building for the working of the metal. Sixty miners have been occupied for some months in driving a main gallery 200 m. long and four cross galleries to develop the mine. (Cf. also Eng. & Min. Journ., June 20, 1914, p. 1252).

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Nevada Mining Lien Law

Under the Nevada statutes a claim to a lien against mining property for services performed under a contract of employment by the day may be validly joined with one under a contract to perform a specified amount of work at a fixed price; the work being continuous and of the same character under both contracts. (Nevada Supreme Court, Ferro vs. Bargo Mining & Milling Co., 140 *Pacific Reporter*, 527.)

New Smelting Works of Arizona Copper Co.--II

By Richard H. Vail

SYNOPSIS—The reverberatory furnaces at this works are of unusual width, being 22 ft. wide by 100 ft. long; separate oil tanks are provided so that the amount of oil used by each furnaceman may be noted; the waste-heat boilers supply power for the company's mines and concentrators as well as for the smelting works. Agglomerating cones installed to mix hot converter slag and fine siliceous ore for reverberatory charging. The new works cost about two million dollars.

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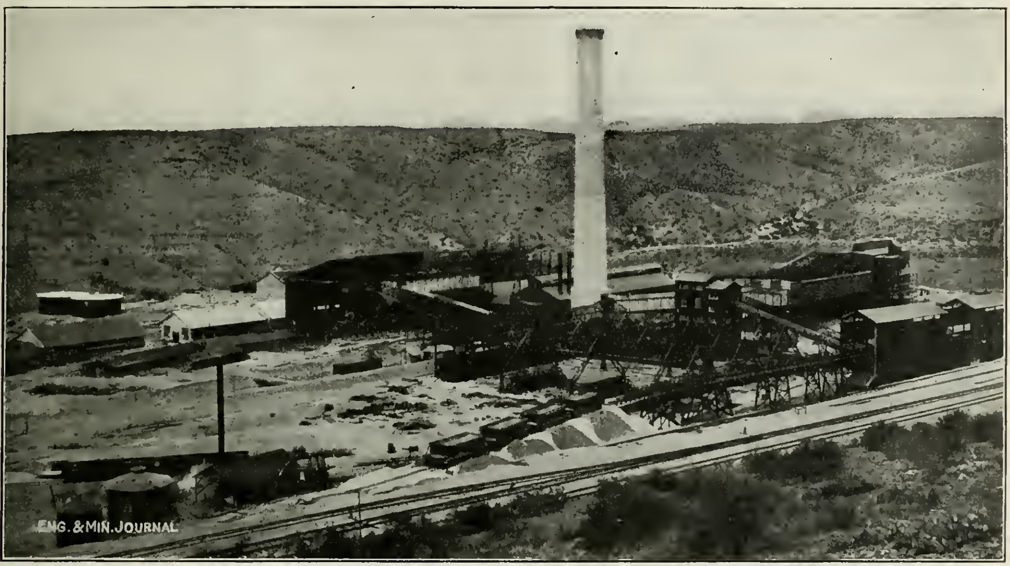
The reverberatory department comprises three furnaces 22x100 ft., the gases from which pass to seven waste-heat boilers of 712 b.hp. each. The reverberatory furnaces are of interest by reason of their being wider than the standard 19-ft. furnace. The No. 3 furnace bottom was built with an inverted arch of 15-in. silica brick, but this was found unsatisfactory and all the furnaces now have the customary silica bottom. Only two of the reverberatory furnaces are operated under normal conditions, the third furnace being held as a spare. Fettling is done through holes in the roof; the converter byproducts and siliceous ore used for fettling are brought over the fettling holes in a small hopper car, running on a track over each side of the furnace; fettling at the bridge is done in the same manner. Siliceous ore, which is to be smelted in the reverberatory furnaces, may be sent directly to the sampling mill and thence to the mixing beds, or it may go to the bunker bins and thence to the clinkering plant and be mixed with converter slag in the agglomerating cones.

The reverberatory furnaces each have two matte tapholes and the matte is tapped into 20-ton cast-steel ladles. The slag is removed in electrically tilted slag cars, built by the M. H. Treadwell Co. There are four of these cars equipped with bowls of 225 cu.ft. capacity, and two four-wheel trucks. These cars are drawn by two Baldwin-Westinghouse 18-ton electric locomotives, having a speed of six miles per hour and a drawbar pull of 8000 pounds.

Oil is supplied to the reverberatory furnaces and to the separate oil-fired boilers through six Wilgus No. 16 oil systems, each comprising a 5¼x3½x5-in. duplex oil pump and heater. A feature of the oil service in the reverberatory building is that a sufficient number of tanks has been installed to permit the measuring of the amount of oil used on each shift in the furnaces or boilers. There are eight of these service tanks, each 10 ft. in diameter by 11 ft. 8 in. high. The furnacemen on each shift will thus have a definite reminder of the amount of oil which their predecessors used.



General View During Construction—Looking West toward San Francisco River

Converting Department

The converting department comprises three stands, for which the Allis-Chalmers Mfg. Co. supplied four 12-ft. upright shells with eccentric mouth. The converters are lined with magnesite brick, the vertical distance from the tuyeres to the bottom of the dished portion being 15 in. Normally, only two stands are used and the matte is brought to the converters in 20-ton ladles by one of two Morgan cranes. These are of 40 tons capacity and each has a 15-ton auxiliary hoist. The crane rails are 50 ft. above the floor and the span is 55 ft. There is a storage capacity of 100 tons in the siliceous-ore bins above the converters and this material may be measured out in a small hopper and fed by gravity through pipe chutes, thus saving much time both for the cranes and for the converters; the latter do not have to be turned entirely over to receive the flux and the operation of feeding is greatly expedited, as there is no waiting for crane service. Doubtless some of the older smelting works will find it advantageous to consider remodeling their converting departments to permit feeding the silica in this manner, especially where the converting capacity is crowded and the conditions are such as to permit overhead bins.

Converter Aisle During Construction—Agglomerating Plant in Background

The converter-dust chamber is 130 ft. long by 25 ft. wide and has a cross-sectional area of 500 sq.ft. above the hoppers; it is constructed of steel and hollow tile with a roof of No. 11 sheet iron. This dust chamber is provided with wires as in the roaster dust chamber, but contains only about 56 miles of No. 10 steel wire and one mile of $^3/_8$-in. steel chain; the wires are hung from the chain at 4-in. intervals and extend midway into the hoppers.

The converter copper is cast in one of two straight-line casting machines[3], similar to those in use at the new Calumet & Arizona plant, in Douglas. The converter bars are handled by a small compressed-air hoist suspended from a monorail radial crane, extending over the storage platform.

Novel Disposal of Converter Slag

The converter slag at this plant is to be handled in an interesting equipment, by which it is expected that the fluxing value of the converter slag will be more completely utilized than when the molten slag is poured into reverberatory furnaces. It is generally accepted that pouring converter slag through blast-furnace settlers in many cases effects only a partial cleaning; on the other hand, when poured into reverberatory furnaces in the usual manner, only a small percentage of the fluxing value is realized, the general assumption being that the heavy converter slag forms a more or less inert layer between the matte and the reverberatory charge or slag.

At this plant there have been installed agglomerating cones, of a type similar to the cone developed at the Copper Queen smelting works at Douglas, where flue dust and converter slag were agglomerated. At the Arizona Copper Co.'s plant, siliceous ore, crushed to pass $^1/_4$-in. ring, will be substituted for flue dust, and the aim will be not to agglomerate into large lumps, but merely to make an intimate mixture and obtain a hot product that will be charged into the reverberatories as a self-fluxing mix-

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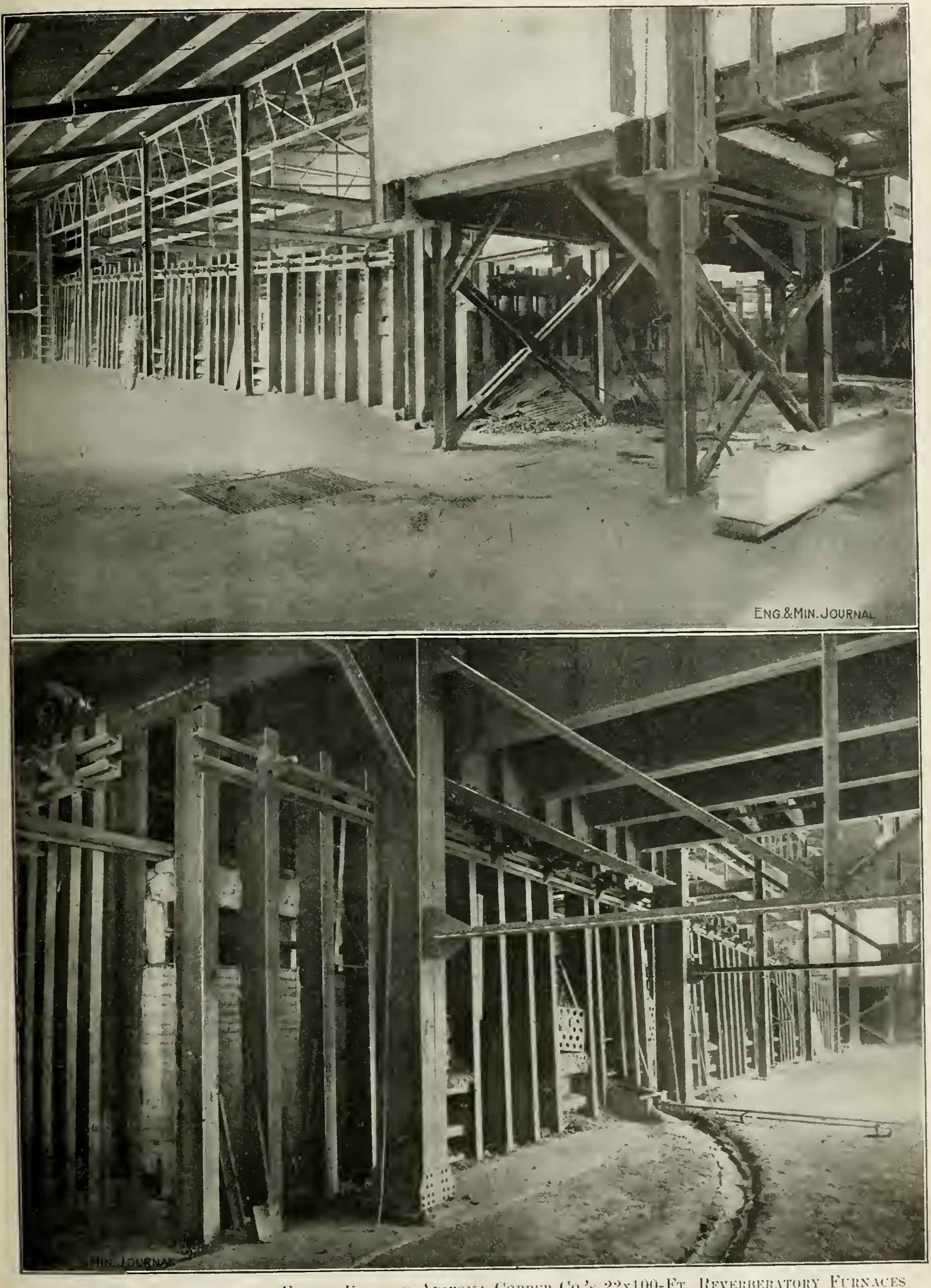
[3] "Eng. and Min. Journ.," Apr. 25, 1914.

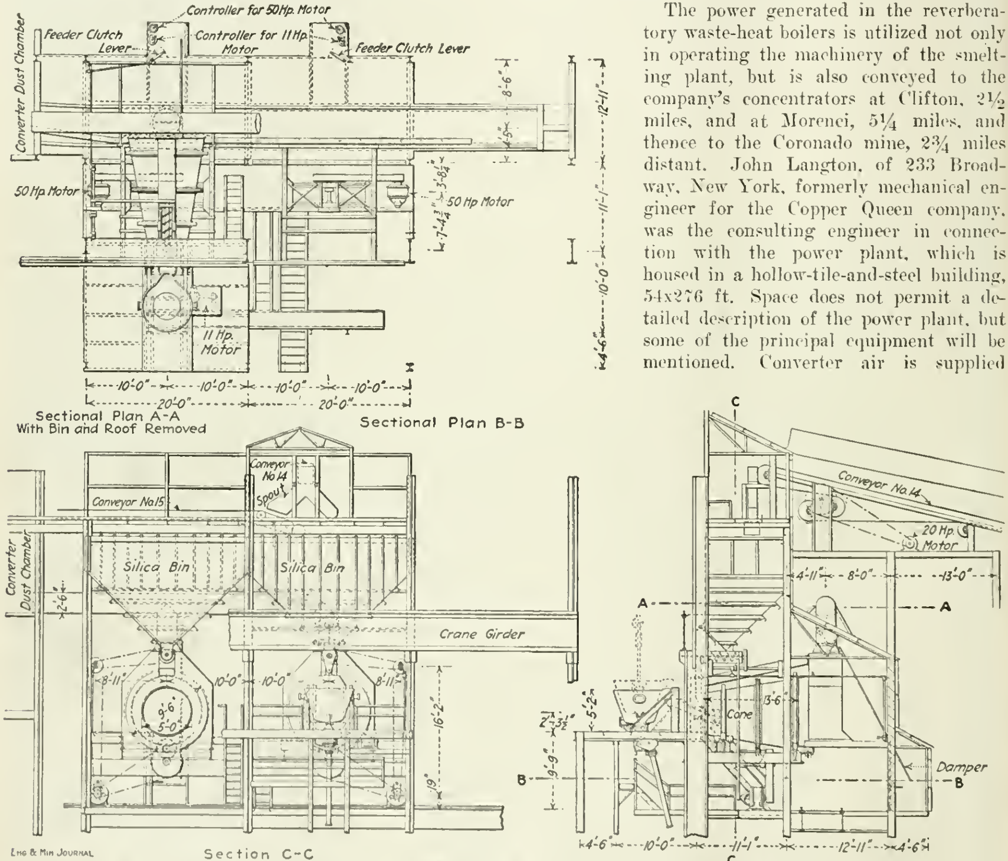


Views from Skimming and Firing Ends of Arizona Copper Co.'s 22x100-Ft. Reverberatory Furnaces ture. By reason of the intimate association of the siliceous particles and the converter slag, it is expected that an additional fluxing value will be obtained from the latter. The cones were not yet in operation at the time these notes were taken, but it was thought by the management that, after a period of experimentation, the operation could be regulated to obtain the desired physical condition.

It is expected that only one of the cones will be used regularly, though a spare unit is installed, as has been done throughout this smelting works. The cones are equipped with mechanical ladle tippers, ore feeders, etc., the general arrangement being shown in the accompanying illustration. The clinkered product will be removed in cars of 165-cu.ft. capacity, made by Kilbourne & Jacobs company; there are three of these cars, one being a larry car equipped with a 10-hp. direct-current motor, the other two cars acting as trailers.

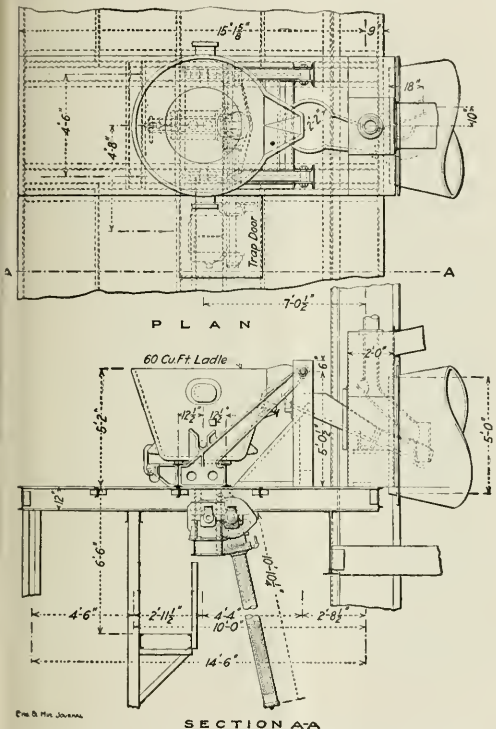
All steam for the mines, concentrators and smelting works will be generated in the reverberatory building in seven waste-heat boilers of 5000-hp. rating, and three 384-hp., oil-fired boilers. Normally, the waste-heat boilers will supply all the steam needed. The gases from the reverberatories pass first to a common header and thence to the seven boilers; following the boilers space has been left for the installation of economizers if it is found desirable later to have them. Steam will be delivered at 175-lb. pressure and 100° superheat, all boilers being equipped with Foster superheaters. The waste-heat boilers are Stirling, class M, No. 26 water-tube boilers; the oil-fired boilers are of the same make, being designated by the company as class M, No. 14. Water will be supplied by two 8x10-in. Aldrich vertical triplex pumps driven by a 40-hp. motor; at 31 r.p.m. these pumps have a capacity of 200 gal. per min. each. A steam pump has been provided for use in emergencies should the electric power be cut off; this is a 10x6x12-in. duplex plunger pump, made by Dean Bros.

The power generated in the reverberatory waste-heat boilers is utilized not only in operating the machinery of the smelting plant, but is also conveyed to the company's concentrators at Clifton, 2½ miles, and at Morenci, 5¼ miles, and thence to the Coronado mine, 2¾ miles distant. John Langton, of 233 Broadway, New York, formerly mechanical engineer for the Copper Queen company, was the consulting engineer in connection with the power plant, which is housed in a hollow-tile-and-steel building, 54x276 ft. Space does not permit a detailed description of the power plant, but some of the principal equipment will be mentioned. Converter air is supplied by two Nordberg blowing engines, but most of the power from this plant is generated by three 2000-kw. Curtis turbines. The latter are of the horizontal type and operate at 1800 r.p.m., condensing; they are direct-connected to 2500-kv.-a., 60-cycle, 6600-volt, three-phase generators. Nine oil-cooled auto transformers step the current up to 13,200 volts for the long-distance transmissions to the company's concentrators and mines. Current for use within the smelting plant is stepped down to 440 volts for general use and to 110 volts for lighting pur-



Arrangement of Agglomerating Plant for Mixing Molten Converter Slag and Fine Siliceous Ore oses; direct current is supplied at 250 volts for the anes, trolleys, converters and Messiter reclaiming maines. There are two 75-kw. Ridgway exciter units and ree 56-hp. Ridgway single-expansion engines are used drive three Connersville rotary pumps, supplying circulating water for the turbines.

The converter blowing engines are Nordberg crossompound duplex condensing engines, with steam cylinders, 22 and 42 in. in diameter, air cylinders 44 in., and 2-in. stroke. They are designed for steam at 160-lb. ressure and 75° of superheat and at a normal speed of 1 r.p.m., each engine has a capacity of 10,000 cu.ft. per in. compressing to 12 lb. at an altitude of 3500 ft. steam consumption of 1.1 lb. per 100 cu.ft. is guaranteed when operating at full speed and 1.2 lb. per 100 cu.ft. at half speed.



Ladle-Tilting Apparatus for Pouring Converter Slag into Agglomerating Cone

The condensing apparatus for the power plant was supplied by the Alberger Condenser Co., and comprised three surface condensers for turbine exhausts, each having a capacity of 40,000 lb. of steam per hr. and requiring 5000 gal. per min. of water; one barometric condenser for the reciprocating-engine exhaust, requiring 2000 gal. per min. of water; there are three 8x20x12-in. dry-vacuum pumps for the former and for the barometric condenser, two 16x12-in. horizontal, single-stage, rotative, dry-vacuum pumps driven by electric motor; three 18x20-in. and two 14x12-in. Connersville pumps supply water to the above condensers. North of the power house there is an extensive wooden cooling tower with concrete basin. The power-house site is such as to permit the turbine condensates to drain from the surface condensers under barometric head; the condensates are then pumped up to a Wainwright heater by two Goulds, 2½-in., single-stage centrifugal pumps, direct-connected to Westinghouse motors; each of these pumps has a rated capacity of 200 gal. per min. against an 80-ft. head, one unit being maintained as a spare. There is also a Cochrane No. 760 feed-water heater, the discharge from which goes to a settling tank and thence to the tank receiving condensates from the Wainwright heater. Before going to the boilers, the water is measured through a Lea recorder, which may also be checked by a tilting-box meter of the Cananea type. From the storage tank the boiler-feed water is pumped to the reverberatory boilers by equipment already described.

The general water-service tank holds 250,000 gal., being 40 ft. in diameter and 26 ft. high. Oil storage for the works is provided by two 486,000-gal. steel tanks and a 48,000-gal. concrete sump, into which six tank cars may be unloaded; beside this, there are the eight 160-bbl. tanks for the individual service in the reverberatory building. An oil pump house contains two 5x8-in. Aldrich triplex pumps that deliver the oil from the unloading sump, either to the general storage tanks or to the tanks in the reverberatory building. These pumps are guaranteed to deliver 80 gal. per min. against 150-lb. pressure, when operating at 37 revolutions per minute.

New Works Cost $2,100,000

The new plant, which cost about $2,100,000, was designed by Dr. L. D. Ricketts, and was started and operated under his direction until Mar. 1, 1914. It was turned over to the company management after two months' operation at figures below the estimated operating cost. While construction cost of the new works was over two million dollars, the cost of the smelting plant proper was only $1,700,000; about $400,000 have been spent on the power house. About $300,000 additional money was spent for transmision lines, transformer houses, etc. Most of the electric power generated is conveyed to the company's mines and concentrators.

The plans for the new smelting plant were drawn by Repath & McGregor, of Douglas, Ariz., and the work of erection was in charge of E. Horton Jones. Construction was begun in January, 1912, and the first copper was poured on Oct. 8, 1913. While the new reduction works was not built in the record time made in constructing the new reverberatory plant at Hayden, yet a creditable rate of construction was maintained; no night work was done, and there were some delays in the delivery of structural steel; also, considerable fabrication of steel work, including all the steel chutes in the sampling mills, etc., was done at the site. The prompt completion of the smelting plant was expedited by the application, in a limited way, of "efficiency engineering," two men having been detailed to assist foremen in planning their work; one of these men took charge of blueprints, listing all materials required and expediting their delivery; the other man was detailed to "take up lost motion" for the construction gangs, by seeing that all material required for a certain job was on hand before the final order was given to the foreman to begin the job. In the erection of the works, the mechanical shops were among the first buildings completed, so that their facilities could be utilized in the general construction of the plant. The shops and warehouse are built of hollow tile and steel, and each building is equipped with Kinnear rolling doors.

The new smelting plant is operated under the general direction of Norman Carmichael, general manager of the Arizona Copper Co., and is in direct charge of F. N. Flynn, smelter superintendent.

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Methods of Treating Tungsten Ores

A process, for which F. M. Becket, of Niagara Falls, N. Y., has taken out U. S. pat. 1,081,571, aims to prepare low-phosphorus tungsten or ferrotungsten from certain phosphorus-bearing tungsten ores, which may or may not contain manganese, or from high-manganese, low-phosphorous tungsten ores.

The method may be carried into effect as follows: The low-phosphorus tungsten ore or concentrate is first subjected to a reducing operation, carbon, hydrogen, carbon monoxide, producer gas or furnace gases having a reducing character. The reduction is effected at a temperature below the melting-point of the reduced product, and the reduction may be either partial, approximately complete, or complete. The product of this reducing operation, or "reduced product," is next subjected to an appropriate treatment for the removal of part or all of the manganese. This may be accomplished by treatment with an acid under the following conditions: To the reduced product is added an excess of sulphuric acid, say of 1.20 sp.gr., and the mass is allowed to stand for 24 hours with frequent stirring. Moderate heating accelerates the reaction, but involves some loss of tungsten by solution. The solution is then drained off, and is preferably applied to the purification of successive batches of reduced product, with such reinforcement as may be required. By this treatment, 70% or upward of the manganese may be removed, and also a large percentage of the iron, the result of the removal of the iron being, of course, a corresponding concentration of the tugnsten of the reduced product.

The purified product is now melted in an electric furnace, with or without carbon, according to whether the initial reduction was complete or incomplete, yielding directly a commercially available metal or ferro-alloy, the composition of which depends upon the amount of residual iron.

Certain ores of tungsten, including ferberite from Boulder County, Colorado, contain considerable proportions of phosphorus, which in special cases may attain 0.6 to 0.7%. Such ores consist largely of iron tungstate with a gangue of siliceous character, the phosphorus being usually associated both with the mineral and the gangue in extremely variable proportions. Becket has discovered that it is possible to remove a material proportion, and in some cases all, or nearly all, of the phosphorus from these ores by a treatment involving the solution of the phosphorus in acid reagents, without substantial solution or loss of tungsten, thus converting high-phosphorus ores into low-phosphorus material available for direct smelting for the preparation of low-phosphorus ferro-tungsten.

In the case of certain ores, a simple acid treatment of the finely ground ore may suffice. For example, the ore, ground to suitable fineness, say 100 mesh, may be mixed with concentrated sulphuric acid (specific gravity 1.84) in the approximate proportions of 200 cu.cm. of acid per kilogram of ore. The solution proceeds at ordinary room temperatures, dissolving from 30 to 90% of the phosphorus in the course of a few hours without substational loss of tungsten, the loss of tungsten under these conditions being usually less than 1%. At somewhat higher temperatures, say 80 to 100° C., the solution of phosphorus is more rapid but the loss of tungsten is materially greater. At the same time, considerable quantities of iron are dissolved, thus effecting a concentration of the tungsten in the ore. Following the acid-treatment, the ore is thoroughly washed with water to remove the dissolved substances.

METHOD FOR HIGH-PHOSPHORUS ORE

There are, however, some ores which do not respond well to the treatment as above described, such ores being usually comparatively high in phosphorus. Those ores which are suitable for treatment by the simple acid-solution process and those which are not suitable, may be rendered responsive to such process by suitable heat treatment, preferably by roasting under oxidizing conditions, a roast of this character being most easily and economically accomplished. For example, the ore is crushed to 10 to 12 mesh and subjected to an oxidizing roast, with stirring, at a red heat or somewhat lower. The acid treatment may be applied to the roasted ores without further crushing. The efficiency of the process may, however, be further increased in certain cases by a finer subdivision of the ores, either before or after the roasting.

The conditions of the acid treatment as applied to the roasted ores may be substantially as above described with reference to the raw ores. Such treatment of roasted ores has been found effective to remove up to 90% or even more of the contained phosphorus, without material loss of tungsten. In the acid treatment of roasted ores much less iron is dissolved than in the treatment of the raw ores.

Results of a similar character may be obtained with other acids, as diluted sulphuric acid, hydrochloric acid or the like. Mixed reagents may also be used, good results having been obtained with sulphuric acid containing a small proportion of nitric acid, potassium chlorate, and other oxidizing agents. In the use of these acid baths it may be desirable to dispose the ore in proximity to an insoluble anode connected in a direct electric circuit, for example in proximity to an anode of lead in the case of sulphuric acid, whereby the solvent effect of the acid is somewhat accentuated.

Preferably the purified ores are smelted in presence of a metallic reducing agent, usually silicon, the reduction being accomplished in an electric furnace. By this procedure it is possible to obtain a ferrotungsten which is low both in phosphorus and carbon, and which is, therefore available for general use in the preparation of high-grade or alloy steels or for other purposes.

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Duty to Guard Shafts

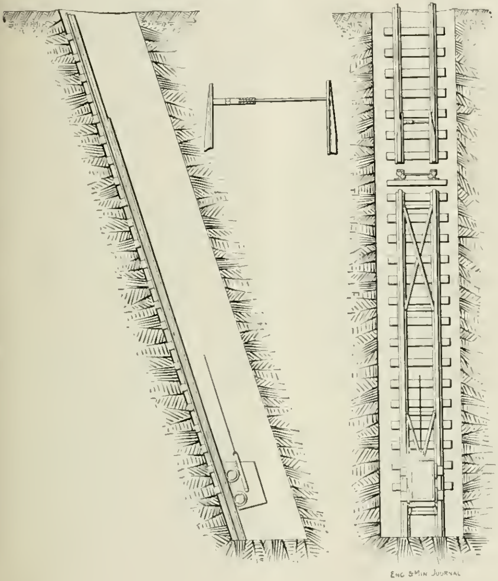
A miner or prospector is not required by law to fence or otherwise inclose holes, pits, shafts, or tunnels to protect live stock running at large from falling into them, according to a decision reached by the Idaho Supreme Court in the recent case of Fix vs. Gray, 140 *Pacific Reporter*, 773.

Details of Practical Mining

Extensible Skip Track for Sinking

A movable track designed to permit the skip to be lowered to the bottom of an inclined shaft in process of sinking, has been invented by Otto Lieber and Chester A. Gibbs, of Hancock and Houghton, Mich. (U. S. pat. 1,093,708.)

At blasting time the movable bottom section is merely pulled up along the fixed track. It consists of two rails set inside the fixed rails in an inverted position, so that the heads work below the heads of the fixed rails; one side of the base is cut away. The two rails are held together by cross and diagonal braces as shown. The tops of both are tapered so as to allow the skip wheels to pass from the fixed rails without difficulty. To get a good fit of these tapered points, a telescope screw bar is inserted, by which the points are spread and held snug to the fixed rails.



Movable Section of Track to Reach Shaft Bottom

Whereas the gage of a section, such as this, is slightly less than the gage of the permanent skip tracks, there is usually enough clearance between the wheel gage of the skip and the permanent track gage to allow the skip wheels to run without any great trouble over the movable section.

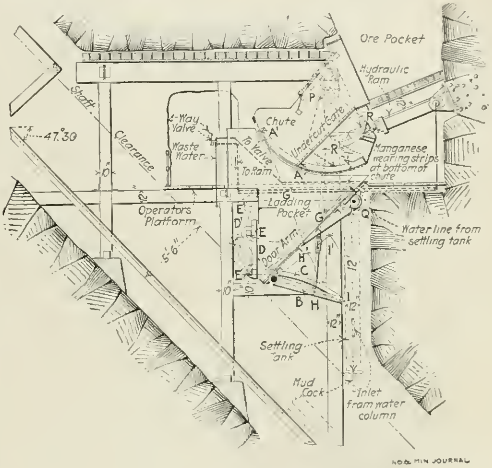
It is stated that the device has been installed in two shafts, dipping 72° and 56°, and has been found to work satisfactorily.

Hydraulically Operated Skip-Loading Pockets

By Clarence M. Haight*

The accompanying drawing shows the general arrangement of the steel ore-loading pockets in use in the Palmer shaft of the New Jersey Zinc Co.'s mine at Franklin Furnace, N. J. The pockets are the design of R. M. Catlin, superintendent.

The arrangement includes a loading pocket and between this and the rock ore-bin, a chute and gate. The loading pocket holds one skip load of ore only; the upper chute feeds the loading pocket and its gate cuts off the ore supply therefrom when the skip is filling. Water from the column pipe in the shaft furnishes power to the hydraulic ram which operates the gate levers. The direction of the movement of the ram is controlled from the loading platform by an easily operated four-way valve. Water, after use, flows out through a waste pipe from the valve.



Side Elevation of the Pocket

When closed, the apparatus stands as shown in the drawing. The lower door is closed and the lip *A* of the upper chute-gate is drawn back beyond the bottom of the chute. This allows the ore to run into the bottom or loading pocket until that is filled, and, as the angle of repose of the ore is then reached, the movement of the ore stops with both the lower pocket and the chute full.

When the empty skip is spotted at the door of the loading pocket, the controlling valve is reversed. The hydraulic ram moves out along the arc shown, its connection point *R* moving toward the position *R'*; this moves the lip *A* around its pivots *P* toward *A'*, closing off the chute so that no more ore can go into the loading pocket. Meanwhile, the rod *G* is pulled forward and up toward the position indicated by the line *G'*. This motion moves the lever arms *B* and *C*, which link the rod *G* to the lower pocket door so that the pins *H* and *I* advance toward the positions *H'* and *I'* The door *D* of the loading pocket is held against the mouth of the pocket by two arms, pivoted at *Q* and *E*. The movement of the arms *B* and *C* forces the door toward the open position *D'*. This position is reached at the end of the stroke of the hydraulic ram. As this door opens, the ore runs from the pocket into the skip.

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*Mining engineer, Franklin Furnace, N. J.

In this operation, the advance of the lip *A* is more rapid at first than the movement of the door *D*, so that it has cut off the ore lying in the chute before the loading pocket begins to discharge to the skip. In like manner, on reversing the ram, the door *D* moves the more rapidly at first, so that it is closed tight before the lip *A* has retreated far enough to allow any ore to run into the pocket. Hence, all danger of an excess of ore running over the skip and down the shaft is avoided. The lip *A* cannot jam, because it cuts in from under the chute when closing and so cannot catch on a chunk of ore; while, as the door *D* does not close until the pocket is empty, there is nothing for that to catch on.

One man only is needed to operate a pair of pockets, as the valves work easily. A second man is stationed in the shaft, below the loading platform, to trim the skip in case a large chunk lies on the top of the load and projects over the back or the sides of the skip. The operation of these pockets is easy and rapid. With skips averaging about six tons to the load, over 2000 short tons have been hoisted in $8\frac{1}{2}$ hours.

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Diagonal End Plates, Inclined Shaft

By G. A. Denny[*]

For a Mexican shaft, inclined at 65°, we used in the first stages the conventional timbering shown in Fig. 1.

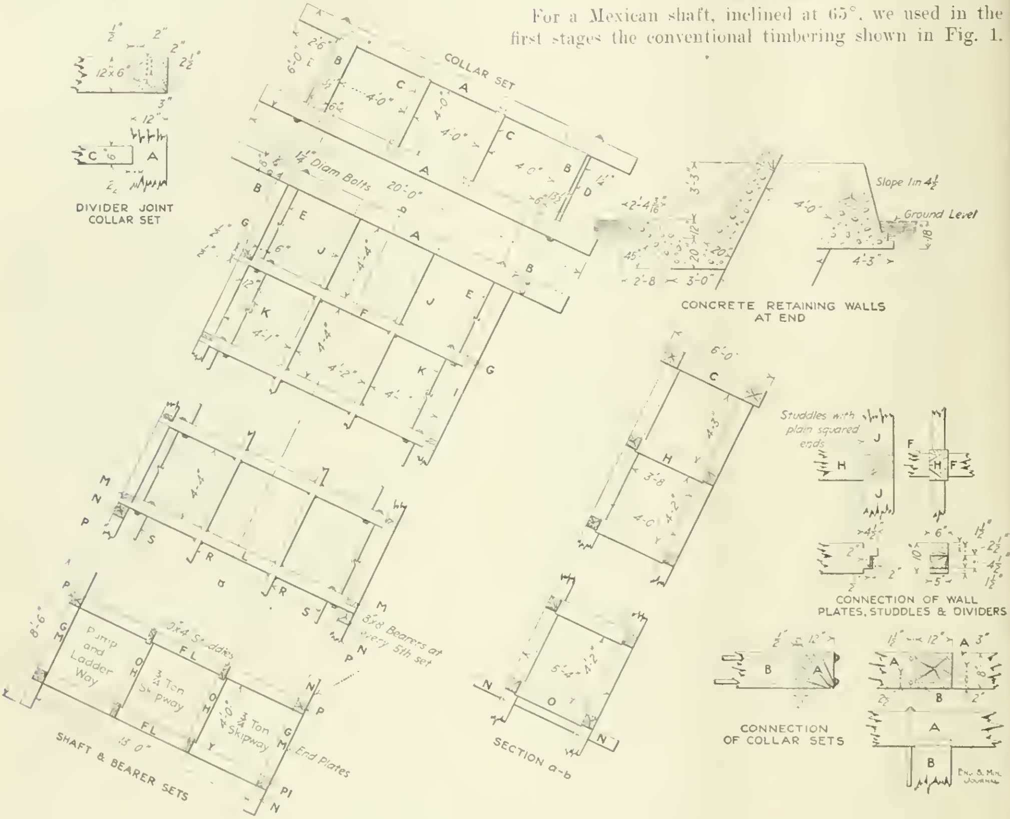

Fig. 1. The Standard Shaft Timbering First Used

The hanging in the shaft was exceedingly heavy and hard to support and to overcome this difficulty we designed the system of timbering shown in Fig. 2. This has proved to be altogether superior to the first set and easily sustains the pressure put upon it by the heavy ground. So far as we are aware, this is the first time that this system has been used and we offer it as a subject of discussion.

The principal difference between the two systems is, of course, the substitution of the diagonal end plates for the right-angled. The bearers, however, are put in parallel to the wall plates in the new system and parallel to the end plates in the old. Fig. 1 shows also the method of reinforcing the collar with concrete. Table 1 gives the bill of materials for sets of the first system and Table II gives it for the new system.

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[*] Of Denny Bros., managers and consulting engineers, Apt 829, Mexico, D. F.

TABLE I. TIMBER LIST OF COLLAR, ORDINARY AND BEARER SETS OF OLD SYSTEM

No. per Set	Mark	Size	Length	Material	Description
2	A	12x12″	20′ 0″	Pine	Wall plates, collar set
2	B	12x12″	4′ 6″	Pine	End plates, collar set
2	C	6x12″	4′ 6″	Pine	Dividers, collar set
4	D	$1\frac{1}{4}$″ diam.	6′ $2\frac{7}{8}$″	Wrt. iron	Tie bolts, collar set
8	E	1″ diam.	3′ 2″	Wrt. iron	Hanging bolts, collar set
2	F	8x8″	14′ 6″	Pine	Wall plates, shaft set
2	G	8x8″	5′ 6″	Pine	End plates, shaft set
2	H	6x10″	4′ 6″	Pine	Dividers, shaft set
4	I	8x8″	4′ 6″	Pine	Corner studdles, shaft set
4	J	4x10″	4′ 6″	Pine	Intermediate studdles, shaft set
8	K	1″ diam.	2′ 10″	Wrt. iron	Hanging bolts, shaft set
2	L	8x8″	14′ 6″	Pine	Wall plates, bearer set
2	M	8x8″	5′ 6″	Pine	End plates, bearer set
2	N	8x8″	8′ 6″	Pine	Bearers, bearer set
2	O	6x10″	4′ 6″	Pine	Dividers, bearer set
4	P	8x8″	4′ 0″	Pine	Corner studdles, bearer set
4	R	4x10″	4′ 6″	Pine	Intermediate studdles, bearer set
8	S	1″ diam.	2′ 10″	Wrt. iron	Hanging bolts, bearer set

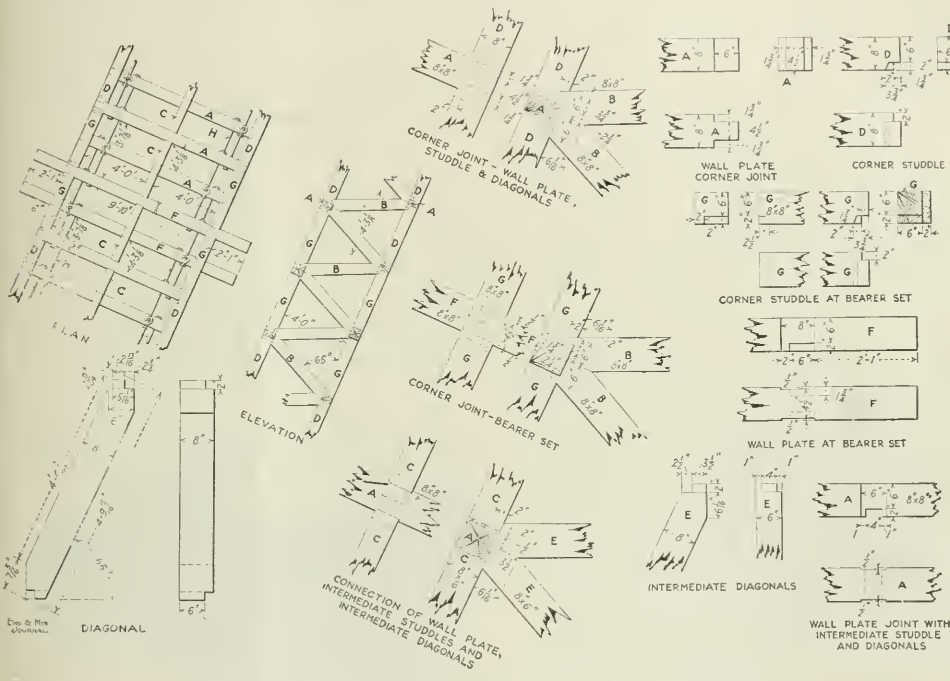
PLAN
ELEVATION
DIAGONAL
CORNER JOINT - WALL PLATE, STUDDLE & DIAGONALS
CORNER JOINT-BEARER SET
CONNECTION OF WALL PLATE, INTERMEDIATE STUDDLES AND INTERMEDIATE DIAGONALS
WALL PLATE CORNER JOINT
CORNER STUDDLE
CORNER STUDDLE AT BEARER SET
WALL PLATE AT BEARER SET
INTERMEDIATE DIAGONALS
WALL PLATE JOINT WITH INTERMEDIATE STUDDLE AND DIAGONALS
Eng. & Min. Journal

FIG. 2. THE NEW TIMBERING WITH DIAGONAL MEMBERS

TABLE II. TIMBER LIST OF ORDINARY AND BEARER SETS IN NEW SYSTEM

No. per Set	Mark	Size	Length	Material	Description
2	A	8x8″	9′ 10″	Pine	Wall plates, shaft set
4	B	8x8″	4′ $10\frac{5}{32}$″	Pine	End diagonals, shaft set
2	E	6x8″	4′ $10\frac{5}{32}$″	Pine	Intermediate diagonals, shaft set
4	D	8x8″	3′ $10\frac{5}{8}$″	Pine	Corner studdles, shaft set
2	C	6x8″	3′ $8\frac{1}{8}$″	Pine	Intermediate studdles, shaft set
8	H	1″ diam.	2′ $5\frac{9}{16}$″	Wrt. iron	Hanging bolts, shaft set
2	F	8x8″	14′ 0″	Pine	Wall plates, bearer set
1	B	8x8″	4′ $10\frac{5}{32}$″	Pine	End diagonals, bearer set
2	E	6x8″	4′ $10\frac{5}{32}$″	Pine	Intermediate diagonals, bearer set
8	G	8x8″	3′ $9\frac{3}{4}$″	Pine	Corner studdles, bearer set
2	C	6x8″	3′ $8\frac{1}{4}$″	Pine	Intermediate studdles, bearer set
8	H	1″ diam.	2′ $5\frac{9}{16}$″	Wrt. iron	Hanging bolts, bearer set

Erroneous Results from Angle-Hole Drilling

By F. A. Glass*

On the Cuyuna iron range in central Minnesota there are no outcrops of ore or of the associated rocks. A mantle of glacial drift covers the entire district for a depth of from 20 to 250 ft., or more, with an average of over 100 ft. There is no relation between the topographic features of the present surface and those of the underlying rocks. There are large undrained areas in many parts of the productive district which, for the most part, lies in or adjacent to marshes and lakes. Test-pitting is impracticable on account of the volume of water encountered, and explorations can be carried on only by means of churn and diamond drills.

The orebodies occur in lenses of variable length and run from a few feet to 300 ft. or more in width. Merchantable ore has been found at depths of a thousand feet, but in general the vertical depth of the orebodies is not explored for over two or three hundred feet. It is considered poor policy, when the orebodies dip so steeply as they do in this district, to carry explorations in depth beyond a point where sufficient ore is blocked out to assure a 15- or 20-yr. output from one shaft.

The orebodies are generally brecciated and frequently contain vugs and seams of pulverulent, disintegrated quartz. Minor but intricate folding within the orebodies is also frequent. The dip is steep, say, from 50°

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*Mining engineer, Brainerd, Minn.

to 80°, prevailingly between 60° and 70°. With such high dips, it is only natural that at first "angle" or inclined holes should be drilled against the dip of the formations, to obtain as nearly as possible representative cross-sections. These angle holes are limited by physical conditions to an inclination of from 60° to 70° from the horizontal. At present, for reasons to be explained, the angle hole has been practically abandoned in favor of vertical drilling.

Most of the ore can be churn-drilled with vertical holes, and much of it can be churned with angle holes. With angle holes, however, the diamond drill must often be used to cut through the harder seams.

In diamond drilling, where no core or only a small amount of it can be obtained, samples of the cuttings are taken. It is at this point that difficulties arise. The recovery of the cuttings is dependent on the velocity of the water as it rises between the hollow drill rods and the casing, and as the area of this space is greater than the opening in the drill rods, the velocity of the water pumped through the rods is relatively high. The clearance between the bit and the diamonds is extremely small, and the scouring effect of the water passing through this clearance, is sufficient to cut out relatively large amounts of any disintegrated quartz through which the drill may penetrate, and to mix this with the sample. The iron content is lowered by the addition of quartz and also by the loss of the heavy ore particles that settle out in the space from which the quartz is removed.

In churn drilling, the scouring action of the water is much less in seams of fine quartz, and by keeping the casing well advanced, caving can be reduced greatly. In vertical holes, a few raps on the casing is usually enough to ream the drill holes and to drive the casing to the bottom of the hole; however, with angle holes, it is usually necessary to blast enough clearance about the drill hole to make room for the casing, as the larger part of a driving blow on the casing is lost in friction. This blasting aggravates the troubles with caving ground, more especially in seams of pulverulent quartz.

An excellent illustration of the relative value of vertical and angle-hole churn drilling (in the latter case the diamond drill was used as an auxiliary in hard ground) is to be seen in the work on the SE ¼ of the SW ¼ of Sec. 1, T. 46, R. 29, known as the Jamison & Peacock property. The holders of the underlying lease drilled two vertical holes that showed an excellent grade of ore. On this showing, an option for a lease, on high minimums, and at a high royalty, was given to one of the large independent operating companies, who drilled the property with angle holes. The drilling was disappointing, and the property was turned down in disgust. After about four years, a second option was given, the holders of the underlying lease having made concessions on the royalty and on the minimum-tonnage requirements. This time, vertical, churn-drill holes were used exclusively, and one of the largest high-grade orebodies in the district was proved up. The drilling under both options was done by the same firm of drilling contractors, one of the most skillful and reputable in the Lake Superior district, so that there is no question about their work, which, moreover, was performed under the direction of engineers representing the holders of the options.

In a recent vertical hole cutting through one of the angle holes, over 100 ft. of ore assaying about 55% in iron was encountered, where the angle hole showed about 40% in iron. In fact, each sample in the angle hole was lower than the corresponding one in the vertical hole. Since the large number of vertical holes show uniformly high-grade ore, as against the poor to indifferent results of the angle holes, it is highly improbable that the areas pierced by the two holes mentioned are really different in composition.

The inherent inaccuracy of one of these drilling methods caused the holder of the first option to lose a valuable lease and about $12,000 in drilling expenses. The loss to the holders of the underlying lease through loss of interest on deferred royalty payments and in the concessions made in the royalty rate, is nearly $100,000.

I do not wish to be understood as condemning all diamond drilling, or even all churn-drill angle holes. In their place, that is, in a compact, homogeneous formation, these methods cannot be excelled, but over a large part of the Cuyuna district, vertical-hole churn drilling is to be preferred.

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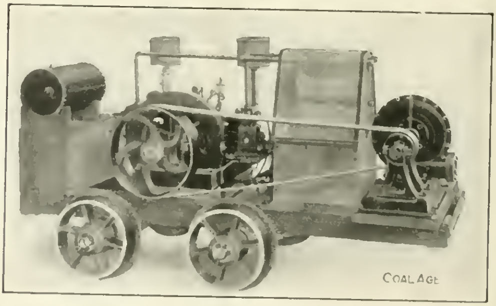
Portable Gasoline-Engine Centrifugal-Pump Set

By A. W. Dickinson*

In a mine of large area working a flat deposit near the surface, great trouble is often had with surface water entering at such points that it cannot be easily handled. Operating under such conditions I conceived the idea of establishing a number of pumping stations near the working face with a sump at each, and employing a portable pumping set consisting of a centrifugal pump and a gasoline engine to drive it, mounted on a car bed. Five such stations were established and at each, two holes were drilled from the surface, one to take a 2-in. pipe through which the gasoline engine exhausted, the other to take a 1½-in. water-discharge pipe. The gasoline engine was of 8 hp., the pump had a 2-in. suction and a 1½-in. discharge.



Centrifugal Pump, Belt-Driven by a Gasoline Engine, and Mounted on a Truck

The pump was in continuous operation for eight months in charge of one man and proved successful. Following my suggestions, the Hayton Pump Co., of Quincy, Ill., furnished another unit, similar but embodying some improvements, shown in the illustration.

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*Superintendent, Central Coal & Coke Co., Bevier, Mo.

Details of Milling and Smelting

Circular Concrete Ore Bins*

A set of four reinforced-concrete ore bins has recently been completed for the Croton Magnetic Iron Mines, Brewster, N. Y. They are intended to provide storage capacity between the proposed one-shift operations of the steam-shovel mine and the two-shift operations of the new concentrator. The bins are each 22 ft. 6 in. inside diameter and 34 ft. 3 in. above foundations, giving an effective capacity of 390 cu.yd. or about 500 tons apiece.

The ore is fed by an inclined belt-conveyor from the coarse-crushing plant to a point at the center of the first bin, whence it is fed directly to the first bin and to the other bins by another belt-conveyor with tripper, running along the center line of the bins. The ore is withdrawn through hoppers, automatically feeding to belt-conveyors running in the arched tunnels under each bin, which carry it to the fine-crushing plant, located 40 ft. farther down the hill.

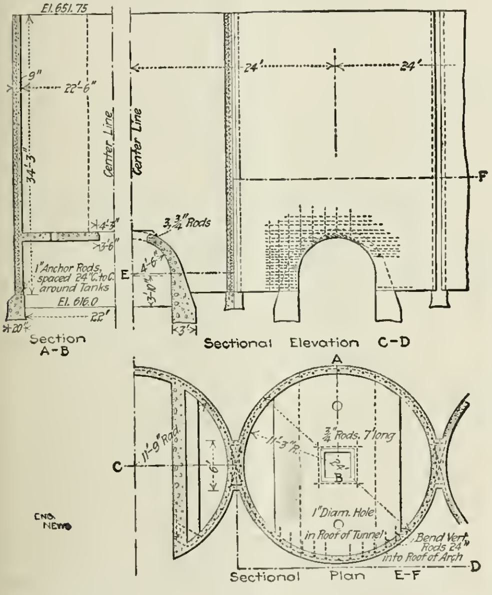

Fig. 1. Details of Construction of Bins, Showing Reinforcement

The bedrock, a mica schist decomposing somewhat readily on exposure to the air, lay close to the surface, and the ore bins were founded on this. No reinforcement was used in the foundations, but 1-in. round vertical rods, 2 ft. long, were placed 2 ft. apart to bond the footing to the 9-in. exterior wall forming the upper part of the ore bins. This 9-in. wall was reinforced vertically by ½-in. round rods, 18 in. apart, and horizontally by cables placed 4¼ in. apart for the first 5 ft., then 6 in. apart for 10 ft., and 9 in. apart for the remainder of the height of the bins.

The original design called for ¾-in. and ½-in. round rods; but the second-hand ¾-in. wire cable could be obtained locally for much less and was substituted. The strength below elastic limit was as high for the cable as for the rods, even allowing liberally for wear, and the cable could be handled more readily than the rods and used in longer lengths, giving fewer laps. Any badly worn sections of the cable were used in the upper sections of the bins, where only ½-in. round rods were called for. The cables alternately circled each bin separately, and made figure eights inclosing all four bins to bond them together. The vertical rods could not be handled full length and were lapped 2 ft. at joints. The cables were cut long enough to encircle one bin, lapped 3 ft. or more at joints, the ends raveled out to give better hold in the concrete, and then the two wires clamped together by a wire clip. The wire cables used cost actually \$75 delivered, as against an estimated \$520 for the round rods.

Fig. 3 shows the forms. They were made of rough 2-in. unseasoned chestnut lumber, except the lagging on the arches, which was 1¼-in. chestnut.

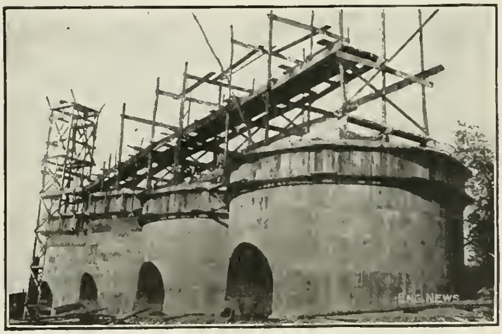

Fig. 2. View of Ore Bins during Construction, Showing Distributing Tower for Concrete on Left

The ring forms, 4 ft. high, were composed of face boards not over 12 in. wide nailed to two ribs, and were made in four types: Type A—inside ring forms 8 ft. 3 in. long; type B—outside ring forms 8 ft. long; type C—outside closure forms 2 ft. 6 in. long, needed to keep the corresponding outside and inside forms opposite each other; and type D—the V-forms at the junction between the bins on the outside ring. Two rows of ½-in. bolts held the forms together—six bolts in all for each 8-ft. section, long enough to pass through vertical bolting pieces, 2x4 in. by 3 ft. 6 in. long, placed outside the ribs.

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*An abstract of an article by M. F. Sayre in "Engineering News," June 4, 1914.

The ribs were wide enough to stand on and the reinforcement and these two-by-fours gave sufficient handholds so that no outside scaffolding other than ladders proved necessary.

Construction

After the foundation concrete had set, the ring and arch forms for the first 4-ft. rise for bins 1 and 2 were placed and concreted. The arch forms were then built up to the full height of the arch, the ring forms raised, the gap between them and the forms for the back of the arch filled in, and this lift concreted. As soon as this had set, the arch forms were removed to be reused for the other bins. Above the arches, the four bins were carried up simultaneously. In raising the form a block and tackle hung from a long pole running across the scaffolding was used. The forms were raised in the order indicated by the Roman numerals on the sketch, two forms at a time being raised by each gang, and two gangs being used. The cable reinforcing was placed for one lift at a time before raising the forms. For the first two lifts the forms were raised 2 ft. 9½ in. each time so that the lower bolts came in the holes just vacated by the upper bolts. Driving the bolts wasted a good deal of time and the other lifts were made 3 ft. 1 in. each, placing the lower bolts on top of the concrete each time, occasionally checking up the elevation of the concrete to keep the top from getting too far off level.

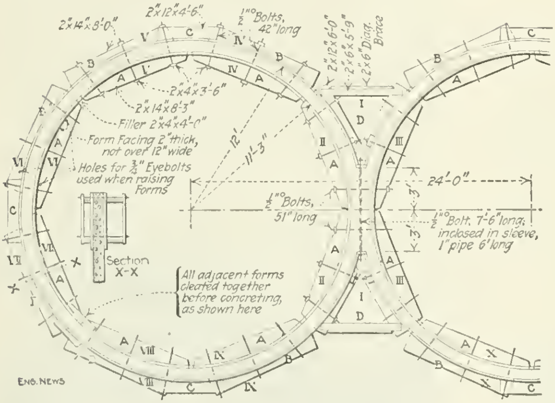

2"x14"x8'-0"
2"x12"x4'-6"
½"° Bolts, 42" long
2"x12"x6'-0"
2"x6"x5'-9"
2"x6" Diag. Brace
2"x4"x3'-6"
2"x14"x8'-3"
Filler 2"x4"x4'-0"
Form Facing 2" thick, not over 12" wide
Holes for ¾" Eyebolts used when raising Forms
12'
11'-3"
24'-0"
½"° Bolts, 51" long
½"° Bolt, 7'-6" long; inclosed in sleeve, 1" pipe 6' long
3'
3'
Section X-X
All adjacent forms cleated together before concreting, as shown here
A
B
C
D
I
II
III
IV
V
VI
VII
VIII
IX
X
Eng. News

Fig. 3. Details of Forms

The bolts were greased each time before placing; but no sleeves were used as the time wasted placing the sleeves would have been more than the time gained when drawing the bolts. Straightening and greasing the bolts and re-running the threads kept a boy busy one day to a day and a half for each rise of the forms.

The scaffolding and elevator are well shown in Fig. 2. The elevator was built first and the separate bents of the scaffolding nailed together on the ground and hoisted to place. The first bent was made the full height to begin with. The others would have been, but that the sticks available were not long enough.

Equipment—The elevator was run by a long-suffering double-drum hoisting engine located at the crest of the hill (Fig. 1), which also handled the incline tram, up which all supplies were brought, the derrick which handled the excavating and concreting at the site of the main crushing plant, and the small incline tram which brought the concrete from the mixer to within reach of this derrick. Thanks to a good engineer, there were no delays on this score.

Two 6-cu.ft. carts were used to carry the concrete from mixer to forms. These were loaded only half full, but at that were all that one man could handle, and smaller, lighter carts would have been advisable.

Mixing was done in a $\frac{1}{10}$-yd. batch mixer, run by gasolene. Each batch was a cart load. The concrete gang comprised one man handling rock, one man handling sand, one man handling cement and water, and dumping the mixer, two men on carts, two or three men tamping, one foreman, one engineer, one fireman. Each man was working very nearly to full capacity all the time and a larger mixer would have given no better economy. Each rise of the forms after the arch had been passed, held 25.5 yd. and took 10 to 11½ hours to fill.

The mixture used was 1 : 3 : 6 for the foundations and 1 : 2 : 4 above. At the start, only 1-in. stone and smaller was used in the concrete for the 9-in. walls, but it was later found that after forming a soft bed by dumping several barrows of the fine concrete into the bottom of the form, a coarse aggregate up to 2½-in. size stone could be used, careful tamping, of course, being necessary. Under local conditions this reduced the cost considerably.

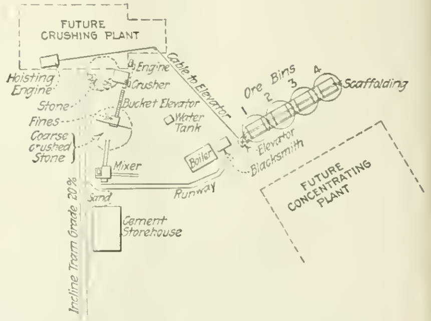


Fig. 4. Layout of Temporary Plant for Construction of Ore Bins

Cost—These bins cost, after crediting for the future value of the form lumber used,

For foundations—221 cu.yd. at $3.81	$842.61
Above foundations—380 cu.yd. at $9.76	3710.28
Total	$4552.89

This includes labor and material used (lumber and reinforcement included), but does not include cost of excavating or charges for superintendence or depreciation of plant.

The bins were designed by Hamilton and Hansel, Consulting Engineers, of New York, and erected under the supervision of the writer and Mr. Theodore Earle, General Manager.

The Assayer and Chemist

Effect of Acidity of Assay Slags on Silver Losses

By D. C. Livingstone*

The following set of experiments, on the formation of slags of varying silicate degree, and the effect of these slags in the assaying of silver in three different types of ores, were recently made by the students of the class in assaying at the University of Idaho.

Siliceous Ores

Five slags of the following silicate degree were formed: subsilicate, monosilicate, sesquisilicate, bisilicate and trisilicate. As no siliceous silver ore of a sufficiently high grade for an experiment of this nature was available, approximately 100 mg. of silver are carefully weighed in duplicate for each of the five silicate degrees, and put in the crucible with the charge. The charge consisted in each case of sand, litharge and sodium carbonate, with sufficient flour to reduce a lead button of from 20 to 25 grams, and a light cover of borax glass. In each case ½ assay ton of sand was taken, except for the subsilicate, where ¼ assay ton was used. The silicate degree was varied by varying the amounts of litharge and soda in the charge, Fulton's table for the calculation of slags being the easiest method of doing this, and assuming that half of the silica combined with the soda and half with the litharge.

Curve sheet No. 3 shows the average percentage of silver lost in fusing and cupelling these different charges as obtained by four of the students.

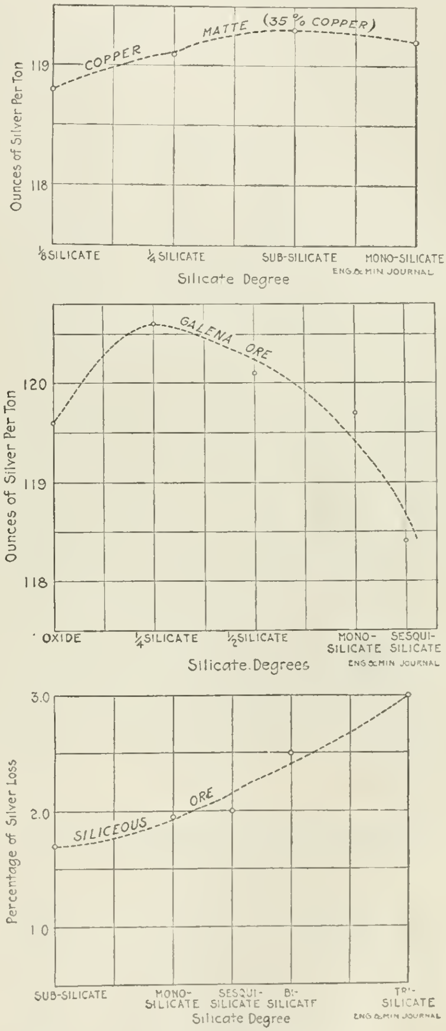
This curve shows a gradually increasing loss of silver as the silicate degree increases, and from this the inference would be that even for a siliceous ore the highest silver assay would be obtained by using a charge approaching a subsilicate of Na_2O and PbO. This set of experiments would have been of greater value if an ore had been used instead of the artificial mixture given above, but results obtained from a set of experiments that were made last year on a high-grade siliceous ore, showed the same results; that the subsilicate charge gave the highest assay.

Galena Ores

A practically pure galena ore was used, carrying about 120 oz. silver to the ton, and about 80% lead.

In assaying this ore the following slags were calculated and the following charges used: A half assay ton of ore was used in each case, and the slags were an oxide, a sesquisilicate, a mono- or singulosilicate, a subsilicate or ½ silicate and a half sub- or ¼ silicate.

For the sesquisilicate, the charge was 10 grams silica, 12 grams sodium carbonate and 43 grams of litharge. For the monosilicate, 10 grams silica, 17 grams sodium carbonate and 55 grams of litharge. For the subsilicate, 10 grams silica, 34 grams sodium carbonate and 92 grams litharge. For the ½ sub- or ¼ silicate, 5 grams of silica and the rest of the charge like the subsilicate. For the oxide, the same charge as the subsilicate, leaving out the silica altogether. Curve sheet No. 2, which gives the average curve obtained by four students from plotting the number of ounces per ton of silver obtained as one coördinate and the silicate degree as the other coördinate, shows the following facts: The maximum results were obtained in each case with the ½ sub- or ¼ silicate, the



Influence of Acidity of Slag on Silver Absorption curve showing an increase from the oxide to this point and then a decrease with the increase of silica in the charge. The apparent reason for the low results from the oxide slag was the brittleness of the lead button, due to the presence of litharge. This gives rise to mechanical loss of some of the lead, with a consequent loss in silver, when cleaning the slag from the button.

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*University of Idaho, Moscow, Idaho.

The inference from these experiments is, that with a galena ore the highest assay will be obtained where the slag approaches a ½ subsilicate.

LOSSES WITH COPPER MATTE

A copper matte carrying 35% of copper and about 120 oz. in silver was next tried, using four different slags. These slags were a ¼ sub- or ⅛ silicate, a ½ subsilicate, a subsilicate and a monosilicate. The matte, of course, contained iron, the percentage of which was known, and when allowance was made for this, the charges were as follows, ¼ assay ton of ore was used in each case. For the ¼ subsilicate 3 grams of silica, 95 grams of litharge and 30 grams of sodium carbonate. For the ½ subsilicate, 5 grams of silica, 95 grams of litharge and 30 grams of sodium carbonate. For the subsilicate, 10 grams of silica, 90 grams of litharge and 30 grams of sodium carbonate. For the monosilicate, 10 grams of silica, 60 grams of litharge and 15 grams of sodium carbonate.

Curve sheet No. 1 shows also the average result obtained from the work of four students on this matte with above charges.

These curves are remarkable in the fact that they show practically no difference in the result through this range of slags. The following special charge was also run by one of the students on this matte and gave a result several ounces lower than the results obtained by these more simple charges. Ore ¼ a.t., silica 3 grams, litharge 100 grams, sodium bicarbonate 7½ grams, potassium carbonate 7½ grams, borax glass 10 grams and also light cover of same. The results from which the curves were plotted were obtained by carefully checked assays, as the students were required to re-run each slag until the results checked in duplicate within 0.3 oz. In the above work the subsilicate in assumed as containing ½ the silica that the monosilicate contains, or twice the number of oxygen atoms in the base as are in the acid. This makes the subsilicate a definite silicate degree, and not any silicate degree below a monosilicate, as given in some metallurgical works.

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Separation of Calcium and Magnesium

In presence of an excess of magnesium, in ammoniacal solution, the calcium is only incompletely precipitated by ammonium oxalate, but a quantitative precipitation is obtained in neutral solution when an excess of solid ammonium oxalate is added, says F. Halla (*Chem. Zeit.*, 1911, p. 100, abstr. *Journ. Soc. Chem. Ind.*, Feb. 14, 1911). When the proportion of magnesium chloride to calcium chloride is less than 12 : 1, the calcium oxalate is contaminated with some magnesium, but with larger proportions of magnesium the results come within the limits of experimental error. The neutral solution is treated at boiling point with an excess of solid ammonium oxalate until the precipitate of magnesium oxalate, at first produced, is redissolved and the residue of calcium oxalate remains unaltered. The solution is allowed to stand for some hours, filtered and the crystallized ammonium oxalate dissolved by warming with a little water. The precipitate is washed at first with hot water, then with cold and the calcium precipitate after incineration is covered with a little alcohol and a few drops of sulphuric acid ignited and weighed as sulphate. The magnesium oxalate dissolved in the form of a double salt is precipitated according to Classen's method by neutralizing the filtrate with acetic acid.

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Flask for Moisture Sample

Taking a moisture sample and preserving it in its original state until analyzed, is always an annoying job. Where reduction of moisture is the main function of a treatment plant, the sampling becomes of great importance. This is true at the iron-ore drying plants on the Mesabi. At the Whiteside drier, a flask has been devised which is both light and practically indestructible. As shown in the illustration, it consists of a short length of 5-in. wrought pipe, the bottom closed by a plate set in with the edge beaded down tightly on it. For the other end a screw plug with a handle is provided.

IRON FLASK FOR SAMPLING AT DRYING PLANT

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Asbestos Shapes

BY DONALD M. LIDDELL

The plasticity of thin asbestos paper, when wet, does not seem to be sufficiently appreciated by most chemists. This material can be worked and molded like clay. In a recent laboratory visit some small rings were seen, which had been molded over a funnel, just where it begins to flare. These fitted inside iron crucibles, and just neatly took a platinum crucible inside, thus leaving an air space below this asbestos ring, between the iron and platinum crucibles. The arrangement permits of very rapid evaporations.

Another piece of this molded asbestos work was a cover which fitted the neck and upper half of the bulb of a florence flask. After baking, the cover had been slit down one side, and removed. It could then be fitted over any flask, to prevent chilling the upper portion during distillations, etc.

The chemists in this laboratory said the sheet asbestos was invaluable for such work as this, for repairing muffles, etc.

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Rapid Evaporation in Platinum Crucibles can be performed by setting a platinum triangle on the top of an iron crucible, then allowing the platinum crucible to come down in it so that ⅛- to ¼-in. air space is left between the crucibles.

Michigan State Tax Reduction

Marquette Correspondence

The Michigan state tax commission has reduced the valuation of the mines at Negaunee, Mich., $2,500,000, without lowering the general property assessments accordingly, so the business men of that Marquette range city are protesting. The business interests have united in an effort to have the taxes reduced and have engaged counsel to appear before the commission. The taxpayers protest on the ground that they are assessed dollar on the dollar and, since the depression in the mining industry has set in, their property values have decreased in like proportion to the value of the mines. The businessmen are aware that the mining companies have sold little ore this season and assert that the reduction given the companies is just, but they hold that the city goes up and down with the mining industry and that the property owners in general are entitled to proportionate reductions. As a matter of fact, the cut in mining assessments is not because of trade depression, but because errors were made in the process of figuring valuations a year ago. These errors are now corrected.

In the Iron River district, Menominee range, the tax commission has cut off $2,000,000 from the valuation of the mines. The figures for 1913 and those for this year are shown in the accompanying table.

	1913	1914
Caspian	$3,670,000	$2,772,879
Dober	1,160,000	1,030,792
Baker & Tully	1,010,500	396,950
Sherwood	1,103,292	1,037,101
Zimmerman	805,200	952,134
James	794,452	750,000
Bengal	782,000	913,147
Baltic	646,040	587,065
Forbes	608,678	745,355
Davidson	437,346	545,101
Homer	427,856	440,500
Minckler	361,000	347,450
Berkshire	251,150	246,416
Youngs	215,000	230,400
Fogarty	200 000	362,237
Chatham	176,000	129,940
Wauseca	141,620	140,429
Virgil	95,800	30 000
Hiawatha	80,000	48,784
Wickwire	56,000	26,625
Purcell	25,000	30,000

Mining properties not assessed in 1913, but which are on the roll this year, are, together with the valuations given them, as follows: Aronson, $72,200; Spies, $32,000; McGillis, $20,000; Cory, $6870; Cortland, $3000; Lenox, $3000. The assessed valuations fixed include the value of the buildings and machinery, but not that of the stockpiles.

⁂

Salvaging Pumps in the Baraboo Mines

The iron mines of the Baraboo district in Wisconsin have been abandoned by the Steel Corporation. A particularly difficult feat, but one successfully performed, was that of salvaging the pumps. The Baraboo district is so wet that while the Steel Corporation shaft, sunk on an incline, is only 350 ft. deep, it produced 6,500,000 gal. of water per day. Thirteen pumps were used to raise this big inflow. As with the machinery stopped the mine was sure to become inundated within a few hours, great care and expedition were required to recover the equipment, too valuable to abandon. A bulkhead was constructed, bolts were loosened and other preparations were made to get the pumps out of the mine in quick order, one at a time, once the hoisting was started.

So well did the plans work out that only two small pumps were left in the workings. The last pump taken out was in operation until within a few minutes of the time when, slung in its chains, it was taken to surface. The bulkhead, 7 ft. high, was submerged so quickly the men barely had time to escape. In less than six hours the shaft wall filled to within 50 ft. of the collar and water gushed forth from every drill hole on the surface.

The Steel Corporation controls in fee or lease 2000 acres in the Baraboo field. It is unlikely, however, that further efforts will be made to develop a mine for years to come. No ore was taken from the property now abandoned. No mining operations whatever are in progress in the field. Pumping costs are prohibitive.

⁂

Radium Output of Standard Chemical Co.

By Charles H. Viol*

It has been customary in the past to speak of "radium" and to signify thereby the pure crystalline bromide salt ($RaBr_2 2H_2O$) which contains 63.6% of radium, element (or metal). Our sales are based on a guaranteed content of radium element in our preparations, and it is to be hoped that the practice of describing any radium preparation in terms of its radium-element content will soon become general. When the radium-element content is stated it makes little difference as to the purity of the salt, or whether it is a sulphate, bromide or chloride, since the exact purity of the salt and the chemical combination of the radium are of less importance than the actual amount of radium element in a preparation. Our radium is refined until it contains about 50 to 60% of pure radium salt and it is supplied in the form of bromide, chloride or sulphate. In order to avoid any possible misconceptions I give figures in terms of the equivalent of pure crystalline radium bromide and also in terms of radium element.

In October, 1913, following extensive alterations in our mill looking toward increased facilities in handling ore, etc., the Standard Chemical Co. entered upon the production of radium on a large scale. The first finished product was obtained in January, 1914, and contained the equivalent of 560 milligrams of pure radium bromide or about 300 milligrams of radium element. Since then each month has seen an increase in the production and at present the production (in the form of radium salts of 50 to 60% purity) is at the rate of 2050 mg. of pure radium bromide per month. That is the month's output contains 1100 mg. of radium element. This is not the maximum output for the year and each succeeding month will see an increase, such that by October, 1914, the monthly output will be equivalent to 2800 mg. of the pure radium bromide, or 1500 mg. of radium element. This is the estimated capacity of our mill.

In 1913, when it was foreseen that the Standard Chemical Co. was to produce radium on a larger scale than had ever been realized in Europe, it was of course important to assure a market for the radium as fast as it was produced. Just about that time Europe was in a fever of excitement over the application of radium in the treatment of malignant growths, and the small visible supply of radium was wholly inadequate to meet the great demands. Governments, municipalities and philanthropic persons were vieing with each other in the purchase of radium.

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*Director, Radium Research Laboratory, Pittsburgh, Penn. Note—This article was written to reply to certain specific questions asked by the "Journal."

The president of our company decided to sell one-half of our 1914 production abroad, which was then estimated would on the average amount to about 1870 mg. of pure bromide, or 1000 mg. of radium element per month. So contracts were made in 1913 to deliver the equivalent of 11,200 mg. of pure radium bromide (6000 mg. of radium element) to foreign purchasers during the year 1914. In spite of the fact that American physicians showed practically no interest in radium in 1913, half of the radium output for 1914 was reserved for this rather dubious market in the hope that the American people and physicians, particularly, would soon become aware of the importance of radium. This hope has been more or less realized and at present contracts are signed for the delivery, in America, during 1914, of radium preparations containing the equivalent of 7500 mg. of pure bromide (4000 mg. of radium-element). The balance amounting to the equivalent of 3750 mg. of pure radium bromide (2000 mg. of radium-element) is still available for delivery in 1914 at the current market price.

Up to May 1, the Standard Chemical Co. had produced a total of 8530 mg. of pure radium bromide (4563 mg. of radium element) and of this 5950 mg. of pure radium bromide (3183 mg. of radium-element) was contained in the material prepared between Jan. 1 and May 1. The Standard Chemical Co. is proud of the fact that so far all the contracts for the delivery of radium preparations have been promptly fulfilled, and as the contracts were based on the estimated outputs, which increase from month to month, this is further evidence that there has been no exaggeration in the statements regarding our present and future output. The greater amount of the radium preparations now sold are sulphate, with bromide and chloride next in the order named.

The producers of radium in America are the Standard Chemical Co., of Pittsburgh, Penn., and the Radium Co. of America, of Sellersville, Penn., although I have no definite advice as to the output of the latter company. There are, I understand, a number of companies in Colorado and Utah which at present are engaged in the preliminary work looking toward the future production of radium.

Chronology of Mining for June 1914

June 1—Timber Butte mill, at Butte, Mont., began regular operations treating Elm Orlu ore.

June 2—Canada Refining & Smelting Co. closed its plant at Orillia, Ontario.

June 10—East Tennessee mine surface plant of Ducktown Sulphur, Copper & Iron Co., at Isabella, Tenn., destroyed by fire.

June 12—Butte miners started rioting in protest against unions levying assessments to support strikers in other districts, charging union officials with irregularity in disposing of union funds.

June 17—Two mills of Witherbee-Sherman & Co. at Mineville, N. Y., destroyed by fire.—Workmen at the Abangarez mine in Costa Rica seized and operated mine and mills when company attempted to shut them down pending introduction of a system for preventing theft of gold.

June 19—Fire in the Vieille Marihaye colliery, near Liége, Belgium, resulted in entombing 200 coal miners. —An explosion in the Hillcrest colliery, Hillcrest, Alberta, resulted in the death of 199 miners.

June 22—The Supreme Court decided the Intermountain rate case in favor of the Interstate Commerce Commission, and against the railroads.

June 24—Supreme Court handed down decision in favor of Southern Pacific R.R. in oil lands in California case.

New Mine and Metallurgical Construction

Arizona Consolidated Gold Mines Co., Kingman, Ariz., broke ground June 1, 1914, for a Nissen stamp mill of 6 to 12 tons daily capacity, which will be completed Aug. 1; cost of installation, $7500.

Pasquale Copper Co., Bellevue, Ariz., broke ground May 1, for a 100-ton flotation plant, which will cost $35,000 and be completed in six months.

R. F. Schaefer, Vulture, Ariz., will build a mill with three to five stamps.

Argonaut Mining Co., Jackson, Calif., plans building a 50-stamp mill of 200 tons' daily capacity, to replace the old 40-stamp mill.

Arnold Concentrating Machinery Co., Lawson, Clear Creek County, Colo., broke ground Mar. 25, 1914, for a concentrator for treating low-grade ores, which cost $10,000 and was completed May 25.

Tomboy Gold Mines Co., Ltd., Telluride, Colo., broke ground May 7, 1914, for a cyanide plant of 400 tons' daily capacity for the treatment of tailings, which will cost $130,000 and probably be completed by December.

Tecumseh Mining Co., Thoms Station, Mo., operated by Homer Seals, Joplin, Mo., is building a mill of 150 tons' daily capacity, which will cost $10,000 and be ready for putting in commission after July 10.

Butte Duluth Mining Co., Butte, Mont., broke ground Nov. 1, 1913, for a leaching plant with electrolytic precipitation of 1000 tons' capacity, which will cost $250,000 and be completed in July.

Elko Mining Co., Jarbidge, Nev., is considering building a cyanide plant, possibly this summer.

Irwin Bros., Currant, Nye County, Nev., completed a small stamp mill of 10 to 15 tons' daily capacity, May 1, 1914; it cost $2000.

Metals Recovery Co., Dayton, Nev., broke ground Aug. 1, 1913, for a cyanide plant of 200 tons' daily capacity, which cost $50,000 and was completed May 1, 1914.

Nevada Packard Mines Co., Rochester, Nev., will probably begin grading Oct. 1, for the first 50-ton unit of a cyanide plant.

Ben Harrison Mine, Whitney, Ore., expects to break ground in July for a cyanide plant of 120 tons' daily capacity to cost $10,000 and be completed by October.

Park City Milling Co., Park City, Utah, began remodeling the Graselli mill Mar. 17, 1914, for treating

50 tons of ore daily, by chlorination, the cost being $21,000; the work was completed early in July.

Lawrence Mines Co., Hazel Green, Wis., will complete by Sept. 1, entire mining equipment and mill of 150 tons' capacity per 9-hr. shift.

Mineral Point Zinc Co., New Diggings, Wis., will complete, by the end of the year, a Joplin-type mill of 250 tons' daily capacity at a cost of $12,000.

Wisconsin Zinc Co., New Diggings, Wis., broke ground May 1, 1914, for a hoisting plant and mill of 300 tons capacity per 24 hr. at a cost of $50,000, which will be completed in September.

* * *

Mining Dividends for June

Thirty-one mining companies making public reports paid $7,410,317 in dividends in June, as against $7,331,706 paid by 34 companies a year ago. Steel, smelting and holding companies paid $12,945,007, an increase of $220,291 over June, 1913; and Mexican and Canadian companies paid $1,018,580 as compared with $1,287,645 last year.

United States Mining Companies	Situation	Per Share	Total
Alaska-Treadwell, g.	Alas.	$0.75	$150,000
Bunker Hill & Sullivan, l. s.	Ida.	0.25	81,750
Bunker Hill Con., g.	Calif.	0.02	10,000
Butte & Superior, z.	Mont.	0.75	406,703
Calumet & Arizona, c.	Ariz.	1.25	748,741
Calumet & Hecla, c.	Mich.	5.00	500,000
Chino, c.	N. M.	0.75	648,615
Federal M. & S. Co., l. s.	Ida.	1.50	179,791
Fremont, g.	Calif.	0.02	4,000
Gemini-Keystone, l. g. s.	Utah	10.00	50,000
Golden Cycle, g.	Colo.	0.03	45,000
Hecla, l. s.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.65	163,254
Mexican, g. s.	Nev.	0.75	141,750
Nevada Con., c.	Nev.	0.37½	749,796
North Star, g.	Calif.	0.40	100,000
Ray Con., c.	Ariz.	0.37½	543,964
Superior & Pittsburgh, c.	Ariz.	0.38	569,922
Stewart, s. l.	Ida.	0.10	123,826
St. Joseph, l.	Mo.	0.05	73,632
Tennessee, c.	Tenn.	0.75	150,000
Tomboy, .g.	Colo.	0.48	150,660
Tom Reed, g.	Ariz.	0.06	54,573
United Verde, c.	Ariz.	0.75	225,000
Utah, c.	Utah	0.75	1,189,440
Vindicator, g.	Colo.	0.03	45,000
Wasp No. 2, g.	S. D.	0.01	5,000
Yellow Aster, g.	Calif.	0.00½	5,000
Yellow Pine, l. c. z. s.	Nev.	0.01	10,000
Yosemite, g.	Calif.	0.01	2,400
Yukon, g.	Alas.	0.07½	262,500

Iron, Industrial and Holding Companies	Situation	Per Share	Total
Am. Sm. & Ref., com.	U. S., Mex.	1.00	500,000
Am. Sm. & Ref., ref.	U. S., Mex.	1.75	875,000
Crucible Steel, pfd.	U. S.	1.75	427,638
Greene Cananea, c.	Mex.	1.00	486,209
International Nickel, com.	N. J.	2.50	948,133
Lackawanna Steel, pfd.	N. Y.	1.75	612,115
National Lead, com.	U. S.	0.75	154,916
National Lead, pfd.	U. S.	1.75	426,436
Phelps Dodge, c.	U. S., Mex.	4.00	1,800,000
Pittsburgh Steel	Penn.	1.75	112,500
U. S. Steel, com.	U. S.	1.25	6,353,781
Warwick I & S.	Penn.	1.67	248,279

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Caribou Cobalt, s.	Ont.	0.02½	25,000
Crown Reserve, s.	Ont.	0.02	35,376
Granby Con., c. g. s.	B. C.	1.50	222,721
Hedley, g.	B. C.	0.50	60,000
Hollinger, g.	Ont.	0.15	90,000
Kerr Lake, s.	Ont.	0.25	150,000
Lucky Tiger, g.	Mex.	0.09	64,380
Mexico Mines of El Oro, g. s.	Mex.	0.96	174,960
Peterson Lake, s.	Ont.	0.01¾	63,000
Seneca-Superior, s.	Ont.	0.12½	59,860
Standard Silver Lead, s. l.	B. C.	0.02½	50,000
Temiskaming & Hud. Bay, s.	Ont.	3.00	23,283

The features of the month's payments are an extra dividend by Alaska Treadwell; a long expected disbursement by Mexican, which shows what can still be done on the Comstock by real miners; an initial payment by Butte & Superior; and resumption of payments by Wasp No. 2.

Dividends for the half-year are: Mining companies, $32,925,883 in 1914, $38,216,193 in 1913; metallurgical and holding companies, $41,714,103 in 1914, $41,129,521 in 1913; Canadian, Central American and Mexican companies, $9,894,912 in 1914; $10,781,767 in 1913.

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Lake Superior Mining Institute

Ishpeming Correspondence

It has been definitely decided to hold the 1914 meeting of the Lake Superior Mining Institute during the week of Aug. 31. The members will assemble at Ishpeming, Mich., on the Marquette range, the first day, where a first-aid meet will be held and a visit made to some of the newer mining properties. After the completion of the contest, the members will be taken in automobiles to the Negaunee mine, at Negaunee, where everything in and about the mine is operated electrically. From here the party will go to the Cleveland-Cliffs company's hydro-electric plant on the Carp River, where the power is generated for the Negaunee and other mines owned and operated by the Cleveland-Cliffs company. After this the Lake Superior & Ishpeming Ry.'s steel dock at Marquette will be visited. It is expected that visiting these points of interest will consume a whole day. If the plans of those in charge carry, the members of the Institute and guests will then take the night train on the Duluth, South Shore & Atlantic Ry. for Mackinaw City, arriving there the following morning. At this point a chartered steamer, "City of Detroit, II," of the Detroit & Cleveland Navigation Co., will be boarded for Detroit. The members will have the exclusive use of the boat and all business sessions will be held on board. Two days will be spent in Detroit, and the return trip will be made either on a special steamer or on the regular boats, as some have expressed a desire to remain away for a week or more. It is believed that 300 will make the trip.

The first-aid and mine-rescue exhibition at Ishpeming will be in charge of Charles E. Lawrence, of Palatka, Mich.; D. E. Sutherland, Ironwood, Mich.; William Conibear, Ishpeming, Mich; W. H. Schacht, Painesdale, Mich; and M. H. Godfrey, Virginia, Minn. Elimination contests will be held on all of the iron ranges to select the teams that are to represent the several districts in the meet. Cash prizes and trophies will be presented to the teams exhibiting the most skill. The judges will be selected from surgeons and first-aid men who are not identified with any mining company.

ENTRANCE RULES

1—All entries will close July 20, and must be filed with William Conihear, Ishpeming, Mich.

2—A team is composed of five men, including captain.

3—Each team will select its own patient in addition to the five operating members thereof, or will have a miner present selected for them.

4—All members of a team shall be bona fide workers.

5—The teams will bring their own first-aid material, including bandages, splints, blankets, stretchers, etc., and will not be allowed to leave the patient to secure material.

CONTEST RULES

1—The captain will select the patient and designate the member or members of the team to perform the work.

2—The captain will control his team in the field by giving audible commands.

3—The captain may select himself as one of the members who will perform.

4—The captain or other members will not prompt the person performing unless he is one of the performers. This will not apply to full-team events.

5—At the conclusion of any event, the captain will raise his right hand and announce his team number. The team will remain at post until relieved by the judges.

6—The triangular bandage will be the standard used in the contests, but roller bandages may be used and equal credit will be given for their proper use as with the triangular bandages.

7—All splints must be prepared on the field for each event requiring their use. Specially designed splints may be used, but they must be assembled during the time of each event requiring their use.

8—No practicing will be allowed on the field before the beginning of the contest.

9—The teams will be numbered consecutively, beginning at No. 1, and they will occupy their consecutive positions on the field.

10—Each judge will mark the team number, event and discount for each team judged, sign his name and deliver record to recorder.

11—The recorder will foot up the discounts and mark points made by each team in each event. The total points will be divided by the number of events and the quotient will be the average for each team for the entire contest.

12—Time will not be an element unless the team or men performing run over the alloted time or fail to give treatment properly.

13—All exceptions to these rules must be made to the Committee on the Practice for the Prevention of Accidents of the Lake Superior Mining Institute, of which Charles E. Lawrence, general manager for Pickands, Mather & Co., Palatka, Mich., is the chairman.

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Alfred E. Barlow--An Appreciation

By H. Mortimer Lamb

The majority of men born into the world pass out of it leaving little to mark the passage of that progress. A small minority in each generation more richly endowed with gifts, and chosen of destiny, stand out as conspicuous figures from among the multitude, and achieve by their works and service to humanity some nearer approach to immortality. The name of Alfred E. Barlow, whose death was briefly announced in the Journal a week or so ago, will be indelibly associated with Canadian geology, and particularly with that branch of it dealing with economic problems, whereof he was in this country a pioneer exponent. Two, at least, of his papers for the Geological Survey of Canada are classics. His voluminous and comprehensive report on the Sudbury nickel area has been of immense service to industry. His report on corundum, written in collaboration with Dr. F. D. Adams, and of which just before his death he completed the preparation of a revised edition, is no less monumental. Other important work he did, as all geologists know.

But the recollection of him as a personality, as a man, can linger only for a short while, limited to the duration of the lives of his friends and intimates. Hence my acceptance of the invitation to write this appreciation in testimony of the charm of his nature and the uprightness and manliness of his character. Were he alive, such a task would have been a welcome one; with the somber shadow of his tragic death so near it becomes a mournful duty.

The successful geologist, I conceive, must possess a temperament akin to that of the great painter or poet. He must have an intense love and a reverence for nature, whose secrets he would fathom and interpret. He must be gifted with imagination, and be large of soul, in order that the greater truths that lie beneath the surface of things may be revealed to him. And because geologists of distinction have these attributes, which make them essentially human, they are usually lovable. Barlow was one of the most lovable of men, but it was necessary to know him well to realize fully and appreciate the finer and bigger side of his nature. A superficial acquaintance might easily create misleading impressions, for he, like his great prototype, Sir William Logan, was inclined to be careless of his personal appearance, while a certain almost boyishness of manner gave no indication of his powers of mind and character. Nevertheless, there have been few men who commanded to so universal a degree the respect and esteem of their associates. And the foundation for the sentiment he inspired may be attributed to certain fundamental and admirable qualities that were the basis of his character. He was unfalteringly honorable in all his dealings; he was the spirit of sincerity; he was entirely fearless; extraordinarily disinterested; always true to his principles and ever loyal to his friends.

You never had any doubt where he stood and if he fought you it was in the open. Perhaps he loved fighting rather overmuch, but his fight was always for a cause or a principle, not for his personal gain, unless he believed there had been an attempt to impose on him. As a worker, he was indefatigable. His delight in work, and in geological investigation in particular, was unbounded. But since he left the Canadian Geological Survey in 1907, certainly more than half his time has been ungrudgingly devoted to the performance of gratuitous service. McGill University, where he served as honorary lecturer in economic geology, owes much to him. He contributed in no small measure to the success of the International Geological Congress. But his chief debtor is the Canadian Mining Institute, of which he was successively a councillor, vice-president and president. His profession was first, but the interests of the Institute were next in his affections. He devoted himself to the promotion of those interests with unflagging zeal, sparing neither his time nor his money, which latter he was none too well able to afford. During his term of office he must have traveled several thousand miles at his personal expense on behalf of the Institute, while day after day he would put his own affairs aside for those of the Society.

Doctor Barlow retired from the presidency of the Institute last March, and but for the fact that he held office and considered it a point of duty to be present at the annual meeting of the society, he would have sailed for Europe last December or January, and in all probability would have been alive today. It is difficult yet to realize the loss his death represents. To his friends, it seems irreparable. To the mining industry of Canada, and to the Canadian Mining Institute, it is a heavy blow. But measured by effectiveness, Barlow's life, although so prematurely shortened, was far fuller than that of most men whose years extend to beyond the scriptural span. It is no less solacing to believe that he himself could have chosen no more fitting or more noble end, for there can be no doubt that he gave his own life in the effort to save that of his wife, to whom he was devotedly attached.

It may not be out of place to add here that it has been proposed to establish a memorial of Doctor Barlow, for which purpose an endeavor is now being made to raise funds. Already the invitations to contribute have met with a ready response both in this country and in the United States. The form the memorial will take will depend largely, of course, on the amount of money subscribed, but the present suggestion is to place a gold medal, at the disposal of the Council of the Canadian Mining Institute, to be awarded annually.

Correspondence and Discussion

Automatic Samplers

My attention has just been directed to L. U. W. Judell's description of "A Simple Sampling Device," printed on page 1052 of your issue of May 23, 1914. The machine illustrated is not, as Mr. Judell suggests, "altogether original," as the same mechanical movement has been applied to automatic samplers before. All such movements of the sampling trough suffer from the same absolutely fatal defect.

On reference to the illustration, it will be seen that the sampling trough is moved by a falling weight, in this instance a slowly filled tipping tank; therefore, at the beginning of its traverse it must move at a slower rate than at the end of its traverse. It follows, therefore, that if there be a greater proportion of water or sand or slime at one side of the launder than there is at the other, the sample drawn must be inaccurate.

Furthermore, in the sampler illustrated the area of the orifice through which the sample is collected changes in accordance with its position in relation to the bottom of the launder, being a maximum at the middle of the stroke and a minimum at the beginning and end of the stroke. It follows from this that a larger proportion of the middle of the stream is secured than of either side, and therefore again the sample must be inaccurate.

This question of automatic sampling is an extremely important and interesting one. During the last few years much work has been done on the subject and many trials with various forms of samplers have been made. The sampler illustrated and described on p. 1017 of the Journal of May 16, shows a machine free from the defects pointed out above, because it cuts an absolutely true sample, the cut being made at a perfectly uniform speed with a collecting orifice of fixed area.

W. H. C. Jerome.

Stoke Newington, N., England, June 5, 1914.

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Oil on Eastern Slope of the Andes

I have noticed in the Journal of June 13, an article upon the "discovery of oil on eastern slope of Andes," marked "Washington Correspondence." This article would give the impression that petroleum in paying quantities is about to be found along the entire eastern slope of the Andes.

As I looked into this question, and these Santa Cruz deposits in particular, during a trip through these countries in 1911, I am surprised at this statement, and should advise all stampeders to the new diggings to get much more proof of the conditions before they stampede. The information sounds too much like that contained in Colonel Roosevelt's recent speech before the Geographical Society to the effect that a great mining region is lying dormant along the Paraguay River. I do not believe it, and think these off-hand predictions should not be taken too seriously. There are numerous oil seeps along the eastern slope of the Andes and considerable drilling has been done, especially in Argentina; but no one, so far as I know, has ever struck oil in commercial quantities there.

A. P. Rogers.

New York, June 20, 1914.

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Development System, Lyon Mountain Mine

Appended to an abstract published in the Journal of May 16, describing the development work now under way at the Lyon Mountain mine of the Chateaugay Ore & Iron Co., I note the editorial comments on the advisability of developing by inclined shaft rather than by vertical shaft, and also on the proposed methods for ventilating the workings.

The question of vertical or inclined shaft was considered in all its bearings. The country rock in the district is an extremely hard syenitic gneiss and with a vertical shaft the cost of crosscuts to the vein would be large, as well as the cost of excavating ore pockets adjacent to the shaft. A vertical shaft, to develop the territory below the old mine, which has been proved by diamond drilling, would necessarily be on ground over 100 ft. lower than the present concentrating mill and 1200 to 1500 ft. distant. By sinking an inclined shaft, we are able to land the ore practically at the mill, the headframe and shaft-house being only about 100 ft. away.

Again, by sinking parallel to the average dip of the ore in the foot wall, at a distance of 20 to 50 ft. from the vein, the shaft will be kept entirely independent of the mine workings so that disturbances caused by the removal of the ore will not affect it. This foot-wall material is really a portion of the mineralized ore zone, and contains more or less lean ore, being thus better material to sink in than is the syenitic country rock. The shaft can be sunk more cheaply and rapidly than could a vertical shaft through the country rock. Other reasons governing our choice are of more purely local interest.

It will be understood, of course, that the "vein" is a mineralized zone or orebody from 100 to 200 ft. thick, containing a concentration of magnetite near or along the upper border of the zone, and this concentration of mineral constitutes the ore which is usually spoken of as the vein or orebody.

As consulting engineer to the Chateaugay company, I am personally responsible for the plans under which these improvements are being made, but the details, both as to general layout and power plant, hoisting and machinery equipment, have been worked out by my son, T. M. Chance.

Regarding the comments upon the proposed method of ventilation and the statement that the ventilation at Lyon Mountain is good, it is true that the ventilation of the mine is most excellent, and if the new mine were to be worked by the methods which have been used heretofore, no special provision for ventilation would be necessary. However, the new mine is to use a shrinkage-stope method of mining, and a well planned system for insuring efficient ventilation of the stopes, and a quick driving out of the powder smoke is therefore essential. The method adopted is practically that in common use for ventilating steeply pitching anthracite mine workings where the breasts are kept full of broken coal. Such system if planned from the outset will be much cheaper and more efficient than the usual methods of supplying stopes with air by forced ventilation through pipes or conduits, and was chosen as being much more satisfactory than any other known method. It further provides, as your comment points out, protected traveling ways for the men, and will thus reduce the risk of men being run over by cars or motors. The old workings of the Lyon Mountain mine are connected to the surface by 12 or 15 shafts; all of these were opened and sunk and the ore was stoped by the open-stope method. Under such conditions and with an orebody as large as the Lyon Mountain deposit, there would, of course, be no trouble with the ventilation.

In opening up the shrinkage stopes, raises will be driven from each level and pushed through rapidly by double-shift work, until they are holed into the level above. These raises will be at points corresponding to the end of each stope, and are planned to be 300 ft. apart, giving a length to each stope of 300 ft. The levels will be 300 ft. apart so that each stope will be 300x300 ft., by the working width, which is an average of 35 to 40 ft. These raises will be used for ventilation and for access to the stope. The stope will be opened from the level below by raises spaced 50 ft., which will be used as loading chutes. These raises will be driven up wide enough to be used as chutes and will gradually be widened out until they meet, thus providing substantial pillars at the bottom of each stope. At the start, access will be had to the stopes from the raises and chutes, but after the end raises are holed through, access to each stope will be had from above through these raises. Tools, drill steel and materials will also be raised and lowered from the upper level through these raises, using small air hoists. If it be found that the distance of 300 ft. between levels is too great, a counter level will be driven midway between the levels, and ore from this level will be passed through a chute, or chutes, directly to the loading pocket on the level below.

All of the work has been planned to secure continuous and intensive operation and large output, by methods that will insure safety to the men and proper working conditions. The shrinkage-stope system could not properly be used in a large development such as is planned, without provision for adequate ventilation. Many of the mines in the Lake Superior districts are today seriously handicapped as to cost and output because of the impossibility of securing adequate ventilation, operations being carried on under conditions that seriously decrease the efficiency of the average employee; these conditions developed because provision was not made at the outset for efficient ventilation. The depth of the mines has increased, the output and number of men employed has increased, but it seems impracticable to ventilate in a way that will carry out the powder smoke and keep the humidity and temperature conditions such as will enable a man to perform a full shift's work.

H. M. CHANCE.

Philadelphia, Penn., May 18, 1914.

What Becomes of All the Mining Engineers?

The query, "What Becomes of All the Mining Engineers?" propounded by J. I. Blair in the JOURNAL of May 30, 1914, is evidently meant to be serious, although on first reading I mistook it for attempted humor or the brain-child of one suffering with a grouch. On second thought I have attributed the author's trouble to "liveritis," and would there let the matter rest were it not that the author has left the mining engineer and the mining and smelting business in such a helpless condition. Hence to the rescue.

If there ever was a business that needed and is asking for the technical man to guide its affairs it is the mining and smelting business, and its successful engineers are amply rewarded. The man with an engineering diploma from some college is simply a possibility and nothing more. That more college mining engineers are not following their supposed calling is due to several reasons:

The physical requirements for young mining engineers are severe and many young engineers find, after a few months in the field, that they are not equal to the task, physically, or else do not care to submit to the hardships. To be a successful mining engineer requires a high order of executive ability combined with good engineering brains in the one head, and this is a rare combination. Many young potential mining engineers find that they are better fitted for other lines of engineering and they enter these other fields, to their benefit.

Then there is the man with simply a superficial engineering education and nothing more. This type is found in every profession or occupation and because of some mental deficiency will be found among the tail-enders. That only a small percentage of college graduated mining engineers remain and succeed in the profession I readily admit, but it is not because of lack of opportunity. A large number desert the profession for reasons given above, some few are natural failures; those that remain and have brains succeed and succeed in a substantial way.

In following Mr. Blair across the continent I did not find only a few technical men at work, and all in minor positions. Such is not the case. Mr. Blair was seeing things with jaundiced eyes. The recent advances in mining and metallurgy were made by the brains of the technical man—the mining engineer—and not by the ex-drygoods clerk, who thinks only as per directions from the boss. That some fail as cited in the last paragraph of Mr. Blair's article I do not doubt, but these are the rare exception and not the general rule as is rather suggested.

But not to carry this too far, it is my opinion, based on some years of active work in the profession that mining engineering offers an equal opportunity for the young man properly equipped with any other profession or occupation; that the wealth and success gained is the cleanest in the world; that the rewards are certain and come much sooner than in most other professions; that the field is the greatest and the opportunities larger than anywhere else.

Park City, Utah, June 6, 1914. GEO. H. SHORT.

Editorials

What Is the Prospect for Copper?

Everybody has had to reverse the optimistic views of the prospects for copper that he held six months ago. At that time the statistics were good and the sentiment also was good. Since then sentiment has become bad. This is because of the pall of depression that has overtaken American industries. The forecasts of production and of European consumption have proved to be correct; but the forecast of revival in American business and increasing domestic consumption was as erroneous as anything could be.

The brilliant statistical position, which has all along been the bulwark of hope, is not yet materially impaired. But if things continue for another three months as they are now the statistical position will begin to be looking dubious. In that event we might as well be prepared to see copper at less than 13c. Indeed, it is not very far from that now. On the other hand, a sudden revival in domestic demand might cause the price to bound up to 15c. within a few weeks.

Which will it be? The answer depends on what is going to happen in general business in this country. He who can solve that riddle can prophesy the movement of copper.

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Iron-Ore Supplies

Independent producers—that is, producers who mine ore to sell—are not having a very good time this season on the Lake Superior iron ranges. The season prices are lower than for several years, sales so far are light, and the prospects for business not very good. The large quantity of ore brought down last season on a falling market and decreasing demand has filled the furnace yards to an unusual extent, and they are not disposed to buy, even at the lower prices, until the old stocks are worked off. The last stroke has been found in the reported sales by two or three large furnace and steel companies of some round lots of ore to outside furnaces. These companies have, perhaps, found that it is worth while to make such sales to keep down expenses and fill up the minimum quotas on their leases. It is good for them, but not so good for the merchant ore miners.

That there has been some change in views concerning iron ore has been observed by more than one commentator. A few years ago there was a rush to secure iron-ore properties, especially in the Lake Superior country. The iron or steel company which was behindhand in the race was pitied, a concern doomed to early failure. The culmination of the rush was the lease of the Hill ore properties by the United States Steel Corporation, which most people now take as an economic and financial mistake, imposing a heavy burden on the Corporation with no corresponding benefits. This lease was abandoned mainly for political reasons, or for effect on the Government suit against the Corporation; but it would probably have been given up in any event, when its full effects were realized.

The surrender of this lease, though it will not terminate until next year, marked the turn of opinion. The steel men have learned what some engineers could have told them before, that an iron-ore famine was a very remote contingency. It will be a long time before supplies begin to be exhausted, and some of them, at least, realize that they have burdened themselves with heavy continuing charges to provide against an emergency which is not likely to arise until long after our time. Reserves of iron ore in the United States are so large and the quantities that South American and other neighbors are ready to supply are so great that scarcity is not to be considered as a factor.

It is not simply a dull year that has brought about this change of views; it would have come, perhaps a little later, in any event. A pinch is a good thing sometimes, if it will teach us that future prosperity is dependent not upon hoarding up natural resources, but in extending their wise and economical use.

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Analysis of Mine Accident Figures

We recently commented on the general excellence of the Bureau of Mines' 1912 metal-mine accident report, but suggested lines of improvement in the collection and formulating of statistics that seemed to us desirable. A large part of the value of such reports is the stimulation of rivalry along safety lines. This end, the comparison of results in the various states is well calculated to serve. We look forward to the day when a low death rate and accident rate shall be as much a source of commonwealth pride as a great production of metals. For purposes of analysis, however, a division by districts would be more serviceable than by state boundaries. The mining regions of this country are susceptible of grouping into a few large divisions, within any one of which mining conditions are similar, while they differ from those existing in other divisions. This is particularly true of labor conditions and nothing more forcibly influences the accident and death rate than the character of the labor available or employed. Such a division might be as follows: (1) The Rocky Mountain, Pacific Coast and southwestern states, including Alaska and the Black Hills; (2) the Mississippi Valley lead and zinc districts; (3) the Lake Superior iron and copper region; (4) the southern states iron region; (5) the Atlantic states.

The report in question also presents its figures classified according to the metal mined; i.e., into copper, gold and miscellaneous metal, iron, lead and zinc in the Mississippi Valley, miscellaneous mineral. There is not much information to be gained by this analysis. The mining of any one metal does not constitute a homogeneous industry, and conditions affecting the mining of any such metal are highly variable. The Ray copper mine is more fairly comparable with the Alaska-Gastineau gold mine than with the Anaconda copper mine. Utah Copper has more in common with the Mahoning than with the Calumet & Hecla. A division by the mining method followed would be more logical and more profitable. Some such tentative division would be: (1) Work in narrow veins or deposits of similar form; (2) caving and slicing; (3) other methods in large orebodies; (4) steam-shovel work; (5) glory holes and milling; (6) dredging; (7) hydraulicking. Such a division has regard to the essential hazard of the various systems.

No adverse criticism of the work of this nature, which the Bureau is carrying on, is here intended. We believe it to be extremely well done and of the greatest importance, but in the process of development, certain changes are likely to be found desirable. The changes here suggested we put forward as objects toward which to work.

International Gold Reserves

At the recent Congress of Chambers of Commerce in Paris, one of the leading questions brought up was the question of gold reserves as a means of preventing panics, on which a committee had been appointed the year before. The report of this committee was presented by Mr. Faithfull-Begg, of London, suggesting an international organization by which the circulation of gold supplies can be regulated quickly and effectively and the reserves placed where they are especially needed in times of trouble. In effect the plan strongly resembled the International Monetary Clearing House suggested by Richard P. Rothwell over 20 years ago.

The chief addition to that plan was that this clearing house should control a large reserve of gold held in readiness for quick and effective use. The report suggested that this reserve should amount to $90,000,000, to be contributed by the six leading commercial nations, and to be held permanently at six financial centers, except when specially needed.

The clearing-house part of the committee's scheme met with few objections, but the reserve section was sharply criticized by such eminent financial authorities as M. Raffalovitch and Herr Kaempff. They both pointed out that the questions involved would stir up matters of an international and political character, and that it might be very difficult to secure agreement as to the use of the reserve, or the special need for it at any one center. Moreover, Herr Kaempff suggested that the hoarding of so great a sum might in itself at times cause financial trouble.

Another point, which does not seem to have been brought up at the meeting, was that some of the great commercial nations might very strongly object to the use of the reserve to meet an emergency caused by an outbreak of militarism and excessive expenditure for armaments on the part of other nations. Such a condition has been partly the cause of the demand for gold which has been so strong in Europe for the past half year. That demand has taken from the United States some $60,000,000 in gold in the last three months; but it has taken it in the ordinary course of trade, because we owed money, and because our supply of gold was abundant at the time. There would have been sharp resistance to the taking of the gold by any international committee.

The Congress referred the whole matter back to the committee for further study and a report two years hence. During that time the plan may be materially modified. Its adoption in the present form seems hopeless, even as a recommendation.

Some Questions

If Congress enacts legislation exempting labor unions from ordinary processes of law, what is to be done when members of a union shoot and dynamite each other, as recently in Butte?

What is to be done when 80,000 members of the bricklayers' union are blacklisted by the superior labor organization and excluded from chances of earning their living in so far as that body can control things?

If farmers are to be permitted to organize and hold their wheat for an agreed price, why may not the bakers agree upon a price for bread made out of that same wheat? And why then should not the copper producers agree about the price for their product?

If thrifty workingmen have invested their savings in the shares of the Steel Corporation, or the other companies for which they are working, are they to be punished for being capitalists?

Is the new legislation that is directed against the big corporations and very wealthy men in reality going to bear hardest upon the middle classes, who are workers even if not organized?

Do the big banks, railways, and insurance companies really own the bulk of the wealth of the country or do they merely concentrate the savings of hundreds of thousands of small investors who by their thrift have saved from their labor?

Is the "new freedom" to be simply a freedom for farmers and members of labor unions and is the new legislation to be especially in the interest of the incapable and unthrifty?

Ingenious Skip-Loading Arrangement

There is described in this issue by Clarence Haight a mechanically operated skip-loading chute, the most complicated to design and the simplest to operate that has ever come to our attention. The device is in use in the main hoisting shaft of the New Jersey Zinc Co., at Franklin Furnace, the design having been worked out by the manager, Mr. Catlin.

The arrangement embodies the familiar double-pocket principle; the lower loading pocket, which holds just a skip load, is filled while the skips are traveling, so that it is ready for instant discharge when the descending skip is spotted below it. There is nothing new in this, but the fact that the upper gate is left open until time to load the skip and then closed by the same operation that discharges the loading pocket, is a novelty. It is difficult to imagine anything simpler than this—one twist of the control valve after the skip is loaded, another when it is time to load it again. Three points in the design make this possible. In the first place, the relative positions of the pocket and the feeding chute are such that the ore at the angle of repose, itself prevents any overflow; in the second place, the upper gate is swung up through the ore pile by the powerful action of the hydraulic ram; in the third place, the two gates are mechanically connected by a system of levers and arms so that not only does one stroke of the ram move both gates, but it closes the upper one before it opens the lower and opens the upper after it closes the lower.

The speed of this loading chute is evidenced by the hoisting rate given in the article. Where high capacity is required from a shaft, especially if it is relatively shallow and the loading time is an important element in the hoisting cycle, it would be hard to devise a more economical installation than this.

BY THE WAY

What a wretched life Brother Moyer has to lead! He visits Hancock, Mich., to run a strike, is deported with some personal damage incidental thereto, and thereafter had to direct the strike from a distance. Lately he went to Butte to adjust some internal affairs of the union and had to make a precipitous departure to avoid being dynamited, since when he has been spouting from Helena. In the meanwhile the courts of Michigan are awaiting his attendance. Truly the career of a patriot has its trials and tribulations. Brother Moyer is quoted as saying in Helena: "I almost lost my life in Butte." In Hancock it was the enraged citizens who were the aggressors, although Moyer averred that they were thugs led by the doughty McNaughton in person. In Butte it was his own whilom subjects.

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During an attack made by Constitutionalists upon the Federal forces in Matamoras, Mexico, the defending Federal troops entrenched themselves behind a barricade of barbed wire, and then, as an afterthought, their commander hit upon the pleasant scheme of connecting this barbed wire to the line of the Matamoras electric plant, says *Engineering*. During an assault on the Federal works six or seven Constitutionalist soldiers were electrocuted by the wire before the deadly nature of the barricade became known. Withdrawing his infantry, the rebel general directed his field guns upon the electric plant, quickly shutting it down. Returning to the assault the now innocuous barbed wire entanglement proved only a slight obstacle to the final capture of the city by the Constitutionalist forces.

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This is a tale from Russia, although its geographical situation is of small account, except as explaining some peculiarities of its English. It runs somewhat as follows: "In the Namanganska Mountains, in the distrct of Ferghana, a new metal has been discovered whose properties are surprising and remarkable. A prospector found, besides rich deposits of asbestos and rare ores of different kinds, a dough-like metallic substance of a dirty brown color, which was not known to either chemists or metallurgists before. He sent a sample of the stuff to the chemical laboratory in Moskva, where it was analyzed and experimented on with most surprising results. When the ore was treated with acids an intensive cold was developed. The glass that held the acid was disintegrated into powder. Vessels of stone and porcelain were reduced in the same manner. Iron vessels to hold the acid were then tried, but they exploded instantly and were reduced to atoms. The chemists then tried it on a large piece of granite. This was instantly disintegrated and reduced to gravel without explosion or generation of gas of any kind. When alkalines were brought into contact with this new substance the vessel containing the alkaline lost 20% in weight. So far as the chemists have yet been able to ascertain, this new substance is in no way related to radium. One of the most curious phenomena concerning it is that substances coming in contact with it lose much of their weight." By which we are reminded again of the traveler-farmer dialog. "There's a great scientist lives up there." "You don't say, what does he do." "He's looking for an acid that will dissolve everything." Head scratching by Reuben—"Huh, what's he going to put it in."

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What is a Prospector?

We beg to report that analysis of the specimen labelled *Prospector* shows the following:

	Per Cent.
Optimism	45
Alcoholism	22.5
Superstition	11
Perseverance	9
Education	5
Business sense	2
Insolubles	2
	96.5

SNICKERS & PRANKS—
Psychological Chemists.

The foregoing being merely the result of a test on a grab-sample, it is manifestly unjust to generalize. But if asked to describe the typical prospector one must plagiarize the remark of the old farmer who, upon first seeing a giraffe, indignantly exclaimed: "there ain't no sich animal." For, like the typical farmer of the vaudeville stage, the common conception of the typical prospector is but the exaggerated personification of a rare and almost extinct variety. We are all prospectors, or we should be. *Pro* signifies "forward," and *spector* a "looker." The prospector looks forward, the inspector looks in, the promoter moves forward, and the expecter generally has to look out. The investor may be all of these; taking a look in, moving forward with his cash, expecting dividends, and looking forward for a rise in the value of the stock he buys. Sometimes, in a retrospective mood, he realizes not merely that his vest is in, but that he has lost his shirt. And thereby hangs a tale. Dirty Dick was a prospector. Such faith had he in his mineral prospect that when he struck ore he made a vow not to change his shirt until the mine (have you noticed how a prospector insists upon calling his prospect a mine; probably because it *is* his?) was sold to an Eastern capitalist, the ideal prospect of the prospector. In "them days" an Eastern capitalist almost invariably could be spotted by his spotless white b'iled shirt, so Dirty Dick acquired the habit of looking forward along the trail for Mr. E. C. and soon became an authority on shirts. His general powers of observation improved coincidently, and eventually the mine was sold to a prospect for a sum sufficient to enable Dirty Dick to put on a clean shirt every day, regardless of contingent dirt. The moral of my tale is this. Cultivate a harmless eccentricity and you may attract notice to such an extent that you will profit financially and also become an authority on some particular subject. When prospecting, keep your shirt on, figuratively, and do not look through colored glasses lest you fail to recognize the white shirts of rational scientific deduction.

PERSONALS

F. C. Alsdorf, of Prescott, Ariz., is in the state of Washington examining mines.

C. M. Means, of Pittsburgh, has been appointed consulting engineer with the U. S. Bureau of Mines.

C. R. Wilfley had moved from Denver to Ouray, Colo., to look after the leasing of the Barstow mine.

Edwin J. Collins has returned to Duluth, Minn., from an examination trip in Inyo County, California.

Campbell M. Hunter, of Thompson & Hunter, an English firm of petroleum mining experts, has gone to inspect the Calgary oilfield.

Alvin R. Kenner, superintendent Rio Plata Mining Co., attended a directors' meeting in New York last week, and has returned to El Paso, Texas.

F. F. Wilson has gone to the Calgary oilfields in the interests of a group of Toronto and Northern Ontario capitalists, who has extensive holdings in the district.

General Manager Graves, of the Granby Consolidated Mining Co., has resigned his position. F. M. Sylvester, who has been assistant manager for some time, succeeds him.

H. C. Meek has resigned his position as manager of the Dome mine, Porcupine. He is succeeded by C. D. Keading, who has been made vice-president and managing director of the company.

R. W. Deacon has been appointed superintendent of the Chrome, N. J., works of the United States Metals Refining Co. Mr. Deacon was assistant superintendent at this plant for over six years.

Dr. F. L. Nason, of the Mineral Point Zinc Co., has been in Silver City, N. M., and vicinity, examining operations of the Empire Zinc Co., where a power plant and two ore-treatment plants are under consideration.

Robert H. Richards will spend July and early August visiting mills at Lake Superior, Butte, Anaconda and in Idaho, California, Nevada and Utah, with the idea of bringing the data in his "Ore Dressing" up to date.

Thomas Turnbull has been appointed superintendent of the new underground mine, to be opened at Crosby, Minn., by the Merrimac Mining Co. He was formerly superintendent of the Shenango Furnace Co.'s Webb mine, at Hibbing.

J. W. Whitehurst has been visiting Denver and various cyaniding districts of the United States in the interests of the Estaca Mining Co., of Contra Estaca, Sinaloa, Mexico. His permanent address is 422 Kohl Building, San Francisco.

Walter Harvey Weed will be in Butte, Mont., until July 11, engaged as expert witness in the Anaconda-Pilot Butte Mining Co. case, now being tried. He was also engaged as expert witness in the Alice-Amalgamated suit tried last week at Helena.

William W. Clark has resigned as chief chemist of the American Vanadium Co., to take effect July 15, and has accepted a position as metallurgist for the Seymour Manufacturing Co., Seymour, Conn. His connection with the last named company starts Aug. 1 next.

Newton W. Emmens, mining engineer, of Vancouver, has been commissioned by the Minister of Mines of British Columbia to investigate and make a special report upon the recent discovery of tin on Fish River, and a general report upon the present mining development in Upper Arrow Lake and Lardeau mining divisions.

W. H. Donner and Geo. V. Massey were elected directors of the Cambria Iron Co., succeeding Geo. F. Baer, deceased, and E. T. Stotesbury, resigned, at a meeting in Philadelphia, June 18. Alexander P. Robinson formally was made treasurer to succeed E. T. Stuart, who resigned some time ago to become treasurer of the Pennsylvania Steel Co., at Steelton.

Thomas F. Higgins, who for the last eight years has been superintendent of the smelting plant of the Central Chile Copper Co., at Panulcillo, Chile, left, on June 10, for New York, where he will be for three or four weeks attending to business for the company; afterward he will go to Europe for a well earned vacation, returning to Chile about the beginning of next December.

T. E. Mitchell, assistant superintendent of the Anaconda Copper Mining Co., in charge of the Leonard mine, has accepted the position of assistant general manager of a large copper-zinc and silver-lead mine, in Burma, India, owned by English capitalists. Mr. Mitchell will sail from New York for London on July 4. The name of his successor at the Butte mine has not yet been announced by the company.

J. A. Singmaster, general superintendent of the Palmerton plant of the New Jersey Zinc Co., is making a tour of Europe, visiting smelting works and other departments of the zinc industry. He left New York on Apr. 25, and will be away at least three months. He will visit plants in Silesia, Belgium and France, probably making detours to Italy Spain and Sweden, ending with the Swansea district in Wales. He has been especially interested in the manufacture of lithopone, which brought him in contact with all departments of the Palmerton plant, leading to the position of general superintendent, which he has held for three years.

OBITUARY

Benjamin F. Wheeler died at Santa Monica, Calif., June 20, aged 65 years. He was largely interested in Colorado mines and was a pioneer of the Aspen district in that state.

Newton Wilson died at St. Louis, June 23, aged 56 years. He had been engaged in mining operations in the Southwest and Mexico, and built the smelting plant at Torreon. He was also interested in oil wells and lands in Texas, owning a large property at Beaumont.

Fred J. Bedford, a mining engineer, aged 29 years, who had been in the service of the Canadian Copper Co. for about six years, was accidentally killed on June 25 in a mine near Copper Cliff, Ont., while repairing some machinery that had broken down. The machinery was started by mistake while Mr. Bedford was working about it.

William Plummer, of Winnipeg, died June 16, aged 44 years. He was born in Keswick, England, graduated at the Cornwall School of Mines, and had an extensive professional experience in the mining districts of England, as well as in Spain, India and Northern Nigeria. He went to Manitoba a year ago and was consulting engineer to the Rice Lake Gold Mining Co., besides acting for other syndicates operating in the Rice Lake district. He leaves a widow and three children.

SOCIETIES

American Society of Mechanical Engineers—A party of 30 members, following the annual convention at St. Paul, visited Duluth and vicinity on June 20 and 21, inspecting the new plant of the Minnesota Steel Co. Among others, the party included W. F. McGregor, A. F. Blaisdell, G. H Hutchinson, R. W. Hutchinson, John Hunter, Arthur Seubert, C. J. Taylor, F. R. Low, E. J. Von Rein, James Powers and Stafford Montgomery. The trip was in charge of Steel Corporation officials.

Canadian Electrical Association—The 24th annual convention of this association was held at Montreal, June 24-26, with an attendance of over 300 members. The chair was occupied by the President, Col. D. R. Street, of Ottawa, who, in his opening address, dealt with the growth and progress of the association. A large number of technical papers were read and addresses given. Officers were elected as follows: President, Col. D. R. Street, Ottawa; first vice-president, D. H. McDougall, Toronto; second vice-president, R. M. Wilson, Montreal; third vice-president, W. Maclachlan, Toronto; honorary secretary, T. S. Young, Toronto; secretary-treasurer, Alan Sullivan, Toronto.

Southern Oregon-Northern California Mining Congress—This congress will meet in Ashland, Ore., July 9 and 10. The local committee is preparing to entertain a large number of delegates. The program is as follows, besides the usual opening addresses: President's address, L. J. Luce; S. B Edwards, Grant's Pass, "Placer Mining in Southern Oregon"; H. N. Lawrie, Portland, Ore., "Mining Industries of the State"; R. A. Watson, corporation commissioner, "Blue Sky Law, Relation to Mining Industry"; A. L. Lamb, Ashland, "Mining in Jackson County"; M. Mangum, "Mining in Josephine County". Professor Parks, "Mineral Resources of Oregon"; address by state mineralogist of California; C. B. Watson, Ashland, "Clay and Kaolin and Their Possibilities"; "Iron and Copper, Their Relation to Commercial Industries"; E. P. Hopson, "Irrigation and Reclamation"; C. L. Probstel, "Mineral Resources of Siskiyou County."

Editorial Correspondence

SAN FRANCISCO—June 24

Western Fuel Co. and Other Suits, which will be filed by the Government, are announced by U. S. Attorney John W. Preston, at San Francisco. These suits will demand the recovery of sums aggregating $300,000. This action by the Government is based upon the results of the criminal trials when some officers of the Fuel company were convicted of conspiracy. Various steamship companies, acting with the Western Fuel Co., are included in these civil actions. The suit against the steamship companies is for recovering money paid by the Government on false affidavits made by the Fuel company's officials. The action against the Western Fuel Co. is for the recovery of money which the Government charges was paid for coal that was not delivered. The several amounts sued for are as follows: Western Fuel Co., $22,417; Pacific Mail Steamship Co., $225,163; Oceanic Steamship Co., $20,314; American Hawaiian Steamship Co., $4778; Pacific Coast Steamship Co., $172.

Character of Land Granted to Southern Pacific R.R. should have been known by the Department of the Interior before issuing final patent, according to the decision of Justice Vandeventer of U. S. Supreme Court. This decision was handed down in the Edmund Burke case. Burke sought to locate as mineral land, certain parcels of land in the Coalinga oil district, which had been patented to the Southern Pacific. Burke claimed that the Southern Pacific had no title, because of the mineral exemption clause, and that the land was open to entry. The case was tried in the U. S. District Court and was taken up to the U. S. Court of Appeals ,which asked the supreme court to instruct on seven points. The decision of the supreme court is the reply. Burke is denied the right to locate the land on the ground that collateral suits have no standing and that only the Government has the right to attack the validity of the patent. Justice Vandeventer intimated that in the case at bar the time within which the Government had the right to such attack expired in 1900 or 1901; the patent to the lands in controversy having been issued in 1894. The decision holds that the officials of the Department of the Interior must do their duty in ascertaining whether the land comes within the law, excluding and excepting mineral lands patent to railroads, and that they could not perform their duty by inserting exceptions that the lands should not pass to patent, if found later not to be within the law. Justice Vandeventer cites the Northern Pacific, which secured patent to every alternate section of land in a 40-mile strip from Duluth to the Pacific Coast. Should the exemption be held valid in an attack on the Northern Pacific the question would arise whether those who long ago purchased from the railroad, and created farms, ranches and towns have any rights. The court held, contrary to the contention of the Southern Pacific, that oil land is mineral land. So there need be no more contention on that point. The Southern Pacific, however, has gained by this decision more than the winning of the Burke suit means. The decision may be held to mean that the attacks of the Government upon the validity of patent to the Southern Pacific of oil lands valued at several hundred millions of dollars, cannot be maintained in the courts. This decision of the supreme court is met with general approval throughout the state. Whether or not the Southern Pacific was aware that the lands contained mineral, the burden of proof that they were mineral lands appears to have been laid upon the Department of the Interior. It is not likely that either the Southern Pacific officials or the officials of the Department of the Interior had any knowledge that these lands contained mineral oil at the time the patents were issued.

DENVER—June 26

A Virgin Field for Prospectors has been provided by recent acts of the managers of the Luis Maria Baca Land Grant No 4. This tract is in southeastern Saguache County, along the western flanks of the Sangre de Cristo range, and covers a little more than four modern townships, or 150 square miles. This old Mexican cession having heretofore remained privately owned, prospectors have not been privileged to search for mineral on it, although the area has long been known to possess mineral deposits from remarkable float finds that have been made. The owners now announce the opening of this large tract to general development under leases that will be granted only to discoverers of mineral. Such leases will run for two to five years and will carry royalties of 10% on net returns from operations. With each lease there will be given guarantee of free timber sufficient for mining needs and abundance of free water. Furthermore, there are no taxes of any kind and the corporation will furnish free assay service to prospectors and miners. Placer ground exists in the area. The chief metals known to prevail are gold and silver, but there are good reasons to presume the existence of base-metal ores. Faithful performance of contracts assures each lessee of extensions on his leases, which are transferable.

BUTTE—June 24

A New Union Was Formed by Butte Miners at a meeting held at the Holland Rink Sunday afternoon, June 21, more than 4000 miners attending. The new organization is to be known as the Butte Mine Workers Union. Muckie McDonald was elected temporary president and with his elected associates was instructed to draft a constitution and bylaws, also to send telegrams and letters to all those unions which have wired promises of support to President Moyer, and to request them to withhold judgment on the Butte situation until investigated by their own representatives which are invited to come to Butte. The report of the executive committee was adopted. The chairman of the committee announced that inside of two days the organization would open temporary quarters to receive dues and application for membership. President Moyer of the Western Federation of Miners contends that the action of the secessionists means an open shop and will result in the destruction of organized labor in Butte. These views are not shared by the members of the new union, who are equally firm in their contentions and are not inclined to favor any compromise with the old Butte union or the Western Federation. The resignation of all officers of the old Butte union, announced by Moyer and the promise to abide by the results of an election of new officers from among the seceding miners, were ignored at the meeting. No attention was paid to any offer of compromise, nor were any suggestions offered in the way of conferring with adherents to the old unions. The whole attitude of the meeting clearly indicated that the great majority of the miners were through for all time with the old union and were confident to stand on their own feet and to further the interests of their members far better and more justly than the officers of the old union were able or willing to do.

Moyer's Visit to Butte was made in opposition to the advice of friends. He attempted to bring back into the federation 4000 or 5000 rebellious miners. Of course, he failed and with some of his staff officers had to flee from the city to save his life. Today Butte, the strongest union town in the world, the parent of the Western Federation and for years the support of the organization and its officers, occupies the unique position of being a "wide-open shop," so far as the mines are concerned. The rebels have refused to recognize longer the authority of Moyer and his federation, and for two weeks men have been working in the mines without union affiliation, having divorced themselves from the union of miners. Moyer and 142 of his loyal followers, out of a membership of 8000, attempted to hold a meeting in the wrecked old union hall. Thousands of rebels and others congregated in the street in front of the hall and jeered at the few going into the hall The men inside became nervous and lost their heads. They were all heavily armed, and when one of their own number started to enter the hall, he was shot down by one of the inside riflemen. Then shooting became general and a man in the street was killed and four others wounded. The mob cried for the blood of Moyer and he beat a hasty retreat through a rear window and over adjoining roofs, followed by the faithful 142. All made their escape, and when the mob procured dynamite and began blowing up the building many thought Moyer was still in the hall, but he got out of town in an automobile, and with several of his followers, turned up in Helena, where he petitioned Governor Stewart to send troops to Butte. The Governor declined to do so in the absence of requests from the local authorities. Moyer was again advised to stay out of Butte, but he threatened to return, and later did. The mob, led by I. W. W. agitators, who have been attracted to Butte by the direct-action Socialist administration of Butte, made threats against other property, the newspapers and public buildings, but let it go with threats, as it was known that most of the mine and other buildings were under heavy guard of armed men, who were not Socialist policemen. The sad condition of Butte's civic administration may be noticed in the fact that while the I. W. W. dynamiters were stealing dynamite at the mines, a dozen policemen were at headquarters playing cards and refused to respond to a call for assistance, while the mayor was safely guarded in another part of the city hall.

SALT LAKE CITY—June 25

Restoration to Entry of Withdrawn Lands in Utah, amounting to 262,822 acres, which had been withdrawn as possible coal land, was made by the Secretary of the Interior, June 6; 320 acres reserved by the Government for power sites will be restored to entry July 1, and 40 acres formerly included as a part of the Strawberry Valley project, have been restored, subject to entry Aug. 7.

A Decree To Silver King Consolidated has been given by Judge John A. Marshall, of the U. S. District Court, quieting title to all the ores vertically beneath the surface of its Electric Light, Cumberland, Ural and Croesus claims at Park City. The Silver King Consolidated has recently developed a large orebody in the Electric Light claim, and the decree quiets any effort that might be made to apex the orebody from adjoining property. About one year ago it was rumored that the Silver King Coalition would claim an apex. For that reason the Silver King Consolidated Mining Co. started suit against the Silver King Coalition Mines Co. to quiet title to the claims. The complaint alleged that there were veins and lodes of mineral-bearing rock in place vertically beneath the surface of the claims, carrying minerals without which the claims would be of little or no value. It was declared that the minerals within the said claims belonged to the plaintiff, but that the defendant caused it to be said that the ore belonged to the Coalition company, and that it had certain rights in the ground. A number of extensions of time within which to file an answer were given, the last one expiring Oct .15, 1913. After this an order was entered taking the bill as confessed for want of an answer, and a final decree was given. In this it is adjudged that the veins or lodes and all the mineral therein are the property of the plaintiff, and that at and prior to the time of the filing of the action the plaintiff was the owner of said veins and lodes; and that the defendant had no right to enter under the surface of such claims and mine and remove said minerals as its own. It was held further that the title of the plaintiff in and to the ore in said claims was established, confessed, and quieted against any and all claims of the defendant.

HOUGHTON—June 29

Copper Range Consolidated is getting out a greater tonnage than ever before in its history. General physical conditions at all of the mines are better or as good as ever before. Expenditures for improvements have been paid for and the company is now about to gain from its investments It has no extraordinary outlays in view, and earnings for the next six months depend upon the price of copper alone. A total of 2750 men is now employed. A daily total tonnage of 6100 tons is being sent to surface, this being the best rock tonnage in the history of the consolidated companies. At the Champion mine, four shafts are producing, B, C, D and E and the daily tonnage exceeds 3000. Shafts B and E are down approximately 2300 ft and the two others to a depth of 2100 ft. The lower levels are maintaining the general grade of Champion rock, which is comparable with the best from the Baltic lode at any point. At present no sinking is being done and no advanced openings are under way. Advanced openings had been extended before the strike, and when operations were resumed all energies were directed, properly, to the maintenance of rock tonnage. By July 15, this mine will be extending its openings again and maintaining its maximum tonnage at the same time. At the Trimountain mine three shafts are producing. No. 2 is the deepest, 2800 ft. Nos. 3 and 4 are down to the 22d and 23d levels respectively. The general improvement in the underground showing of this mine that has been commented upon for the past two years, continues with all the newer openings. The Trimountain seems to have permanently passed out of the leaner levels and it is yet a young mine. Before Trimountain openings at these three shafts attain their maximum rock productiveness, the tonnage probably will reach 36,000 per month. A high mark of 33,000 tons will be attained in July, from present indications. The Baltic mine is now turning out 1800 tons daily and the trend is upward. The good showing of rock in the bottom of No. 3 shaft is holding out. No. 2 is particularly good in the north end. The bottom of No. 4 continues to show poor copper rock, and it is believed that it will continue poor for a distance of 200 ft. more when the good run of ground which is showing in No. 3 at a similar depth, will be encountered. This is a reasonable deduction as the 28th-level drifts from No. 3 shaft toward No. 4 are in good rock. No. 4 shaft is a small producer at Baltic, as a limited tonnage only can be taken out now, but the shaft is being retimbered and this work will be completed in the near future. This will permit of increased hoisting capacity and then two regular shifts of miners and trammers can be put on at this shaft. Normal opening work is now being done at the Trimountain, about half of normal at the Baltic, and the Champion is so far ahead that the immediate necessity for extending advanced drifts and sinking is now not great, for this work can be started in the near future. Before the end of the year the Champion will again have maximum advanced openings as well as maximum daily tonnage. Extensive changes and improvements in the stamp mills of the Copper Range Consolidated have been about completed and paid for, a comparatively insignificant outlay having been required. Tube mills have been installed and are working satisfactorily on regrinding. The power is furnished by a recently installed exhaust-steam turbine in the Baltic mill. About the only large construction item that will come this year at these properties is the new change house for the men. This was practically a necessity some time ago and the recent destruction of the old change house made the new one an immediate need. All of the Copper Range Consolidated mines are equipped with one-man drills and the increased efficiency as well as the increased compensation to the miners is remarkable. The saving in drifting alone runs from $1 to $2 per foot and in a mine where the drifting work averages 30,000 ft. per year this is a pronounced betterment in operating costs. The drill now is perfected so that it is as easy to operate as any drill and the miners who have become accustomed to them and are able to see substantial increases in their pay checks by reason of the change are delighted with the innovation, now as they were opposed to it when it was first proposed and introduced.

TORONTO—June 26

Another Discovery of Oil at Calgary has been made. On June 17, crude black petroleum was struck at a depth of 808 ft. in the Monarch well, 30 miles west and six miles south of Olds, and 70 miles to the northwest of the Dingman well. This find is considered as demonstrating the extent of the field, and the fact that the oil is crude instead of light, white oil like the former find is viewed with much satisfaction as more likely to indicate its presence in commercial quantities. This, however, is not yet assured, as drilling was suspended until the well could be provided with a special cap to avoid a rush of oil. The news of the find caused a renewal of speculative excitement at Calgary where the shares of the Monarch of the par value of $1 speedily rose to $50. The company is capitalized at $200,000 and controls claims covering 122,952 acres. The Dingman well remains capped owing to the high pressure and will not be reopened until ample storage capacity is provided. The directors have ordered twelve 12,000-gal. tanks for installation near the well.

COBALT—June 26

In Liquidating the Bailey Mining Co., the Standard Stock & Mining Exchange has departed from the ordinary procedure in asking for proxies to contest the action of the directors. At the last meeting of the directors, it was decided to liquidate to satisfy the claims of the creditors, and it was decided to call a shareholders' meeting in Toronto to have this action ratified. The president of the exchange states that he is unable to explain the proceedings to wind up the business and upon inspecting the records, finds that Edwin A. Benson, the president and other promoters issued 4,250,000 shares of $1 par to themselves leaving 750,000 in the treasury. In 1909, Benson was the holder of 2,155,165 shares, in 1910, 1,187,916 shares, in 1911, 1,001,655 share, while at present he is the registered holder of only 278,190 shares. Other promoters who held large blocks of stock, have been selling in the same way and they have held in the treasury, the 750,000 unsold shares. The sale of the treasury shares might have come in competition with the shares of the promoters' shares, and the result has been that the public now owns almost all of the outstanding capital stock. If the exchange receives a sufficient number of proxies before the petition for the winding-up order comes on for hearing, a counsel will be engaged to oppose the petition and to challenge and dispute the validity of the judgment.

The Mining News

ALASKA

RECENT REPORTS FROM TWENTYMILE are not encouraging. Three shafts have been sunk to bedrock near scene of recent discovery of pay without finding even fair prospects. Prospectors have every confidence that more pay will be found, however, and will remain there for some time yet before giving up. Pearson & Anderson, discoverers of pay, are sluicing. Morency and partners are sinking on creek that flows into Twentymile near Pearson & Anderson ground, working day and night. William Volkman and John McLaren have bedrocked one hole a short way up Twentymile from Discovery and are now sinking another. MacGillivray & Henderson are prospecting on Hanson Creek. There are many other prospectors in vicinity, and it is probable that district will be thoroughly prospected this summer. Twentymile Creek is a right-limit tributary of Salchaket River, or Salcha River, as it is known on maps, which flows into Tanana 40 miles above Fairbanks, and receives its name from fact that it is 20 miles from roadhouse, mission, and trading post at mouth of Salchaket.

CRITES & FELDMAN (Fairbanks)—A mill will be built at mine to avoid long haul to custom-mill.

WILLIAMS & RUTHERFORD (Fairbanks)—These Engineer Creek operators recently added a 60-hp. Oil City boiler of return-tubular type to their equipment. Ground on which they are working is comparatively low-grade, but has produced over $1,000,000 previous to present season. Some portions of claim ran as high as $10 per sq.ft., but a recent cleanup by present workers indicates that they will recover between $1 and $1.25.

NO. 3 BELOW, PEDRO CREEK (Fairbanks)—One-third interest in Mudge-Goodrich lease was recently purchased by Ed. Farrel. Lessees expect to strip 80,000 sq.ft. of bedrock during season. Bagley scraper of 32 cu.ft. capacity, operated by an 8x10 Washington engine, will be used. Gravel will be scraped into a car, and car will be hauled up an incline to dump-box with a small auxiliary hoist. This method of elevating gravel, which has never before been tried in Fairbanks district, although used at Iditarod, will, it is hoped, effect a great saving in power. Ordinarily, loaded scraper is dragged from cut up incline to dump-box, but, although this permits more rapid work, it is otherwise less efficient. On account of shortage of water during greater part of season, it is rarely possible to sluice all the gravel scrapers will handle, so these operators expect to uncover as much bedrock during summer by using a car as they would by dumping scrapers directly into boxes. Ground is wet, and on that account has never been thoroughly prospected, but result of work done by others on adjoining ground leads to belief that an estimate of 50c. per sq.ft. of bedrock is conservative. All conditions being favorable to low costs, it is hoped to mine gravel for 25c. per sq.ft., which is lower than any figure yet reached in district.

HILTY & LUNDBLAD (Fairbanks)—Operators are working 40 men on No. 1 Below, Cleary Creek, and this crew will probably be doubled later. Two years were spent in preparing for present season. Ground is wet, which means that it contains sufficient water to make cost of pumping prohibitive with wood at $15 per cord. It was therefore necessary to drive a drainage adit 1900 ft. long before mining operations could be undertaken with hope of success. Ground is 16 to 18 ft. deep and will be worked by scrapers. Small dump taken out during winter will first be sluiced, then tailings from previous mining operations will be scraped into boxes with a 3½-ft. Bagley scraper operated by a 7x10-in. double-cylinder, double-drum Lidgerwood engine. When piles of old tailing are out of the way, work will be started on virgin ground, and for this purpose largest hoist ever designed for interior of Alaska has been ordered from American Hoist & Derrick Co. Hoist, which is of special construction, will have steel gears and banked levers; it will have twin 10x12-in. cylinders, and will be capable of lifting 25 tons with steam pressure to be used. Like most hoists used in open-cut work with scrapers in Fairbanks district, it is of 3-drum type. Weight of engine is 13½ tons. A similar hoist, with cylinders of same size, but of general lighter construction, has been ordered for James McPike, a Goldstream operator, from Washington Iron Works, of Seattle. There are several other large 3-drum hoists in use in scraping work in district, and following list will show growing importance of this form of mining:

Name of Operators	Location	Size, In.	Make
Hilty & Lundblad...	Cleary Creek.	10x12	American
James McPike..	Goldstream.	10x12	Washington
Julius Gius..	Pedro	9x10	American
Charles Gius	Pedro	8¼x10	American (2)
Harry Atwood	Pedro.	8¼x10	American
Tom Gilmore..	Pedro.	8¼x10	American
Fred Bleeker	Goldstream.	8¼x10	American (2)
Dan Koch & Co	Goldstream.	8¼x10	American
Henry Wagner	Goldstream.	8¼x10	American (2)
Mudge & Goodrich.	Pedro. ..	8x10	Washington
Lempinnen & Co.	Goldstream.	8x10	Washington
Fred Parker	Fairbanks ..	7x10	American

All of these 15 are of 3-drum, twin-cylinder type, and, with four exceptions, all operate, or will operate, Bagley scrapers of various sizes. Four are used with slip scrapers, which require men on the handles. Bagley scraper is much more efficient and is less dangerous to workmen. Number of hoists in district with 7x10 or smaller cylinders is great, probably running into hundreds.

ARIZONA

Gila County

INTERNATIONAL SMELTING CO. (Miami)—Because of a shortage of steel erection of engine-house unit of power plant at smelter site has been slow, but building is now erected and riveting should be finished in a few days. Exteriors of power-plant buildings are to be of reinforced concrete and erection of forms has already been started on one end of engine house. Multiplex reinforcing plates for boiler-house roof are also in place and concrete filling will be poured promptly. Foundations for turbo-generators were poured this week, as were those for two retaining walls on oil-storage bench. Two auxiliary 24-ft. concrete oil tanks that are to be used for measuring are nearly completed. Each will have a capacity of 3500 gal. Because new 25-ton slag pots, recently received, are not designed for fast haulage around sharp curves, idea of obtaining slag from Globe for reverberatory bases has been abandoned. Instead a 52x276-in. blast furnace obtained from Old Dominion smelting plant is being erected on furnace site so that slag can be made as required. Furnace will probably be ready within a week and foundations will be poured as soon as possible, as this work is already far behind.

INSPIRATION CONSOLIDATED (Miami)—For some time past mine department has had inadequate air supply, but now with new compressor and hoist plant erected and one compressor unit installed and in operation it is possible to supply a quantity greatly in excess of requirements. Present installation, however, is only temporary insofar as scheme of distribution is concerned, as it will require several months to complete entire installation with its elaborate distributing system. With 3000 cu.ft. furnished by this unit total available capacity is now 7500 cu.ft. per min., ample for all development work requiring compressed air. If present rate of erection is continued concentrator trestle should be completed in 10 days. About 60 tons per day is being put in place and riveting is being carried along with erection. Painting will start soon. Carpenters have nearly completed work on shop extension. Company carpenters have started laying composition roofing on main concentrator building, and as soon as shop extension is completed entire finishing force of American Bridge Co. will be put to work to complete inclosing of main building. Considerable riveting, however, remains to be done on concentrator bins, but this probably will be left until trestle is completed. A large shipment of steel shelving for concentrator warehouse has arrived and work of assembling same will begin in a few days. Excavation for concentrator transformer station and distributing station has been completed and forming of walls, floors and piers has been started. Latest addition to test mill is five Metals Recovery Co. pneumatic-flotation machines and auxiliary equipment, which are to be given a thorough test to compare their efficiency with Minerals Separation process. Although two processes are based upon same principle, means of acquiring final result are different and purpose of company is to determine which is best adapted to treatment of its ores. As soon as necessary parts are received from the East a series of experiments are to be started with Bradley preliminary crushers to determine best steel for rolls and die use. The rolls and dies, which gave good results on a dry, brittle feed, were found to wear excessively in crushing moist Inspiration ores, but with a change to one or a combination of alloy steels it is believed much better results will be obtained.

Mohave County

SWASTIKA (McCracken)—Preparations are being made to build smelting plant of 60-tons daily capacity.

WALKOVER (Hackberry)—Qualey Bros., who have a bond on property, recently started working with a small force.

LUCKNOW (Hackberry)—Vein at this mine, operated by Nevada-Arizona Gold Mines Co., has been struck at 420-ft. level, but owing to an inrush of water no examination has been made. In Roosevelt tunnel a drift has been driven 75 ft. on a cross vein, 4 ft. wide.

Pinal County

GOLDEN BELL (Kelvin)—Work has been suspended while ground is being surveyed for patent.

KELVIN-SULTANA (Kelvin)—Retaining walls for Hardinge mill and rolls floors are in place, as well as foundations for ore bins. All grading for mill is now completed. In mine station on 500 is half finished. Old No. 2 has been retimbered for a depth of 120 ft., where a loading pocket will be put in. Putting this shaft in commission opens up large tonnage of mill ore left in old stopes as filling by lessees some years ago, as well as considerable virgin ground.

Yavapai County

BUNKER HILL (Prescott)—Lessees are driving to connect old and new shafts, a distance of 100 ft.

GREAT BELCHER (Big Bug)—Groups known as Great Belcher, Mammoth, Eugene and Red Rock are to be combined and operated under one management.

SNOOZER (Senator)—Senator tunnel, which opened up new ore in Cash and Getchell veins, has now opened up Snoozer vein at a depth of nearly 700 ft., exposing high-grade ore.

HENRIETTA (Chaparal)—After completing cleaning out of lower tunnel, which is 1000 ft. long, it is found that face is 100 ft. from oreshoot. Crosscutting for ore is now under way

CALIFORNIA

Amador County

DREDGING IN COSUMNES RIVER is to be undertaken by Guggenheim interests. One dredge is reported to be ready for operation and others are contemplated.

KENNEDY EXTENSION VS. ARGONAUT CASE was decided June 29, in favor of defendant.

Calaveras County

VALLECITO PLACER DISTRICT is being developed. Work is being done in old ground opened many years ago, but abandoned on account of water troubles. Chief work at present is being done in an old shaft and a drift 200 ft. below surface. Old channel is known to extend five miles with an average width of ½ mile.

Lassen County

ENGLE (Susanville)—It is reported that extraction of ore has been resumed, but smelting plant will remain idle for a time, on account of complaints of farmers against fumes. Ore will be shipped to Nevada.

Nevada County

ZEIBRIGHT MINING CO. (Grass Valley)—Following officers were elected at annual meeting held in June. Fred Searles, president; W. Englebright, vice-president; J. J. Jackson, treasurer; J. F. Colley, secretary; A. Hongle, director. Mine is in vicinity of Bear Valley.

GOLDEN CENTER (Grass Valley)—Board of directors has authorized an appropriation of $35,000 for a 60-ft. headframe, an electric hoist and sinking of a new vertical shaft. Doubling capacity of 10-stamp mill and building of cyanide plant are also contemplated.

Placer County

MAYFLOWER (Forest Hill)—It is reported that this old mine formerly a large producer, is to be reopened by San Francisco and Buffalo, N. Y., men.

Trinity County

OPTION ON DREDGING GROUND ON TRINITY RIVER near Carrville, held by John Hays Hammond and associates has been extended. Further prospecting will be done. Ground extends for seven miles.

ASBESTOS DEPOSITS ON EAST FORK OF TRINITY RIVER are being developed on 10 claims. These are 18 miles east of Carrville. Sawmill with capacity of 10,000 ft. per day has been built to furnish material for necessary buildings. Situation is 18 miles from Castella on Southern Pacific, which is nearest railroad point. There is no road, so that machinery and supplies for present, must come in from Redding by way of French Gulch and Carrville, making a haul of 75 miles. While no company has yet been formed, development is being done by H. T. Mecum, of Oakland, and associates, both in Oakland and South Dakota. With economical transportation it is said enterprise will pay.

Yuba County

YUBA NOS. 3 AND 4 DREDGES (Hammonton)—Yuba Consolidated Gold Fields is constructing these dredges with new steel hulls. Steel hulls are being built by Yuba Construction Co. at Marysville.

COLORADO

Boulder County

HOOSIER DYKE (Crisman)—Idle since 1905, mine is being unwatered and reopened by owners, Golden Link Mines Co.

Gilpin County

GILPIN MILL (Black Hawk)—Howard Wherry has fitted this old plant with sluices and is treating old tailings with fair results.

PITTSBURGH (Central City)—Pump is handling 90,000 gal. per day. Regular shipments continue semi-monthly, as for years past, and returns are good.

KEYSTONE (Central City)—T. R. Cudahy has organized company of Grand Rapids, Mich., men who will develop new ground in this group, that is credited with a production of $200,000. Gulch mining is active in all streambeds of Gilpin county.

Gunnison County

DISCOVERY OF A SILVER VEIN has been made 5 miles southeast of Pitkin, toward old camp of White Pine. Vein is in limestone.

Jefferson County

PLACERING AT MOUTH OF CLEAR CREEK CAÑON being done by James Myers, former superintendent of smelter at Golden. Myers is using a saving device of his own invention.

La Plata County

CHRISTIE (Cave Basin)—Copper ore has been struck.

TOM BOY (Cave Basin)—Samuel Parks will sink shaft, using whim, first piece of machinery in camp. He will also sink a shaft on his Half Moon claim, where he made his first discovery last autumn.

MARY MURPHY (Cave Basin)—Acord & Walker have 20 tons copper-silver ore sacked for shipment. This was taken from a 2-ft. streak and is expected to assay 20% copper and 100 oz. silver. They have also 10 ft. of similar ore of lower grade. Entire county is being prospected; every gulch and hill is being inspected. A small hotel, Pine Bough Inn, is doing business at Cave Basin, while a good general supply store has been opened.

Routt County

RED ROCK GOLD DREDGING CO. (Hahn's Peak)—Company is receiving equipment, materials and machinery to erect a dredge on Hornet placer in Way's gulch.

San Juan County

BAGLEY TUNNEL (Silverton)—Frisco Mines is completing connections with adit and will soon be ready to ship.

San Miguel County

TOMBOY (Telluride)—Steel tanks for cyanide plant have been hauled up from town.

IDAHO

Coeur d'Alene District

PROSPECTS IN MURRAY DISTRICT are being operated by hundreds of miners, besides work is going on in well-known mines. Bear Top, tied up in court proceedings for some time under a receivership, is now working under a lease. Cedar Creek is working steadily with a good force of men. Terrible Edith is under bond and preliminary work is now under way, loking to opening property at an early date. Jack Waite is working steadily. Samson, one of the most promising high-grade silver properties in north-side district, is preparing for further operations. Phedora, lying close to Jack Waite and in which some promising ore was recently uncovered, is working regularly, and Giant Ledge is preparing for extensive development.

ST. JAMES (Wallace)—Work has been resumed at this mine, adjoining Sunset mine, on Sunset Peak.

MORNING (Mullan)—Repairs now being made at Federal company's mine and mill, necessitating a temporary shutdown, are nearing completion, and a call has been sent to former employees, who were given leave of absence during suspension, to report for work not later than June 20. Repairs to hoist practically are finished, and also repairs to mill. Addition of flotation system is under way, but this will not delay opening of mine and mill.

ALBANY LEAD MINING CO. (Wallace)—Articles of incorporation have been filed at Wallace, Idaho. Company is capitalized for 1,500,000 shares at $1. Principal place of business is Wallace. Incorporators, John Dunphy, C. C. Wynn and John H. Nordquist, are owners of Thisbe group of claims near Burke, which group recently was basis of a suit in district court to cancel a deed given by owners to Hector Mining & Milling Co., and it is probable that new corporation will acquire title to this property.

BLACKHORSE (Murray)—Concentrator is being overhauled and is to be used for milling ores of Paragon Consolidated mine. New rolls have been added and a harzt jig installed, and it is expected that alterations will be completed soon, when operations will start. Paragon ores contain lead and zinc, and it is said Blackhorse mill does good work separating both, saving approximately 75%. Considerable ore already is blocked out in Paragon mine, and company intends to open new ground as rapidly as possible to keep mill working continuously so long as metal market will permit profitable work.

CALENDONIA (Kellogg)—After an idleness of nearly two years, result of litigation with Bunker Hill & Sullivan company mine has resumed operations, and it is now anticipated that property will be producing in a few weeks. One of the stipulations in compromise agreement that ended controversy between two companies was that a unit of Bunker Hill & Sullivan mill should be set aside for treatment of Caledonia ores. Plant has been under repair for several months, but was given a trial run recently that proved satisfactory. Mill was started running one shift daily last week and is now treating 100 tons per day. During shutdown connection by means of a raise was made between Caledonia workings and long lower tunnel of Bunker Hill & Sullivan, permitting Caledonia ore to be handled through Bunker Hill & Sullivan at much less expense than under former system of operating. There is a large tonnage in sight in mine.

Idaho County

EVERGREEN CONSOLIDATED (Grangeville)—A. Kincaid has given a bond to Theodore L. Lammers, of Spokane, for Evergreen Consolidated and Dewey groups, consisting of 14 claims, eight miles from Grangeville, on Clearwater River. Bond includes all equipment on property, also assay office and right of 250-hp. on Clearwater River. Lammers spent two weeks making an examination and will commence operations at once. Power will be obtained for present from Grangeville Power & Light Co., whose line is 1¾ miles from camp. About 7000 ft. of development has been done on property in last 15 years and shoots of gold-copper ore are known to exist. Bond includes interest of A. A. Kincaid and Martin Wagner, of Grangeville; J. Frank Watson, of Portland, and A. A. Boothe, of Spokane. Successful operation of this camp means much to Grangeville and Idaho County, as it is one of the best-known properties and will help in activity of entire district, including Ten Mile, Elk City and Buffalo Hump sections. Equipment will be installed by Spokane manufacturers and will first operate on high-grade free-milling ores from St. Patrick claim.

MINNESOTA

Duluth

MINNESOTA STEEL CO.'S MODEL CITY, adjoining steel plant, has been named Morgan Park, for J. Pierpont Morgan. Steel company plans erection of a club house for bachelors, modern hospital, modern school and an office building, which four buildings will cost $500,000. Town will have street-car connections with Duluth; tracks are being laid now simultaneously with cement streets.

Cook County

JOHNSON NICKEL CO.—A Chicago syndicate has purchased 6500 acres of mineral land in Cook County, from this company, for a consideration said to be $1,500,000. Cook County is in extreme northeastern part of state, and it has long been known that iron ore existed there; however, most explorations have shown this to be titaniferous magnetite too low-grade to be amenable to present-day furnace practice at a profit, probably being suitable only for electric-furnace use. Much speculation has taken place in these mineral lands for 20 years past, but this is largest single transaction recorded there. Explorations in territory have been meager, due to utter lack of railroad facilities. This, however, bids fair to be eliminated in near future, as several lines are now proposed. Johnson Nickel Co., so called because lands were originally taken up for their presumed nickel-bearing iron ores, is controlled by Minneapolis men and has long been dormant.

Cuyuna Range

ROWE (Rivington)—Ore shipments were to begin from this new pit June 29. Company expects to ship several hundred thousand tons this season.

MERRIMAC MINING CO. (Crosby)—New mine to be opened ½ mile north of Crosby has been named Croft mine for H. W. Croft, a Pittsburgh iron and steel man.

ROGERS, BROWN ORE CO. (Crosby)—President Chester D. Tripp has announced that season's output from Armour No. 2 and Kennedy has been sold, and that present rate of production will be maintained for remainder of season.

Mesabi Range

GENERAL MESABI NOTES—Albany, a new producer, began shipping ore over Duluth, Missabe & Northern Ry. June 1, at rate of 50 cars per day. Other large daily shipments over this line from Hibbing district are Hull, 160 cars; Clark (underground), 40 cars; Shenango, 125 cars. This railroad is hauling upward of 350 cars per day from Hibbing district. This traffic is, of course, far below normal and it is not expected that a material increase will be made during rest of shipping season. Great Northern Ry. is hauling nearly 2200 cars per day from Hibbing district, and officials state that somewhat of an increase is anticipated by Aug. 1. Season's largest single shipper on Great Northern lines is Leonard pit, from which comes a total of nearly 600 cars per day; part of this, however, is from large stockpile known as Leonard-Chisholm stockpile. Other shippers are Mississippi, Mace (underground), Dale, South Uno and Hill. Mississippi is shipping from stockpile. A large part of Great Northern's activity is due to shipments from Steel Corporation's Great Northern leases, in fact half of daily shipments are from such. Mahoning mine is said to be largest independent shipper from district over Great Northern track, shipping upward of 220 cars daily. Harrison-Quinn, at Nashwauk, made initial shipments June 13. Among those not shipping are Crosby, La Rue and Stevenson, all in vicinity of Nashwauk. Hudson mine of Pickands-Mather & Co., at Aurora, will put one or two shovels to work at once, and Meadows, also at Aurora, will start shipments from a 50,000 ton stockpile June 29. Silver, at Virginia, has suspended operations for three or four weeks. Stripping operations have been completed, and shutdown is in nature of a curtailment of output. Commodore, at Virginia, is loading an average of 100 cars per day, via Great Northern. New town of Bengal has just been platted in Sec. 1, 55-22, on line between St. Louis and Itasca Counties, 6½ miles from Nashwauk. There are some iron prospects in vicinity.

ALPENA (Virginia)—Fifty additional men have been put to work making a total of 800. This is only mine in Virginia district which is shipping its product. Other mines have men at work, but only on drifting and stockpiling. Operations are being rushed in Alpena pit operations, four shovels being in use.

INTERSTATE IRON CO. (Grand Rapids)—Shaft at Kintzville mine is now 50 ft. deep. Company's dredge "John B.," used last season in hydraulic work, has not yet been put into commission. It is stated that exploration by hydraulic methods will be deferred until underground properties are more fully developed.

Vermilion Range

CHANDLER (Ely)—Forest fire menaced surface plant on night of June 23, but Ely fire department prevented serious damage.

SOUDAN (Tower)—Mine has been shut down temporarily for installation of new crushing equipment.

NORTH AMERICAN (Tower)—Two shifts are now said to be at work extracting material from the so called gold-graphite lode. Material is being stockpiled for test later.

MONTANA

Beaverhead County

PENOBSCOT MINING CO. (Elkhorn)—Work on old Hecla mine is progressing and 10 tons of concentrates are shipped daily to East Helena. Hecla mine, which is 18 miles from Melrose, is one of the old gold producers of Montana, having paid $2,500,000 in dividends. It was shut down in 1904 and sold to Penobscot company in 1912. Company equipped mines last spring with a 20-stamp mill and concentrator and at present employs 60 men at mines and mill.

Granite County

PHILIPSBURG MINES DEVELOPMENT CO. (Philipsburg)—At a special meeting of company, held June 10 at Philipsburg, it was decided to dispose of all property of company and close up its business affairs.

UPPER STONY CREEK PLACERS—These claims, located on Upper Stony Creek in the Rock Creek District, are to be extensively prospected by means of churn drills which have just been received by D. T. Conkling and associates. The claims are believed to be very promising.

Jefferson County

WHITEHALL MINING, MILLING & DEVELOPMENT CO. (Whitehall)—This company with T. T. Gates as president at its head, has been organized to take over and develop Burlington group of mines in St. Paul gulch, three miles northeast of Whitehall. Later a mill will be built.

SUNLIGHT (Whitehall)—This group of mines, consisting of 20 patented claims, has been sold to a New York syndicate. Several years ago American Mining & Development Co. had a bond on properties, but after an unsuccessful attempt to mill ore in a concentrator built at Whitehall, option was surrendered and concentrator dismantled. Present owners have made first payment and intend to start operations at once.

Lewis & Clark County

PORPHYRY DIKE MINING CO. (Rimini)—Preparations to operate on a large scale are being made. A contract for machinery for a 20-stamp mill has been let to Traylor Engineering & Manufacturing Co. Mill will be built at once and if it proves satisfactory, additional stamps will be installed. Ore is gold-bearing porphyry.

Silver Bow County

CORBIN COPPER (Butte)—No bids having been received for 92,000 shares of company's stock, offered at auction for delinquent assessment of $1 per share, company made a nominal bid of assessment, turning stock into treasury.

ELLA (Butte)—During last few weeks, shipments of ore have been made from this mine, which was recently acquired by Anaconda Copper Mining Co. Ore amounting to 12 carloads has been extracted, while retimbering old drifts and shaft is now completed to 400-ft. level. In addition to repair work on 300- and 400-ft. level of mine, preparatory to future exploitation, an air shaft is being sunk to 300-ft. level, 165 ft. of which is now completed.

BUTTE & BALLAKLAVA (Butte)—In annual report to stockholders, President Freimuth calls attention to financial conditions of company, which have been seriously affected by costly controversy with Anaconda Copper Mining Co., which has recently been settled out of court. Since resumption of mining, following settlement, operations have been limited and not productive of profits. Thus far officers of company have taken upon themselves almost entire burden of protecting stockholders' interests by directly replenishing treasury and by personally guaranteeing obligations of company. Such conditions, it is pointed out, are not healthy and cannot continue for an indefinite time without disaster. President therefore impresses upon stockholders importance and seriousness of situation in order that they may at this time take action to place company upon a sound and safe financial basis and make the exploitation of property a profitable undertaking. He urges stockholders to provide means to at least partly liquidate outstanding obligations and to sink shaft to 1800 level, to exploit Jessie vein on that level, thereby increasing output and decreasing general expenses. Development thus far has been confined to opening up 1600 level, where drifting east and west has disclosed a continuous oreshoot, with indications that it extends to both east and west boundary of vein. This would mean an oreshoot of 420 ft. in length.

NEVADA

Lincoln County

GOLD CHIEF (Caliente)—Crosscut is being driven on 300-ft. oreshoot opened on level above. Mill has been running on ore assaying $5.50 per ton, making an extraction of 86%.

AMALGAMATED PIOCHE (Pioche)—Development work on 14th level of shaft No. 1 is progressing with satisfactory results. West drift on Raymond and Ely fissure has cut shoot of zinc ore assaying in gold and silver. A two-car shipment of zinc ore was made from 12th level stopes recently.

Lyon County

EMPIRE NEVADA—After drilling six holes, General Development Co. has relinquished its option on this property near Yerington station.

SILVER STATE (Yerington)—Shipment of bullion was made recently from this property, on Mount Grant. It is planned to make regular monthly shipments of bullion.

MASON VALLEY MINES CO. (Thompson)—A 10-ton, experimental leaching plant is being installed at Thompson smelting plant.

Mineral County

NEVADA NEW MINES CO. (Rawhide)—Mine and 10-stamp mill are operating steadily, 900 tons per month being treated. Winze from 500-ft. level is down 35 ft. in good-grade gold-silver ore showing ruby silver. Shipment of 3100 oz. of bullion has just been made to Selby smelting plant, second shipment in June. Other companies now operating in Pawhide are Black Eagle, which is mining and milling 50 tons per day; Mint Lease, on Grutt Hill, operating through 400-ft. shaft and milling ore at own plant, and several leases and subleases.

Nye County

CASH BOY (Tonopah)—Shaft is now 1200 ft. deep.

TONOPAH MERGER (Tonopah)—Drifting west on 1170-ft. level in shipping-grade ore is being done.

TONOPAH BELMONT (Tonopah)—Full face of ore is exposed in Mizpah fault vein, struck on 900-ft. level. Good-grade oreshoot 2 ft. wide, has been opened in shaft vein on 1166-ft. level of Belmont workings.

ROUND MOUNTAIN MINING CO. (Round Mountain)—It is planned to hydraulick almost entire hill, known as Round Mountain. A 6-mile pipeline survey from Jett Creek has been completed. Capitalization is to be increased from 1,000,000 to 1,500,000 shares, and considerable new ground will be acquired.

BIG PINE (Manhattan)—Installation of large grizzly at bottom of shoot leading from glory hole has been completed and mining operations resumed. Grizzly is 7x10 ft. with 3-in. openings, and it is estimated that it will sort out one-third of the tonnage of schist as broken from glory hole, increasing the grade of screened product.

COMMERCIAL MINES & MILLING CO. (Manhattan)—It is rumored that a sale is being negotiated to outside men. Properties controlled by company are Crescent, Reilly Fraction, Jumping Jack, Stray Dog, Indian Camp and Chipmunk, with stock interests in Mustang, April Fool, and probably some other companies, also control of War Eagle mill of 20 stamps. It is rumored that sale may include other surrounding properties, notably Big Four and Big Pine, Mayflower and Gold Crater claims. No authoritative information is obtainable.

WHITE CAPS—(Manhattan)—Raising of 50-ft. headframe completes installation of equipment. Property now has the largest mine plant in camp. Installation of air lines for machine drills is to be started immediately, and within another week, mining operations should be under way again. Sinking of vertical shaft from its present depth of 210 ft. for another 100 ft. lift, is to be most important mining work carried on, although it is intention of management to do development work both in east and west oreshoots from intermediate levels.

Ormsby County

ARTICLES OF INCORPORATION HAVE BEEN FILED recently with the Secretary of State at Carson City, of following mining companies: Sebastopol Mining Co., formerly known as Golden Fleece, six miles north of Schurz, Mineral County; capitalization, 1,000,000 shares, par value of $1 per share; Contact Consolidated Mining Co., Contact, Elko County; capitalization, 1,000,000 shares. Owns Buckhorn Nos. 1, 2, 3 and 4 mining claims.

Storey County

MEXICAN (Virginia City)—Suits were settled June 30, and company will rejoin pumping association.

OPHIR (Virginia City)—Incline winze, it is stated, will be sunk from 2500-ft. level, as soon as other work above is finished, permitting a large volume of air to reach that level to cool it. Work in two Ophir winzes will be discontinued and rock trammed through 2500-ft. level to C. & C. shaft. Sierra Nevada Co., which has discontinued operation of Union shaft, will then be able to tram through this level also, to C. & C. shaft.

White Pine County

CONSOLIDATED COPPER MINES CO. (Ely)—It is stated that preparations are being made to use Giroux mill as testing plant to determine best method of treating company's ores.

LUCKY DEPOSIT MINING CO. (Aurum)—Extension of option has been refused and company will resume operations on copper section of property. Gasoline engine and pump will be installed. It is expected that shipping of copper ore will commence within 60 days. Development work on lead-silver section of property is progressing with satisfactory results.

NEW MEXICO

Bernalillo County

SANTA FE DREDGING CO. (Golden)—Installation of machinery on placer ground is progressing rapidly and plant will be in operation by July 1. Company is considering purchasing a second dredge.

Colfax County

STELLA (Red River)—Operations are to be resumed. Smelting ore was mined from vein in early days. Vein is cut by crosscut.

CARIBEL (Red River)—Development of ore reserves is progressing rapidly. Vein has been cut in two places, 70 ft. apart on tunnel level; average width 5 ft. Assays exceed $30 per ton. Ore treatment experimental work is being done preparatory to enlargement of present plant to 40 tons daily capacity.

Grant County

GAIL MILLER (Redrock)—A California engineer is examining property negotiating for lease and bond.

WELCH CLAIMS (Hanover)—Regular shipments of zinc-carbonate ore are being made to Iola, Kan., by J. C. McKee and lessees. Ore is high grade.

GYPSY QUEEN MINING & DEVELOPMENT CO. (Lordsburg)—Company is organizing. Capital stock to be $1,000,000, divided into $1 shares. Company will operate in Animas Valley.

LUCKY BILL MINING CO. (Bayard)—Company is sinking main shaft from 100- to 200-ft. level and is driving north on 100-ft. level. Two ore shipments per month are being made to El Paso.

Lincoln County

EAGLE MOUNTAIN MINING & DEVELOPMENT CO. (Carrizozo)—Arrangement are reported to be under way with a Chicago power-plant company, to construct electrical generation plant at Carrizozo for operations of mines and mills near Nogal.

NEW YORK

Ulster County

HUDSON IRON CO. (Highland)—Suit to force sale of property of company was brought June 23 by Columbia -Knickerbocker Trust Co. Iron concern owns Hudson mine at Highland, and other mining property at Woodbury, N. Y., and Secaucus, N. J. Company has defaulted in payment of $19,525 interest due on its bonds on Feb. 1, and has also failed to make sinking-fund payments amounting to $10,000. Columbia-Knickerbocker Trust Co. is trustee under mortgage, which is dated Mar. 5, 1906, and against which $802,000 bonds are outstanding. Trust company took possession of property June 20 through Oswald G. Villard, its agent, and is carrying on business, but it has found that receipts are not sufficient to meet obligations under mortgage. Hudson Iron Co. was incorporated under laws of New Jersey with a capital stock of $1,500,000 in 1904

OREGON

Baker County

GOLD NUGGET—This mine on Gold Mountain has been taken over by John Susman, who is driving a new tunnel.

HELEN B—A 20-ft. vein of free-milling gold ore has been struck at this mine in Sumpter district, now operated by Henry Myers.

BLUE MOUNTAIN MINING CO. (Cable Cove)—Last Chance mine is being developed. President announces that company has purchased Psyche 20-stamp mill near Greenhorn. Machinery will be dismantled and hauled to Last Chance mine, a distance of 40 miles. Machinery weighs over 100 tons

Jackson County

J. A. TORNEY & L. SOULE (Medford)—Property of these men will be equipped with a cyanide plant.

GOLD STANDARD—This mine which has been closed for last two years, is to be reopened this summer by Kubli Bros. of Gold Hill. Development work will be started at once, and it is hoped to have property shipping at an early date.

UTAH

Beaver County

SHEEP ROCK (Beaver City)—It is reported that this property has been sold to Eastern men, and that options have been taken on Beaver Butte, Beaver Gold, Busy Bee, and other claims in vicinity.

BEAVER BUTTE (Beaver City)—Work is to be resumed at this property near Sheep Rock. There are 15 claims thought to be on extension of vein, from which Sheep Rock is mining gold-silver ore. A shaft is down 150 ft., with crosscuts on vein at every 25 ft. Width of vein was found to increase with depth. Ore is worth from $5 to $8 per ton. No mill tests have been made.

HORN SILVER (Frisco)—Report for 1913 shows that 25,183 tons of ore, slag and concentrates were marketed, bringing $149,380. Other income brought receipts to $153,286. Operating expenses were $146,990, leaving $2390 profits from operations. Returns for year would have been greater, but for necessity of expending a large sum for repairs to shaft and bad ground in mine. Development was retarded by caves. Shaft is now safe to 900, and will be repaired to 1100, where it is intended to continue development. Lead-zinc ores, zinc ore, tailings from old operations, crude ore, and slag were marketed. It is expected to treat further tailings, which are to furnish funds for further operations.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Ore chutes are being built to transfer ore to bins, which are connected with tram.

UTAH METALS (Bingham)—Proposed reorganization plans have been outlined to stockholders as follows: New company is to be formed with 500,000 shares, par value $1; 396,176 shares will be issued, holders of present shares being offered one new share for four shares of old on payment of 10c. per share on old stock. Of new shares 120,000 are to be issued to dispose of present floating debt of $134,000. New company will hold property free from all indebtedness except present bonds and unpaid coupons. Arrangements have been made to extend $375,000 of bonds to Apr. 1, 1919. Coupons due are to be taken care of for present by notes. Stock not taken by present holders has been underwritten, and underwriters have option to take balance of treasury stock at $1 per share. Future exploration and development will be done with money provided by reorganization plan, and income derived from present sale of water.

WASHINGTON

Chelan County

MONTANA MINING & DEVELOPMENT CO.—An oil engine, rock crusher, two Nissen stamps and other equipment are being installed. There is a haul of 63 miles from the nearest shipping point. Company expects to make early shipments.

Ferry County

GALENA HILL (Orient)—A new vein of high-grade ore has been encountered. Company will soon begin shipping.

Okanogan County

NEW RAILROAD FROM WENATCHEE TO OROVILLE is now in operation. This service will mean much to all mines in this district, which heretofore have been hampered in marketing ore. A number of mines will build tracks up to their properties, and operations on claims undeveloped will be started in near future.

Stevens County

IMPERIAL (Chewelah)—Operations are to be resumed as soon as mine is unwatered. Considerable improvements are being planned.

CANADA

British Columbia

GRANBY CONSOLIDATED (Anyox)—Hidden Creek property has been making a slight profit from the first. This has strengthened confidence of the management regarding the future prospects of this acquisition. With its three furnaces running, new smelter has increased its tonnage to 1500 tons of ore daily. Company has under consideration acquisition of a quartz property which carries copper, gold and silver. Some of the quartz has been used at Anyox as a flux for Hidden Creek ores. Its value would be two-fold, as a flux and for its precious metals contents, which would reduce cost of handling material.

Ontario

TRETHEWEY (Cobalt)—A dividend of 5% has been declared calling for a disbursement of $50,000, which will leave about $100,000 in treasury. property is now producing from $8000 to $10,000 monthly above expenses.

LA ROSE (Cobalt)—In a recent interview president stated that unless development at mines is more favorable this summer or company acquires new properties in near future, that surplus will probably be distributed among shareholders.

YORK-ONTARIO (Cobalt)—Capitalization of this company has been increased from $1,000,000 to $1,500,000. Mill on old King Edward property will be put into good condition and operations resumed as soon as possible. Shaft will be put down to 1000-ft. level.

LARINE CLAIMS (Sesekinika)—A rich find has been made on these claims, 15 miles northwest of Kirkland Lake. Four veins ranging in width from 1 to 4 ft. have been uncovered for 1000 ft. Assays are stated to run high in gold and silver and discovery has caused a rush to district.

CHAMBERS FERLAND (Cobalt)—At adjourned meeting of this company held June 10 at Cobalt proposed bylaw for transfer of assets to Aladdin Mining Co. was strongly opposed by minority stockholders and matter was postponed to a meeting to be held at Salisbury House, London, July 1. A writ has been served on company by Henry Cecil to restrain them from concluding deal.

COLOMBIA

POCHET DREDGE (Zaragoza)—Louis Pochet has moved his dredge to Pinea, a few miles below Zaragoza, but on opposite side of Nechi River. Dredge has been overhauled and is reported to be digging at rate of 1500 cu.yd. per day.

The Market Report

METAL MARKETS

NEW YORK—July 1

The metal markets generally are still quiet, with a tendency to easier prices. No large buying movement is apparent at present.

Copper, Tin, Lead and Zinc

Copper—The sharp reduction of price mentioned in our last report was carried further, and on June 25, 13½c., delivered, usual terms, was accepted for some round lots. Business was done on the following day at the same price. Domestic manufacturers bought moderately. However, the demand was not sufficient to check the decline, and there was further shading of price on June 27. On June 29, round lots were offered at 13.40, delivered, usual terms, without finding buyers, while certain agencies accepted orders from Europe which netted them less than 13.25c., New York. With these reductions of price more business was done than for many weeks previous. However, the aggregate was not very large. Sales to Europe apparently exceeded those for domestic delivery. On July 1, the sharp recovery in the London standard market, together with the better demand that had been stimulated here, caused an up-turn in this market.

The average quotation for electrolytic copper during the week is 13.296 cents.

Lake copper was to be had pretty much through the week at 13½ cents.

L. Vogelstein & Co., New York, have issued "Statistical Compilations about Copper," being extracts from the statistics compiled and published by Aron Hirsch & Sohn, Halberstadt, Germany. This is the 22d year for which this publication has been made.

The London standard market showed small fluctuations, varying little from £60 until Wednesday, July 1, when there was a sharp rise to £61 for spot and £61 2s. 6d. for three months.

Base price of copper sheets is now 19c. per lb. for hot rolled and 20c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14⅞@15⅛c. per lb., carload lots at mill.

Copper exports from New York for the week were 5190 long tons. Our special correspondent reports exports from Baltimore for the week at 836 tons.

Imports of copper into France four months ended Apr. 30 were 43,577 metric tons, an increase of 6957 tons over the corresponding period last year.

Tin—The London market received a severe jolt on Thursday of last week, when pessimistic reports from this side brought about a decline of over £3. Prices here were even below the London parity, as low as 29¾c. being quoted. At this level, buying on the part of consumers becoming very liberal, all London offers were accepted and that market thereby again put on a better footing. Sellers withdrew and this gave the market a chance to advance, which it did readily. The close is firm at £140 15s. for spot and £142 15s. for three months, and about 31⅛c. for July tin here.

Shipments of tin from the Straits, six months ended June 30, were 30,730 long tons in 1913, and 32,785 in 1914; increase, 2055 tons.

Lead—The weaker tendency mentioned in our last report became more evident this week. The price in New York has held firmly at 3.90c., but the business reported done on the St. Louis basis has been at 3.77½ cents.

Lead was rather heavy abroad and declined to £19 for soft Spanish; English lead, 2s. 6d. higher.

Spelter—This metal also has been weaker. The early part of the week a substantial tonnage sold at 4.80c. The latter part, the metal was offered in round lots at 4.80c., without finding buyers.

Spelter was generally quiet in London, but closed slightly higher, at £21 12s. 6d. per ton.

Base price of zinc sheets is now $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount, with the usual extras.

Other Metals

Aluminum—The market is reported quiet and sales are slow. Prices are about the same, 17½@18c. per lb., New York, being quoted for No. 1 ingots. The foreign market is also rather slow.

Antimony—Only the usual consumptive business is being done. The market is quiet and prices unchanged. Ordinary brands—Chinese, Hungarian, etc.—are 5.65@5.90c. per lb. Cookson's is quoted at 7.15@7.35c. per lb., for other special brands 6.90@7c. is asked.

DAILY PRICES OF METALS

NEW YORK

June July	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Dts. per Lb.
25	4.8800	56⅜	13.30 @13.40	29⅞	3.90	3.77½ @3.80	4.92½ @4.97½	4.77½ @4.82½
26	4.8765	56¾	13.30 @13.40	30	3.90	3.77½	4.92½ @4.97½	4.77½ @4.82½
27	4.8790	56½	13.25 @13.35	30⅛	3.90	3.77½	4.92½ @4.97½	4.77½ @4.82½
29	4.8775	56⅝	13.20 @13.25	30½	3.90	3.77½	4.90 @4.95	4.75 @4.80
30	4.8750	56½	13.20 @13.25	30½	3.90	3.77½	4.90 @4.95	4.75 @4.80
1	4.8755	56¼	13.30 @13.35	31⅛	3.90	3.77½	4.90 @4.95	4.75 @4.80

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triests, 22c.

LONDON

June-July	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
25	25 13/16	60	13.04	60⅝	65	135½	137¼	19⅜	4.21	21¼	4.62
26	26⅛	60 1/16	13.05	60 11/16	65	137	138¾	19⅜	4.21	21¼	4.62
27	26	.				.		.	. .	.	.
29	26 1/16	60⅛	13.07	60¾	64¼	137¾	139½	19⅜	4.21	21½	4.67
30	26	60 1/16	13.05	60 11/16	64¼	137¼	139½	19¼	4.18	21½	4.67
1	26⅛	61	13.25	61¼	.	140¾	142¾	19	4.13	21⅜	4.70

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅜c.; £15 = 3.26⅛c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

London quotations for English antimony are £28@29 per long ton; equal to 6.33c. per lb., average.

Quicksilver—Business is fair and the market is firm, but there has been no change in prices. New York quotation is $37.50@38.50 per flask of 75 lb.; with 54@55c. per lb. quoted for jobbing lots. San Francisco, $37.50 per flask, with about $2 less quoted for export business. London, £7 per flask, with £6 17s. 6d. quoted from second hands.

Gold, Silver and Platinum

Gold—The rush for gold has subsided a little, and no premiums were paid this week, the price remaining at 77s. 9d. per oz. for bars. A good part of the gold arriving went to the Bank of England. In New York about $6,000,000 was exported to France in the early part of the week; but the outward movement seems to have stopped for the present, though exchange is still at a high point.

Imports of gold into France, four months ended Apr. 30, were 202,169,000 fr.; exports, 33,222,000 fr.; excess of imports, 168,947,000 fr., against 129,907,000 fr. last year.

Platinum—The market is a little more active than it has been, but prices have not changed. Dealers ask $43@44 per oz. for refined platinum and $46@51 per oz. for hard metal, according to quality.

Two men are under arrest, charged with stealing $40,000 worth—about 1000 oz. of platinum wire from the Commercial Research Co., of Tuckahoe, N. Y. Where they sold it is not stated.

Iridium—Demand is about as usual; supplies are rather small, but the metal is still quoted at $76@79 per oz., New York.

Silver—The market continues dull and quiet, without special feature. Indian Bazaar buying has supported the market and unless China buys freely prices are apt to fluctuate within narrow margins.

Shipments of silver from London to the East, Jan. 1 to June 18, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£3,437,000	£3,617,000	I. £180,000
China	344,500	40,000	D. 304,500
Total	£3,781,500	£3,658,000	D. £124,500

The stock of silver at Bombay is reported at £795,000, or nearly double what it was two or three weeks ago.

Imports of silver into France four months ended Apr. 30 were 74,068,000 fr.; exports, 101,659,000 fr.; excess of exporth, 27,591,000 fr., against 19,426,000 fr. last year.

Zinc and Lead Ore Markets

JOPLIN, MO.—June 27

Blende sold at $44 per ton on an assay base ranging from $39@41 per ton of 60% zinc, and metal base prices were $38.50@39.50. Calamine sold very strong at $22@23 per ton of 40% zinc. The average price of all grades is $38.88 per ton. Lead is still selling on a base price of $46 per ton of 80% metal content and the highest price reported is $47.50 per ton, with an average of all grades $46.36 per ton.

Nearly 4000 men have left the mining district now for the harvest fields; some mines are closing down tonight and others follow on July 3 for an indefinite period from lack of laborers.

SHIPMENTS WEEK ENDED JUNE 27

	Blende	Calamine	Lead	Values
Totals this week	10,033,080	595,200	1,294,340	$236,580
Totals 6 months	269,777,080	18,242,660	46,201,740	6,604,545

Blende value, the week, $199,430, six months, $5,285,890.

Calamine value, the week, $7170, six months, $208,405.

Lead value, the week, $29,980, six months, $1,110,255.

PLATTEVILLE, WIS.—June 27

The base price paid this week for 60% zinc ore was $40@40.50 per ton. The base price for 80% lead ore was the same as last week, $48 per ton.

SHIPMENTS WEEK ENDED JUNE 27

	Zinc ore, lb	Lead ore, lb.	Sulphur ore, lb
Week	2,871,010	64,000	410,200
Year	73,743,340	2,782,610	20,708,330

Shipped during week to separating plants, 3,985,580 lb. zinc ore.

The letter of June 20, delayed in transmission, shows shipments for the week of 2,79[illegible]320 lb. zinc ore, and 396,000 lb. sulphur ore. Deliveries to separating plants were 2,075,540 lb. zinc ore. Base prices for 60% zinc ore was $40 per ton; for 80% lead ore $48 per ton.

IRON TRADE REVIEW

NEW YORK—July 1

June has been the best month in several months in bookings of steel orders. With different companies the increases over May bookings range from 10 to 60%, and a general average, excluding rails, tin plates and wire products, which are out of season, is 35 to 40%. In the case of the National Tube Co., the June bookings were 12% in excess of the average in the preceding five months. While conditions are difficult to judge, the common opinion is that the better rate of bookings will continue in July, with little if any decline on account of the time of year. If the expectation is borne out the condition will be very satisfactory, as July is almost invariably a very dull month.

The production of steel has increased slightly in the past two or three weeks, and June shipments on the whole probably exceeded those of May.

The Pennsylvania R.R. has placed orders for 100,000 tons of rails, which is in addition to 37,000 tons already contracted for. Of the order now given 15,000 tons are to be of 120 lb. per yard, the heaviest section yet made in this country.

A celebration is being held at Catasauqua, Penn., this week to commemorate the first make of pig iron with anthracite coal. This was done in 1840 by David Thomas.

PITTSBURGH—June 30

General reports that there will be extensive closings of steel mills in July are not borne out. Most of the producers having headquarters in Pittsburgh report that from present indications they will turn out a somewhat larger tonnage in July than in June. Some of the independent sheet and tin mills closed at the end of last week, or will close tonight, when the Amalgamated Association wage scale expires, but this movement is not general, and the union mills comprise less than 20% of the total in operation.

It is reported that the criticism of the Washington administration by large interests will shortly be curtailed; that it has become recognized no useful result has been accomplished, and that more good could be done for business by expressing hopeful feelings. Certainly in the steel trade there is more ground for feeling hopeful for the future than there was 30 days ago.

Steel-mill operations have averaged fully 65% of capacity in the past 10 days, representing a slight improvement over the rate of 30 days ago. Pig-iron production has not correspondingly increased, there having been rather a slight slowing down, due not so much to the blowing out of blast furnaces as to the operation of individual furnaces being slowed down a trifle. Some large interests have lately been reducing their stocks of pig iron, whereas three months ago they were accumulating pig iron.

Steel prices are practically stationary. There has been no declining tendency in the past week, and indeed in some directions there has been a slight stiffening tendency. Plates, shapes and bars are quite firmly on a basis of 1.10c. There have been divergences in plates, down to 1.05c. in some instances, but these are reported to have become quite infrequent. In black sheets the 1.80c. price is reported to be less common. In nearly all commodities the refusal of mills to sell for forward delivery at present prompt prices is more of a feature in picturing the situation, in that the mills have lately been under more pressure than formerly to sell for forward delivery and their failure to yield up to this date is giving buyers more confidence in the future of prices.

Pig Iron—For No. 2 foundry, the market is $13 at furnace. There have been several fair-sized sales of bessemer at the regular figure of $14, Valley. Basic is quiet, but well held at $13, Valley. Cherry Valley furnace, at Leetonia, which has lately held to a minimum of $13.50, furnace, when other Valley furnaces were quoting $13, will be blown out at the end of this week. Some fair-sized sales were effected at the price, but not enough to keep the furnace in operation, and the owners were unwilling to cut the price. We quote: No. 2 foundry, basic and malleable, $13, bessemer, $14, at Valley furnaces, 90c. higher delivered Pittsburgh, but would note that some furnaces having a 75c. rate to Pittsburgh would sell foundry at $13, furnace.

Ferromanganese—The market is quiet with prices well held on the basis of $38, Baltimore, prompt or forward.

Pittsburgh, July 1 (By Telegraph)—W. P. Snyder & Co. today announce bessemer pig iron average for June at $14 Valley, unchanged from May, with about 10,000 tons entering into average. June basic average $13 Valley, unchanged from May with about 15,000 tons involved. There has just been a sale of 10,000 tons basic at $13 Valley, over third quarter, details of which are not yet announced.

Steel—Consumers are taking little interest in billet or sheet-bar contracts for third quarter, though there are some negotiations in progress. It is admitted that sheet bars can be done at 50c. less than formerly, or at $20, f.o.b. maker's mill, Pittsburgh or Youngstown, while billets are still quoted at $19.50. Rods are easier, and $25 at mill can be done, if not shaded.

IRON ORE

The French Creek iron mine at St. Peter, in Chester County, Penn., which has been idle for 15 years, is to be reopened. The ore carries about 55% iron, but requires roasting on account of a high sulphur content. It will now be crushed and desulphurized by sintering. The mine is being reopened by the E. & G. Brooke Iron Co., which owns one-half and leases the other; and the ore will be used in that company's blast furnaces at Birdsboro.

Argument is in progress in the Minnesota Supreme Court in the suits brought to determine the ownership of iron ore under the beds of lakes on the Mesabi range. The owners of adjoining lands claim the right to this ore, but the state asserts its rights to all the land and minerals under the water.

COKE

Connellsville Coke—Early last week one producer of highgrade furnace coke closed three contracts for second-half delivery, aggregating 27,000 tons a month, all at $2 at ovens. One of the buyers, taking about 8000 tons a month from this interest, purchased about 4000 tons a month from a Greensburg district producer, at 20c. less base price and with 20c. less freight. Two or three other purchasers were in the market and were expected to pay this figure, but it appears now they refuse to close at this time and will likely buy July coke at the lower figures possible for that delivery. The market on the whole shows a firmer tone, based upon better expectations for the iron and steel industry, but on the other hand there are a number of contracts expiring today and the producers may now throw more coke into the open market than it can absorb. Many foundry coke contracts have been closed for the twelvemonth at $2.50 to consumers or $2.35 for dealers, the dealers being required to sell at the full $2.50. This is for the best brands, other brands being offered at various lower prices. We quote: Prompt furnace, $1.75@1.80; contract furnace, $1.90@2; prompt foundry, $2.35@2.50; contract foundry, $2.35@2.50, per ton at ovens.

Coal Tonnage Through Sault Ste. Marie Canals, season to June 1, short tons:

	1913	1914	Changes
Anthracite	626,159	287,938	D. 338,221
Bituminous	2,890,789	2,192,001	D. 698,788
Total	3,516,948	2,479,939	D. 1,037,009

The coal trade reported in June was the lightest in several years, and the movement had hardly begun in that month.

Exports of fuel from Great Britain, five months ended May 31, long tons:

	1913	1914	Changes
Coal	29,519,825	28,852,718	D. 667,107
Coke	424,334	444,446	I. 20,112
Briquettes	837,070	852,326	I. 15,256
Steamer coal	8,366,021	8,500,680	I. 134,659
Total	39,147,250	38,650,170	D. 497,080

Imports of coal for the five months were only 13,524 tons in 1913, and 13,961 tons this year.

CHEMICALS

NEW YORK—July 1

The general markets are quiet and business is light. July and August are unusually dull months, and no material change is expected before September.

Arsenic—The market is quiet, with only a moderate demand. The prices are unchanged. Quotations remain about $3 per 100 lb. for both spot and futures.

Copper Sulphate—On a fair business prices remain unchanged. Quotations are $1.65 per 100 lb. for carload lots, and $4.90 per 100 lb. for smaller parcels.

Nitrate of Soda—There is some business forward in this article, but no special activity. Quotations are unchanged at 2.13⅛c. per lb. for spot, and 2.10c. for futures.

Pyrites—Imports at Baltimore for the week included 5971 tons pyrites from Huelva, Spain.

Potash Salts—Further consideration of the proposed new regulations for producers in Germany has been postponed until fall. Meantime there is much complaint of the overproduction, which the new law was intended to stop.

PETROLEUM

Oil production in California in May is reported at 9.221,446 bbl.; deliveries, 8,528,996 bbl.; stocks on hand, 50,318,025 bbl. on June 1. There were 57 new wells completed during the month.

At a meeting of Oklahoma oil producers in Tulsa, June 25, it was resolved to recommend the State Corporation Commission to order a cessation of drilling for 90 days, excepting only in cases where work may be necessary to hold leases.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	February	March	April	May	June
Alaska shipments	1,803,579	2,069,960	1.279.537	585,387	.....
Anaconda	21,300,000	23,800,000	22,900,000	23,500,000	.....
Arizona, Ltd.	3,062,000	3,286,000	3,570,000	3,092,000	...
Copper Queen	6,987,366	7,637,042	7,562,723	8,388,203	..
Calumet & Ariz.	5,596,850	5,875,000	5 450,000	5,495,000	.....
Chino	5,642,426	5,399,814	5,926,591	5,496,875	.....
Detroit	1,814,214	1,973,725	1,790,926	2,105,034	...
East Butte	1,193,960	1,546,180	1,178,000	1,179,962	...
Giroux	90,017	287,980	45,948	429,553	.....
Mason Valley	1,254,000	1,250,000	862,000	916,000	....
Mammoth	1,400,000	1,800,000	1,850,000	1,750,000	....
Nevada Con.	4,588,243	5,218,257	4,880,043	4,959,589	.....
Ohio	582,000	597,520	610,518	.....	...
Old Dominion	3,066,000	2,997,000	2,779,000	3,302,000	....
Ray	5,432,000	6,036,908	6,089,362	6,300,847	....
Shannon	903,761	1,082,000	1,012,000	1,056,000	.....
South Utah	333.874	406,381	247,641	55,394	....
Tennessee	1,232,812	1,262,184	1,370,800	1,336,950	....
United Verde*	2,700,000	3,100,000	3,000,000	3,100,000	....
Utah Copper Co.	9,207,111	12,323,493	12,739,757	13,208,483	......
Lake Superior*	8,500,000	11,000,000	13,000,000	.	.....
Non-rep. mines*	7 600,000	8,200,000	8,000,000	8,200,000	....
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	...
Total prod.	96,790,213	107,036,667	108,554,846	....	....
Imp., bars, etc.	19,918,448	22,676,605	17,043,191	....	...
Total blister	116,708,661	129,713,272	125,598,035	....	.....
Imp. ore & matte	9,713,164	7,029,646	10,400,122	....	......
Total Amer.	126,421,825	136,742,918	135,998,157	....	......
Miami†	3,316,482	3,361,100	3,130,772	3,347,000	...
Shattuck-Arizona	1,134,480	1,136,458	1,386,594	1,353,043	...
Brit. Col. Cos.:					
British Col. Cop.	....	....	....	....	.....
Granby	1,661,212	1,775,852	1,692,102	....	.....
Mexican Cos.:					
Boleo†	1,984,080	2,535,680	2,204,720	2,213,120	...
Cananea	2,688,000	4,260,000	2,632,000	2,222,000	...
Moctezuma	2,642,543	2,882,884	2,654,926	2,834,616	...
Other Foreign:					
Braden, Chile	2,362,000	1,810,000	2,720,000	2,480,000	...
Cape Cop., S. Af.	459,200	660,800	468,160	....	....
Kyshtim, Russia.	1,534,400	....	....	....	...
Spassky, Russia.	902,720	896,000	904,960	....	...
Exports from					
Chile	6,720,000	6,944,000	9,072.000	7,616,000	....
Australia	7,952,000	8,176,000	7,168,000	8,400,000	.....
Arrivals–Europe‡	18,354,560	17,572,800	17,299,520	13,558,720	......

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡ Does not include the arrivals from the United States, Australia or Chile.

COPPER STATISTICS

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	....	....	....
VII, '13	138,074,602	58,904,192	78,480,071	52,814,606	77,901,000	121,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI	131,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr., '13	1,622,450,829	767,261,760	869,062,784	....	....	....
I, 1914	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,355,667
II	122,561,007	47,586,657	83,899,183	87,296,685	50,108,800	137,405,485
III	145,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV	151,500,531	63,427,633	82,345,216	64,909,319	46,135,200	111,044,519
V	112,308,287	55,592,170	72,740,477	70,037,001	52,671,200	122,708,201
VI	.....	......	.	81,342,641	34,062,400	115,405,041
VII						

Note—Visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Caledonia, Nev.	July 3	July 24	$0 05
Cedar Talisman, Utah	June 12	July 6	0.005
Central Eureka, Calif.	June 20	July 11	0 03
Coos. St. Gothard, Calif.	June 17	July 8	0 25
Cons. Virginia, Nev.	June 16	July 7	0 10
Crown Point, Nev.	July 6	July 28	0 10
Dry Canon, Utah.	June 10	July 6	0 01
Emerald, Utah.	June 15	July 11	0 13
Gould & Curry, Nev.	June 24	July 15	0 03
Hamburg-American, Ida	June 6	July 6	0 001
Hypotbeck, Ida.	June 12	July 14	0 01
Idaho-Los Angeles, Ida	June 19	July 17	0.003
Imlay, Nev.	July 1	July 18	0 005
Indian Pete, Utah	June 27	July 15	0 005
Laclede, Ida.	June 20	July 14	0 003
Manhattan Cons.	June 9	July 9	0 01
Mayflower, Mich		July 9	1 00
Melcher, Utah	June 30	July 18	0 02
Michigan, Utah	June 10	July 6	0 0025
Montello, Utah.	June 10	July 6	0 005
Robbers' Roost, Calif.	June 20	July 15	0 01
Saltese, Mont.	June 20	July 20	0 002
Santaquin King, Utah.	July 11	July 27	0 0025
Scorpion, Nev.	June 15	July 7	0 01
Seg. Belcher, Nev	June 22	July 17	0 02
Silver Mt., Ida., postponed		July 22	0 003
Silver Pick, Nev.	June 22	July 27	0 01
Snowshoe, Ida. postponed		July 27	0 005
Union Cons., Nev.	June 26	July 17	0 05
Utah-United, Utah	July 6	July 27	0 01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56 260	62.938	57 572	25 887	28 983	26.553
February	59 043	61.642	57 506	27 190	28 357	26 573
March	58 375	57 870	58 067	26 875	26.669	26 788
April	59 207	59 490	58 519	28 284	27 416	26.958
May	60 880	60 361	58 175	28 038	27 825	26.704
June	61 290	58 990	56 471	28 215	27 199	25 948
July	60 654	58.721	...	27 919	27 074	.....
August	61 606	59.293		28 375	27.335	....
September	63 078	60 640		29 088	27 986	....
October	63 471	60 793	..	29 299	28 083	. .
November	62 792	58 995		29 012	27 263	....
December	63 365	57 760		29 320	26 720	.. .
Year	60.835	59 791		28 042	27 576	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0 925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16 488	14 223	71 741	64 304	77 750	69 488
February	14 971	14 491	65 519	65 259	71 575	70 188
March	14 713	14 131	65 329	64 276	70 658	69 170
April	15 291	14 211	68 111	64 747	74 273	69 313
May	15 436	13 996	68 807	63 182	74 774	67 786
June	14 672	13 603	67 140	61 336	70 821	66 274
July	14 190		64 166		69 446	
August	15 400		69 200		74 313	
September	16 328	.	73 125		78 614	
October	16 337		73 383		79 250	
November	15 182		68 275		73 825	
December	14 224		65 223		69 583	..
Year	15 269		68 335		73 740	

New York, cents per pound, London, pounds sterling per long ton.

TIN

Month	New York		London	
	1914	1914	1913	1913
January	50 298	37 779	238 273	171.905
February	48 760	39 830	220 140	181 556
March	46.832	38 038	213 615	173 619
April	49 115	36 154	224 159	163 963
May	49 038	33 360	224 143	150 702
June	44 820	30 577	207 208	138 321
July	40 260		183.511	
August	41 582		188 731	..
September	42 410		193 074	
October	40 462		184 837	
November	39 810		180 869	
December	37 635	.	171 786	
Av year	44 252		206 279	

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4 321	4.111	4.171	4.011	17.114	19 665
February	4.325	4 048	4.175	3.937	16.550	19 606
March	4.327	3 970	4.177	3.850	15.977	19.651
April	4 381	3.810	4.242	3 688	17 597	18.225
May	4 342	3.900	4 226	3.808	18 923	18.503
June	4 325	3.900	4 190	3 810	20 226	19.411
July	4 353		4 223	.	20 038	..
August	4 624	.	4 550	.	20 406	. .
September	4 698	..	4 579		20 648	.. .
October	4 402	.	4 253		20 302	...
November	4 293		4 146	. ..	19 334	..
December	4 047		3.929	.....	17 798	......
Year	4 370		4 238	.	18 743	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6 931	5 262	6 854	5.112	26 114	21.533
February	6 239	5 377	6 089	5 228	25 338	21 413
March	6 078	5 250	5 926	5 100	24 605	21 460
April	5 641	5.113	5.491	4.963	25 313	21.569
May	5 406	5 074	5 256	4.924	24 583	21.393
June	5.124	5 000	4 974	4 850	22.143	. . . .
July	5 278	. . .	5.128	...	20.592	.
August	5 658		5.508	..	20.706	.
September	5 694		5 444		21 148	.
October	5 340		5.188	. .	20.614	.
November	5 229	.	5 083	...	20.581	
December	5 156	..	5 004	. .	21.214	
Year	5 648		5 504	.. ...	22 746	

New York and St Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14 94	$17 35	$13.23	$18.59	$13 90
February	18 15	15.06	17 22	14.12	18 13	14.09
March	18.15	15 07	16.96	13.94	17.53	14 18
April	17.90	14.90	16 71	13.90	16.40	14.10
May	17.68	14 90	15 80	13.90	15 40	14.23
June	17.14	14 90	15.40	13 90	15 10	13 97
July	16 31		15 13	.. .	14 74	.....
August	16 63		15 00	.. .	14 88	.....
September	16.65		15 04		14 93	....
October	16.60		14 61		14 80	....
November	16.03	.	13 91	.	14 40	
December	15.71	. .	13 71	..	14 28	..
Year	$17.09	.....	$15.57	......	$15.77	. ..

STOCK QUOTATIONS

COLO. SPRINGS June 30		SALT LAKE June 30	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	02½	Beck Tunnel	03¾
Cripple Cr'k Con	.006	Black Jack	.05
C. K. & N	.04¼	Cedar Talisman.	00½
Doctor Jack Pot	.05¾	Colorado Mining	11
Elkton Con.	.47	Crown Point.	01¾
El Paso	1.45	Daly-Judge	4 90
Findlay	.008	Gold Chain.	.08
Gold Dollar	.03	Grand Central	.55
Gold Sovereign	.01½	Iron Blossom	1 40
Golden Cycle	1 00	Little Bell.	15
Isabella	11½	Lower Mammoth	.00¾
Jack Pot	05	Mason Valley	2 00
Jennie Sample	.04	May Day	07½
Jerry Johnson	03	Opohongo	01
Lexington	004	Prince Con.	17
Old Gold.	01	Silver King Coal'n.	2 85
Mary McKinney	53¼	Silver King Cons.	1 72½
Pharmacist.	009	Sioux Con.	03
Portland	1.12½	Uncle Sam	04¼
Vindicator	1 09½	Yankee	02¾

TORONTO June 30

Name of Comp	Bid	Name of Comp	Bid.
Bailey	00¾	Foley O'Brien	25
Coniagas	7 15	Hollinger	18 75
Peterson Lake	33½	Imperial	01¾
Right of Way.	02½	Jupiter.	05½
T & Hudson Bay	65 00	Pearl Lake	03
Timiskaming	14½	Porcu. Gold	‡ 01
Wettlaufer-Lor.	.05½	Preston E. D.	.01
Big Dome.	8 25	Rea	.13
Crown Chartered	‡.00¾	Swastika	.01
Dome Exten.	.07½	West Dome	.06

SAN FRANCISCO June 3

Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.08	Belmont	6 75
Belcher.	.27	Jim Butler	97
Best & Belcher.	.05	MacNamara	.01
Caledonia	.43	Midway	.21
Challenge Con.	.02	Mont.-Tonopah	60
Chollar	.03	North Star	.27
Confidence.	‡.20	West End Con.	.63
Con. Virginia.	.14	Atlanta	.14
Crown Point (Nev.)	.20	Booth.	04
Gould & Curry.	.03	C.O.D. Con	.02
Hale & Norcross	.03	Comb. Frac.	.05
Mexican	.52	Jumbo Extension	.21
Occidental.	.70	Pitts.-Silver Peak	.34
Ophir	.17	Round Mountain	.35
Overman.	.21	Sandstorm Kendall.	.08
Potosi	01	Silver Pick	.08
Savage	.05	Argonaut	3.00
Sierra Nevada.	.10	Brunswick Con	1.50
Union Con.	.15	Central Eureka	.13
Yellow Jacket	35	So. Eureka	1.25

N. Y. EXCH. June 30

Name of Comp.	Clg.
Amalgamated.	69¾
Am.Sm.&Ref.,com	62
Am. Sm. & Ref., pf.	102
Am. Sm. Sec., pf. B.	82
Anaconda.	31¼
Batopilas Min.	¾
Bethlehem Steel, pf.	85¼
Chino	40¾
Colo. Fuel & Iron.	26½
Federal M. & S., pf.	32
Great Nor., ore., ctf.	32
Guggen. Exp.	53¼
Homestake	114
Inspiration Con.	17
Mex. Petroleum	60
Miami Copper.	22
Nat'l Lead, com.	45
National Lead, pf.	108½
Nev. Consol.	14
Ontario Min	2¼
Phelps Dodge	175
Quicksilver, pf.	1¾
Ray Con.	20¾
Republic I&S, com.	22¾
Republic I&S, pf.	84
SlossSheffi'd, com	24
Sloss Sheffield, pf.	84¼
Tennessee Copper.	33
Utah Copper	58
U. S. Steel, com	61½
U. S. Steel, pf.	109½

BOSTON EXCH June 3

Name of Comp.	Clg.
Adventure	1
Ahmeek.	270
Alaska Gold M	27½
Algomah	.90
Allouez	39
Am. Zinc	15¾
Ariz. Com., ctfs.	4½
Bonanza	.51
Butte & Balak	2¾
Calumet & Ariz.	64¾
Calumet & Hecla	400
Centennial	16½
Cliff	1
Copper Range	35¾
Daly West	1¾
East Butte	9¾
Franklin.	4¾
Granby	79
Hancock.	13½
Helvetia	.31
Indiana	3½
Island Cr'k, com.	49
Island Cr'k, pfd.	87
Isle Royale.	19¼
Keweenaw	3½
Lake.	6
La Salle	3$\frac{11}{16}$
Mass.	4
Mayflower	4
Michigan.	.50
Mohawk.	43½
New Arcadian.	5
New Idria Quick.	‡3½
North Butte	25¾
North Lake	1
Ojibway	.99
Old Colony	3½
Old Dominion	48
Osceola	76
Quincy.	55¾
Shannon.	5
Shattuck-Ariz.	23
Superior.	26½
Superior & Bost.	1¾
Tamarack.	34½
Trinity.	3¾
Tuolumne.	.35
U. S. Smelting	34
U. S. Smelt'g, pf.	46¾
Utah Apex.	1½
Utah Con	11¾
Victoria.	2¼
Winona.	2¾
Wolverine	38
Wyandot.	50

N. Y. CURB June 30

Name of Comp.	Clg.
Beaver Con.	.28
Big Four	05
Boston Montana.	9¼
Braden Copper.	7¾
B. C. Copper.	1½
Buffalo Mines.	$\frac{13}{16}$
Can. Cop. Corpn.	2¼
Can. G. & S.	.09
Caribou.	.65
Chambers Ferland	.16
Con. Ariz. Sm.	$\frac{9}{16}$
Coppermines Cons	1¾
Davis-Daly.	61
Diam'field-Daisy.	04
Ely Con.	07
Florence	40
Gold Hill Con	$\frac{7}{16}$
Goldfield Con.	1¾
Greene Cananea	31½
Greenwater.	‡ 06½
Kerr Lake.	5¾
La Rose.	1¼
McKinley-Dar-Sa	67
Mines of Am	2¼
Mother Lode	‡ 26
Nevada Hills	.33
New Utah Bingham	‡.68
Nipissing Mines	6¾
Ohio Copper.	25
Oro.	.09
Puebla S & R	2¼
Stand'd Oil of N.J	405
Stand'd Silver Lead	1¼
Stewart.	1¾
Tonopah.	6¾
Tonopah Ex.	2½
Tonopah Merger.	42
Tularosa	‡¾
West End Ex	02
Yukon Gold	2½

BOSTON CURB June 30

Name of Comp.	Bid.
Bingham Mines.	04¾
Boston & Corbin.	.28
Boston Ely.	.25
Butte & Lon'n Dev	.32
Calaveras	1¾
Calumet-Corbin	.15
Chief Cons	90
Contact Copper	‡.05
Corbin.	1
Cortez.	.25
Crown Reserve.	1$\frac{1}{16}$
Eagle & Blue Bell.	.95
First Nat. Cop.	2½
Houghton Copper	2$\frac{3}{16}$
Majestic	20
Mexican Metals.	20
Nevada-Douglas.	1¾
New Baltic.	1¼
Oneco.	.50
Raven Copper.	09
Smokey Dev.	.15
So. Lake	3½
S. W. Miami.	‡1
Tonopah Victor	.30
Trethewey	20
United Verde Ext.	80

‡Last Quotations.

LONDON June 19

Name of Comp.	Clg.
Camp Bird.	£0 9s 9d
El Oro.	0 13 6
Esperanza.	0 15 0
Mexico Mines.	4 17 6
Oroville.	0 11 0
Santa Gert'dis.	0 11 3
Stratton's	0 0 6
Tomboy	1 2 6

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MATERIALS OF CONSTRUCTION

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The Engineering and Mining Journal

VOLUME 98 JUNE 11, 1914 NUMBER 2

Russellville Brown Iron Ore District

By A. H. Sawyer[*]

SYNOPSIS—Brown ores occur in this Alabama district in deposits of two types. Prospecting by wells and drill holes. Mining with steam shovels. Ores are all washed. The product runs from 42 to 48% in iron.

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The Russellville brown-ore district of Alabama is situated in Franklin County, 106 miles northwest of Birmingham. The district comprises about 25 square miles, the town of Russellville lying in the northern portion. The Northern Alabama Ry. serves the field. Most of the ore is smelted in the furnaces at Sheffield, but some is shipped to the Birmingham furnaces to be mixed with red ores. The country is rolling and drains into the Tennessee River.

Geology

The deposits lie in the Lafayette, which was deposited on the Bangor limestone after the latter had been subject to erosion. The unconformity between the two is well shown by the cone-shaped masses of limestone frequently uncovered in mining the ore.

Old Plant of the Sloss-Sheffield Co.

New Sloss-Sheffield Plant

The ore deposits appear to be of two types: (1) More or less continuous masses or blankets of ore lying directly upon the Bangor limestone or separated from it by only a thin stratum of clay or gravel; and (2) small masses, boulders and irregular fragments mixed with the red loam of the Lafayette formation.

The first type, so far as known, extends over a more limited area than the second type, but is the thicker and richer of the two. It is usually covered by a capping of exceedingly hard conglomerate, composed of chert pebbles cemented with siliceous iron oxide. This is locally called "peanut capping."

The second type, in the red loam, was probably derived from the first mechanically and redeposited where it is now found. It is really a placer deposit.

Prospecting Methods

The ground is prospected either by sinking wells or by churn drilling. Where the deposits are thin and the ground is dry, the sinking of wells is the common and probably the cheaper method. These wells are about 3 ft. in diameter and are sunk with a hand windlass. The work is usually done on contact at 25c. per ft. for the first 12 ft. and 35c. for the remainder. While some wells have been put down to a depth of 50 ft., they are usually from 20 to 30 ft. in depth. Where water is encountered, the churn drill is used and the cost varies according to conditions, but should not exceed that of digging wells. In the gravel it is best to sink wells and when this is passed through, to use drills for the rest of the hole.

Most of the wells sunk in the past were put down where surface indications were favorable. While this practice is still in vogue, the method pursued by the more progressive operators is to lay the ground out in 200-ft. squares and test the deposit at each corner.

Mining Methods

The companies at present operating in the district are the Sloss-Sheffield Steel & Iron Co., the Sheffield Coal & Iron Co., and the Auxford Brown Ore Co.

Mining is carried on with steam shovels, having buckets of about $1\frac{1}{4}$ cu.yd. capacity, working in opencuts. In the deposits of the first type, the stripping is first removed and then the ore is mined, a 10- to 15-ft. face being taken in one bench. It is the custom to have one shovel working on stripping and one on ore. The stripping shovel often encounters small pockets of ore, which are separated and sent to the washer. The ratio of cubic yards of dirt mined to tons of washed ore varies between 1½ : 1 and 3 : 1 in deposits of the first type and between 4 : 1 and 8 : 1 in those of the second type.

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The material dug by the steam shovels is loaded into 3-yd. side-dump cars and hauled to the washers by 12- to 15-ton dinky locomotives. From 3 to 5 cars make a train, depending on the grades and on the length of the dump at the washer.

WASHING PLANTS

The washeries are approached by trestles of varying length, depending on the topography of the country. The difference in elevation between the dumping and shipping tracks is about 50 feet.

The ore is dumped on grizzlies from 40 to 50 ft. long, parallel to the dumping track. The grizzlies are built of five 60- to 80-lb. rails, spaced 4 in. and set at an angle of 11°. Under the grizzly and parallel to it is a cast-iron trough, at the upper end of which a 4-in. pipe enters and furnishes water to wash the ore. The lower end of the grizzly, just above the chute to the trommel, is level, and here there is discarded the oversize, consisting of clay balls, large pebbles and other waste material. This is loaded into cars by hand as it accumulates and is trammed to the waste dump. Here also are broken up the "dornicks" or small masses of ore.

WASHER OF THE AUXFORD BROWN ORE CO.

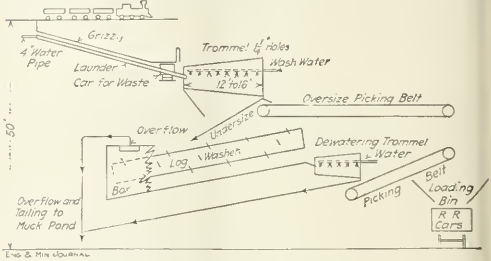
The cast-iron trough or launder discharges into a conical trommel 12 to 16 ft. long, the screens perforated with 1¼-in. holes. The oversize goes to a picking belt, where clay and other refuse are removed, and is then delivered to the loading bins or direct to railroad cars for shipment to the furnaces. The undersize goes to the log washers, situated directly under the trommel.

The log washers are arranged in pairs, either two or four being used. They consist of 18-in. octagonal timbers, about 30 ft. in length, to which chilled-iron blades are fastened in spiral fashion. The logs are set on 38-in. centers at an angle of 7° and are rotated by means of gears. They are inclosed in a water-tight box, which has an overflow to carry off the tailings to the muck pond. The washed ore is forced up grade against the water by the log blades and discharged into a dewatering trommel from which it is discharged through chutes to the loading bins or railroad cars. At some of the plants the ore is discharged upon a short inclined picking belt and many pebbles removed before shipping.

The water supply in the Russellville district is somewhat limited. It is necessary to build dams on the small streams for storing water and the muck ponds are usually inclosed so that they are virtually immense settling ponds, the overflow of which is used again. The quantity of water required for washing is about 2000 gal. per ton of ore.

VALUE OF THE ORE

The washed ore runs from 42 to 48% iron, less than 1% manganese and contains from ½ to 1% phosphorus.



FLOW SHEET OF A RUSSELLVILLE WASHERY

The ore sells for about $1.25 per ton, f.o.b. mines, for 45% iron and varies 5c. per unit up or down, 40% iron being the rejection point.

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Talc and Soapstone in 1913

The talc and soapstone industries in the United States prospered in 1913, the total marketed production as reported by the U. S. Geological Survey being 175,833 short tons, valued at $1,908,097, an increase of about 10.4% as compared with the production of 1912. As usual, New York State led in production with an output of 81,705 tons; Vermont was next, with 45,517 tons, and Virginia third, on account of its production of soapstone, with an output of 26,487 tons; New Jersey and Pennsylvania were credited with 11,308 tons; North Carolina with 4676, California with 952 tons, and other states, including Georgia, Maryland, Massachusetts and Rhode Island, 5158 tons. The figures for North Carolina include talc and pyrophyllite, both of these products being used for similar purposes. A new mill was started in Vermont, at Stockbridge, and will further increase the output of that state. In Virginia a new company began the production of gas tips and pencils at Verdierville.

Of the total production, 147,099 tons were marketed as ground talc, 20,465 tons as manufactured articles, and the remainder sold either as rough blocks or as sawed slabs of soapstone.

The average price in the rough for talc as mined in 1913 was $3.77. Pyrophyllite ranged in price from $2 in the rough to $10 per ton when ground. The lower grades of ground talc sold for from $5 to $7 per ton. Manufactured articles in 1913 averaged $28.99 per ton. About 13,774 tons were imported in the United States last year, the leading importing countries, in the order of their importance, being France, Italy and Canada. Canadian production showed a marked increase last year being estimated at 12,250 tons as compared with 8270 tons in 1912. The United States, however, is by far the largest producer and consumer of talc products; it is not only the largest producer but its output exceeds the combined production of all other countries.

Mechanical Roasting of Leady Matte

By L. D. Anderson*

SYNOPSIS—Matte roasting, as formerly performed in hand roasters, has been unsatisfactory. Experiments showed that two-stage roasting was an improvement, and excellent results were obtained by the use of a Wedge mechanical roasting furnace. By careful manipulation it was found possible to roast satisfactorily without the use of extraneous fuel.

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In the early days of lead smelting, the matte produced concurrently with the bullion was regarded as something of a nuisance, involving a rehandling which, in a certain sense, might be considered a reflection on the primary roasting work. Of later years, however, as metallurgists have come to recognize the value of a reasonable matte fall in cleansing the slag, efforts have been directed toward mitigating the expense involved in the roasting of this matte. In all lines of metallurgical work machinery has come to displace hand labor, and now its application in this direction is producing results of some importance. The narration of some experiences with a roaster of the McDougall type may point out some late tendencies.

Two-Stage Roasting an Improvement

One of the first necessities in the desulphurization of matte is crushing to suitably small size. A basic fact is that the elimination of the last few per cent. of sulphur is the most difficult part of the roasting operation, accomplished only by rather intense firing. The whole practice, as carried out in ordinary hand roasters, has been unsatisfactory and expensive, requiring constant firing, with the actual sulphur elimination an uncertainty dependent upon the personal equation, the quality of coal available and the composition of the matte. A result of finely crushing the matte is a greatly reduced blast-furnace speed, which even the practice of pounding the roasted material in pots into agglomerated cakes scarcely relieves. The above difficulties are largely overcome by the practice of the last few years wherein the roasting is divided into two operations, consisting of a preroast, in which the more easily driven off atoms of sulphur escape, and a blast or suction roast, wherein the last desirable units of sulphur are eliminated and the matte converted to a strong, porous sinter, which produces in the blast furnace increased speed and improved slags. For the preroasting operation many plants still use the old hand reverberatory, or "flat," roasters, but the tendency is now entirely toward mechanically rabbled furnaces, various types having been used with considerable success.

Installation of Wedge Furnaces

In 1912, the U. S. Smelting Co. installed in its plant at Midvale, Utah, two furnaces, built after the patents of Utley Wedge, with the intention of trying them on lead matte and abandoning the hand roasters, which had given so many years of service. Roughly speaking, these furnaces are of the McDougall type, insofar as they are provided with superposed hearths, on which the material is rabbled by plows on arms attached to a vertical revolving shaft, dropping from floor to floor until final discharge is effected. Several important features, however, distinguish these furnaces from the usual McDougall type, of which the most marked is the exceedingly rugged construction, well illustrated by the heavy central shaft built up of boiler plate to a diameter sufficient to admit the passage of a man through it, and standing on a large-diameter conical base-plate revolving on heavy conical rollers. The furnaces under discussion are 21 ft. 6 in. in diameter inside the boiler-plate shell and have each one feed floor on which the material is partially dried as it is rabbled toward the center, five roasting hearths and two skeleton hearths, open on the sides, for cooling. The multiple-outlet dampers, through which heat can be allowed to escape directly to the flue from any one or all of the four upper hearths, are a specially important feature. The arms are designed somewhat after the manner of cannon breech-blocks, to make possible quick replacement, in case of breakage, without shut down. The design is clever but has not as yet been appreciated for the reason that no arms have broken in the 16 months of service thus far given. The plows are of simple cast-iron design, quickly replaceable. Feed to the furnaces is by a belt feeder from a steel bin overhead, discharging on the outer circumference, whence the material is rabbled toward the center. The large drop hole and gas by-pass arrangement in the floors is very effective in keeping down the dusting effect.

When these furnaces were started up they were provided with large fireboxes for coal burning. A gentle fire for drying was succeeded by increasing temperatures until finally the intermediate floors were red hot, the high silica firebrick, in fact, partially glazing over. Pyrite running about 43% sulphur was then run for a few days in order to increase still further the temperature of the brick, if possible. With much curiosity matte roasting itself was then undertaken. It happened at that time that poor furnace work had produced a matte carrying 20 to 25% lead, and there was much apprehension lest this material frit or sinter together on the hearths. But these fears proved ungrounded, for no such trouble occurred. All this time a heavy coal fire was maintained in the fireboxes. New and inexperienced men took hold and ran the furnaces continuously from then on with little trouble.

Roasting Without Extraneous Fuel

In order that the previously roasted matte may be sintered, care must be exercised to avoid too great desulphurization. If the percentage of sulphur in the preroast is brought too low, it is difficult to ignite again. In the operation of these furnaces, this difficulty manifested itself at an early stage in the blast-roasting department where considerable unevenly roasted and friable product began to appear. In an effort to prevent too complete preroasting the speed of the rabbles was increased and a larger tonnage forced through. Finally the fires were gradually lessened, until at last they went out altogether. Yet the matte kept on burning and roasting. Herein was a noteworthy discovery—the possibility of roasting matte without the use of extraneous fuel. At first success was not attained every time the effort was made. Gradually, however, the ground principle became apparent. It was the conservation of the heat generated by running with a draft only just barely sufficient to carry away the gases generated. At first it was a common experience to get the matte roast nicely started, only to discover that the operation had ceased and the hearths "gone black," by reason of the admission of too much cold air. Under present conditions the draft in the main flue down-take is only about $\frac{1}{10}$ in. of water. On the first and second roasting hearths it is about 0.035 in., on the third 0.040 in., while on the fourth and fifth it is scarcely measurable, being, in fact, at moments slightly plus or outpressing. At this point it should be explained that the tonnage of the furnaces proving to be in excess of matte-roasting requirements, spare time has been utilized for the roasting of lead-sulphide ores. In making a cutoff from one material to another, it is usual to put on a coal fire in the fireboxes to start ignition. Yet not infrequently it has been possible to start this ignition, when one material has followed the other with only two or three floors between, without using any coal whatever, the heat retained by the brickwork and carried in the gases from the roasting material just leaving the furnace being sufficient. To accomplish this, however, requires the exercise of some care and judgment.

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*Superintendent, Midvale, Utah, plant of the U. S. Smelting, Refining & Mining Co.

The multiple-outlet damper mentioned has a really remarkable effect in raising or lowering the temperatures on any floors as desired. Both the temperature and, consequently, the percentage of sulphur in the calcines, can be regulated by this means.

Furnaces Economically Operated

The total power consumption for feeders, furnaces, etc., is less than 5 hp. per furnace. Each furnace uses about eight gallons of cooling water per minute, entering at a temperature of 40° F. and leaving at 75° F., the average of all the overflows. The gases escape in the downtake at a temperature of about 550° F., there being given off something like 12,000 cu.ft. of gas per minute from each furnace, rated at the boiling point of water and an altitude of 4500 ft. No accurate determinations of the dust losses have been possible as the gases from these furnaces are mingled with other gases and conducted to a bag house. Estimates based on weights of raw and roasted matte would indicate them to be under 8%. Each furnace handles in 24 hr. from 75 to 80 tons of lead-copper-iron matte, crushed to pass a 4-mesh screen. Naturally the cost is but a fraction of that involved in hand roasting.

It is interesting to note that the success attained in roasting matte without the use of extraneous fuel is based on a procedure quite opposite to that found of advantage in the roasting of ores carrying a larger percentage of sulphur than the 22% usually found in matte. The able paper given last year before the A. I. M. E., by Frank R. Corwin and Selden S. Rogers, on "Increasing the Efficiency of McDougall Roasters at the Great Falls Smelter of the Anaconda Copper Mining Co.," emphasized the beneficial effect on tonnage brought about by the increased draft made available by the famous new stack at that plant. The experiences outlined above would indicate that such a draft as prevails at Great Falls would require continuous coal or oil firing in order to maintain a matte roast. One factor in promoting easy matte roasting is an accelerated weathering obtained by sprinkling with water both before and after crushing. Possibly this weathering causes matte of 22% sulphur content to roast more easily than would be possible with ordinary ores of a like sulphur tenor. Nevertheless the success attained in maintaining combustion in matte by carefully reducing the draft leads to some speculation as to whether the same procedure might not make possible the roasting without fuel of ores of lower sulphur content than are ordinarily considered amenable to such treatment.

Hydrated Lime for Cyaniding

By Richard K. Meade*

Lime is extensively used in cyanide operations for the purpose of neutralizing the free acid developed in many ores during the process and for coagulating the slime and so assisting it to settle. As a general rule, the lime is purchased in the form of quicklime, stored in sheds and bins and drawn on as desired. When the time comes to use it, the lime is either mixed with the ore and ground with it, or else slaked with water to form a thin cream, which is then added to the ore pulp at some suitable point. The chief disadvantages of quicklime are its poor keeping qualities, as it rapidly absorbs carbon dioxide from the air and becomes worthless. There is always danger, too, in storing quicklime, as water from a leaky roof or other source will slake it, and the heat thus generated may set fire to any combustible matter in contact with the lime. The value of lime for cyaniding increases with its fineness, so that it is usually necessary to grind the lumps before slaking or mixing with the ore.

There has been introduced in the lime trade, within the past few years, dry, slaked lime under the trade name "hydrated lime." This is simply calcium hydrate, $Ca(OH)_2$, or in the case of certain limes, a mixture of calcium hydrate and magnesium hydrate, $Ca(OH)_2 + Mg(OH)_2$. It is lime slaked with just enough water to convert it to hydrate without having an excess of moisture. When lime is slaked in the usual manner, water is added in considerable excess. This excess remains after the lime has slaked and forms it into a paste or putty. In the manufacture of hydrated lime, however, just sufficient water is added to slake the lime, and what small excess is employed is evaporated by the heat generated by the slaking process.

There are a number of points of superiority possessed by hydrated lime over quicklime which make it peculiarly adapted to the use of cyanide plants. It has splendid keeping qualities and may be kept for several months without appreciable loss of value. There is absolutely no danger of fire from it, and it may be stored in wooden bins or even paper or cloth bags without any risk. It is extremely fine; 90% of it will usually pass a 200-mesh screen. It is, of course, already slaked and in a finely divided condition, and hence needs no further treatment before use, and may be mixed directly with the ore in the bins or as fed to the grinding mills. Hydrated lime is usually purer than lump lime, because in the process of manufacture impurities are screened out.

On the other hand, of course, hydrated lime contains water, and hence a given amount of it will not contain as much calcium oxide as will the same amount of quicklime. At the same time, when hydrate can be obtained, it will probably prove the cheaper in the long run, owing to the convenience with which it can be stored and used.

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As we have said, one of the great advantages of hydrated lime is its keeping qualities. This makes it especially desirable where only a small quantity of lime is used at a time, and over an extended period, allowing the user to purchase lime by the carload without loss from reversion to carbonate form.

Hydrated lime will absorb carbon dioxide if spread out in a thin layer. In a bin, however, the loss of hydrate from air slaking is slight. The outer layer of lime undoubtedly serves to protect the rest of the package. In some tests of hydrate kept all winter in a dry storehouse, the loss was found to average 3%; some of the outside bags showed as much as 5%, and some of the inside bags as little as 1½%. In the same length of time, a lot of lump lime would have been rendered practically worthless by becoming carbonated.

The fire risk from storing quicklime is well known to dealers in building materials. A ton of lime on slaking will give off as much heat as the burning of 75 lb. of good coal. If water has a chance to get at the lime and any combustible material, such as the barrels in which it is kept, is in contact with it, fire is apt to occur. With hydrated lime there is no fire risk.

Generally speaking, hydrated lime is much purer than lump lime. This is particularly true of hydrates made by the air-separator process. In hydrates made by this method, the impurities are separated from the hydrate. These impurities consist of ashes, siliceous cores, unburned limestone and a small amount of unhydrated lime, the latter usually occurring from the overburning and semifusing of the lime. When the lime is burned in "mixed-feed" kilns, in which the fuel comes in contact with the lime, the latter often contains coke or charcoal. This is a precipitating agent and both destroys cyanide and occasions loss of precious metal. The separators will discard this also, leaving the hydrate free from carbon.

As hydrate is not now manufactured to any extent in the territory where most of the cyanide plants are located, it is probable that the latter would even find it an advantage to build small hydrating plants and to prepare the lime as received, storing it in bins and drawing on this supply as needed. The equipment for this purpose need not be extensive, as the capacity of the hydrating plant would be small. Where power is available a small hydrating plant capable of manufacturing from 15 to 20 tons of hydrate per day could be equipped for between $4500 and $5000, including the installation of the machinery.

In the system designed by me especially for small capacities (15 to 20 tons of hydrate per day), the lime is first crushed to pea size by means of a small rotary crusher having an opening sufficiently large to take pieces of lime as big as a kiln will burn. The lime is weighed as it is put through the crusher, and then elevated into a small bin. When a charge, 400 to 600 lb., is obtained in the bin, a slide in the bottom of this latter is opened and the lime is dumped into the hydrator, which consists of a steel drum revolving on tires, and provided with a ventilating arrangement to carry off the steam produced. A measured quantity of water is added to the lime and the two are mixed by revolving the cylinder. At the end of 10 to 20 min., depending on the lime, the slaking is complete and the contents of the hydrator will consist of very fine light fluffy powder, the calcium hydrate, mixed with the impurities already mentioned. These latter are for the most part in the form of coarser particles varying from the size of a pea down to sand. The contents of the hydrator are then discharged into an air separator which discards these coarser particles. The fine powder so obtained is the finished hydrate.

The cost of hydrating lime by this process usually amounts to 30c. or 40c. per ton. This charge, however, would also include the cost of unloading a car of lime if placed alongside of the hydrating equipment, and also the cost of conveying the lime into the storage bin. The latter may be made of wood, but a large steel silo capable of holding, say 500 tons of hydrated lime, would be desirable in some instances.

For a cyanide works burning its own lime, the installation of a hydrating plant would allow the kilns to be run at certain seasons of the year and then shut down for the balance, the lime being hydrated as fast as made and stored in a wooden, steel or concrete silo. In certain localities where the operation of the lime plant is carried on at some seasons with difficulty, owing to the weather, etc., this would be of great advantage and would allow the lime kilns to be operated at their maximum capacity while they were burning stone, and consequently greatly cheapen the cost of production.

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Drawback on Bonded Lead

WASHINGTON CORRESPONDENCE

William P. Malburn, assistant secretary of the Treasury in charge of customs, has sent to the Collector of Customs, at New York, a letter relating to the drawback on lead articles, in which he rules as follows:

> In the matter of the liquidation of drawback entries covering articles manufactured with the use of lead produced in bonded-smelting warehouses from imported ore, the question at issue is whether in the liquidation of drawback entries covering articles manufactured in the United States from such lead allowance shall be made for waste in smelting and refining.
>
> Under paragraph N of Sec. 4 of the tariff act of 1913, on the withdrawal for domestic consumption of lead produced in bonded-smelting warehouses from imported ores, duty is assessed on an equivalent amount of ore from which the lead would be producible in its condition as imported without any allowance for waste, which invariably occurs. Under Sec. 29 of the tariff act of 1897, on the withdrawal of such lead for domestic consumption, duty was assessed on the lead content of the ore from which it was produced.
>
> While the two statutes cited differ in phraseology, their effect on such lead withdrawn from bonded-smelting warehouse for consumption in the United States is the same. The question of the legality and propriety of an allowance for waste in smelting and refining, where such metals are used in the manufacture of other articles in the United States under the act of 1897, was settled in favor of the proposition by T. D. 19,670 of July 19, 1898, T. D. 21,251 of June 12, 1899, T. D. 24,010 of Oct. 21, 1902, and T. D. 25,777 of Nov. 18, 1904, all of which decisions must be read in connection with one another.
>
> Under the circumstances, in the liquidation of entries at your port covering articles manufactured from lead produced in bonded-smelting warehouse from imported ores, an allowance may be made for waste in smelting and refining equal to the difference in the quantity of lead actually withdrawn and the quantity of which duty was paid.

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To Blast a Series of Holes in a Gneiss Quarry spaced 12x15 ft. and 20x20 ft. and about 20 ft. deep, sticks of 60% Dupont dynamite, 1½ in. in diameter by about 8 in. in length, were used (A. I. M. E. Bull., Feb. 1914), and the charge was calculated to average about ½ lb. of dynamite per cubic yard of rock.

Equipment of Mine Machine Shops

By F. A. Stanley*

SYNOPSIS—Importance and scope of the mine machine shop noted. Descriptions of arrangement, construction and equipment of certain typical mining and smelting company shops.

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The mine machine shop, owing to its isolated location and the character of the operations, requires, as a rule, an equipment with greater range of capacity than that of the general repair plant situated in machine-shop districts. The mine shop is constantly called upon to make and repair parts, varying from small work up to heavy bed plates, big cylinders, pulleys and sheave wheels 12 to 15 ft. or more in diameter. Not infrequently the mine machine shop started primarily as a small department for the purpose of overhauling and repairing engines, pumps, rock drills, and the like, develops into an important establishment not only capable of attending to all the repairs of the mechanical equipment of the mine, but also adapted to building much of the new machinery required.

The mine shop in certain places also develops into a semi-commercial institution in that it is often called upon for all sorts of repairs required by other industries in the community.

Certain of the larger mining companies in this country maintain machine shops employing hundreds of mechanics and forming a part of extensive metal and woodworking plants, including iron and brass foundries, forge, machine and sheet-metal shops, pattern and carpenter shops, and so on.

The Calumet & Hecla Shops

One of the largest and best equipped of these mine machine shops is that of the Calumet & Hecla Mining Co., at Calumet, Mich. This shop not only repairs all kinds of mining equipment, but also builds rock drills and other apparatus for the company's use.

The drill parts in particular are put through in large numbers and like various other parts are machined economically by the use of jigs and fixtures, so that in addition to a comprehensive equipment of standard machine tools, there are many special tools and appliances in the shop.

A good general idea of this shop and its tools may be gathered from Fig. 1. The building is of brick and frame construction, with the main bay served by a powerful traveling crane, the tools at either side of the bay being served by suitable jib cranes and hoists.

The heavy lathes, boring mills, planers, radial drills and other large tools are arranged as in Fig. 1, leaving the central portion of the floor clear for the free handling of material. The character of some of the work done in this department will be obvious from the illustration, which shows a few large castings, shafts and other machine members in the foreground.

Rock-drill and other work of lighter nature is attended to in other departments, one of which is illustrated by Fig. 2, which shows clearly some of the special apparatus developed for use in handling rock drills, either in connection with the making of new drill parts or in repairing old. The racks at the right form convenient storage space for drill cylinders and pistons ready for assembling, and the floor stands in front of the bench enable the drills to be fitted up and completed for operation without difficulty.

Anaconda Shops

Another machine repairing and building plant of large size, connected with the copper-mining industry, is the foundry department of the Anaconda Copper Mining Co., at Anaconda, Mont. This establishment comprises machine and pattern shops, foundry, sheet-metal and boiler shop, blacksmith shop, woodworking shop and other departments. It not only builds and repairs machinery for the various mines and reduction works of the Anaconda company, but also does considerable contract work for outside customers.

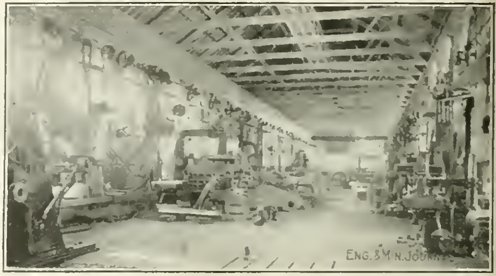

Fig. 1. Calumet & Hecla Machine Shop

A view of the machine shop is reproduced in Fig. 3, and a layout of the entire machine shop with location of all the tools and other equipment is given in Fig. 4. The building is of brick and frame. The main bays are served by hand cranes of 5-ton capacity each, the position of the runways being shown in Fig. 4. A complete list of

TABLE I. ANACONDA SHOP EQUIPMENT

No.	Machine	No.	Machine
1	4x12-ft. receiving tank	37	dynamo
2	3x7-ft. grease extractor	38	10-ft. boring mill
3	3x12-ft. feed-water heater	39	18-in. slotter
4	No. 0 pump feed	40	50-in. boring mill
5	5¼x3½x5-in. duplex feed pump	41	10-in. slotter
6	50-kw. 500-volt dynamo	42	20x48-in. slab miller
7	18x36-in. engine	43	48x48-in. by 20-ft. openside planer
8	5-ft pulley boring mill	44	30-in. upright drilling machine
9	5-ft pulley lathe.	45	30-in. upright drilling machine
10	12x14-in. air compressor	46	28-in. upright drilling machine
11	40x96-in. air receiver	47	24-in. upright drilling machine
12	60-ton portable hydraulic press	48	30-in. upright drilling machine
13	magnetic separator	49	laying-out table
14	12-in double-spindle drilling machine	50	18-in. double-spindle, car-wheel grinder
15	tool grinder		
16	10-in drill grinder	51	18-in. double-spindle emery grinder
17	14-in box column shaper.	52	pouring table
18	15x36-in engine lathe	53	babbitt furnace
19	15x54-in engine lathe	54	coal bin
20	20x36x2¼-in turret lathe	55	30x30-in. by 8-ft. planer
21	15-in. shaper	56	10-in. emery grinder
22	20x20x72-in planer	57	48 in. by 18-ft forge lathe
23	No. 1 plain miller	58	24 in. by 8-ft engine lathe
24	30x30-in by 10-ft planer	59	24-in. by 10-ft engine lathe
25	24 in by 8 ft engine lathe	60	36 in. by 20-ft. engine lathe
26	20 in by 9-ft engine lathe	61	30 in. by 22-ft. engine lathe
27	20 in by 5-ft engine lathe	62	36-in. radial drilling machine
28	24-in. by 7-ft engine lathe	63	60-in. plain radial drilling machine
29	24 in. by 9-ft engine lathe	64	48-in. plain radial drilling machine
30	24 in. by 9-ft engine lathe	65	hydraulic press for 12-in. wheels
31	24 in. by 9-ft. engine lathe	66	250-ton portable hydraulic press
32	24 in. by 9-ft engine lathe	67	8-in. pipe threader
33	24 in. by 9-ft engine lathe	68	12-in. pipe threader
34	10-in emery grinder	69	welding generator
35	18-in emery grinder	70	2-in. pipe threader
36	50-kw., 500-volt dynamo	71	10-hp. motor

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*Formerly associate editor, "American Machinist," New York.

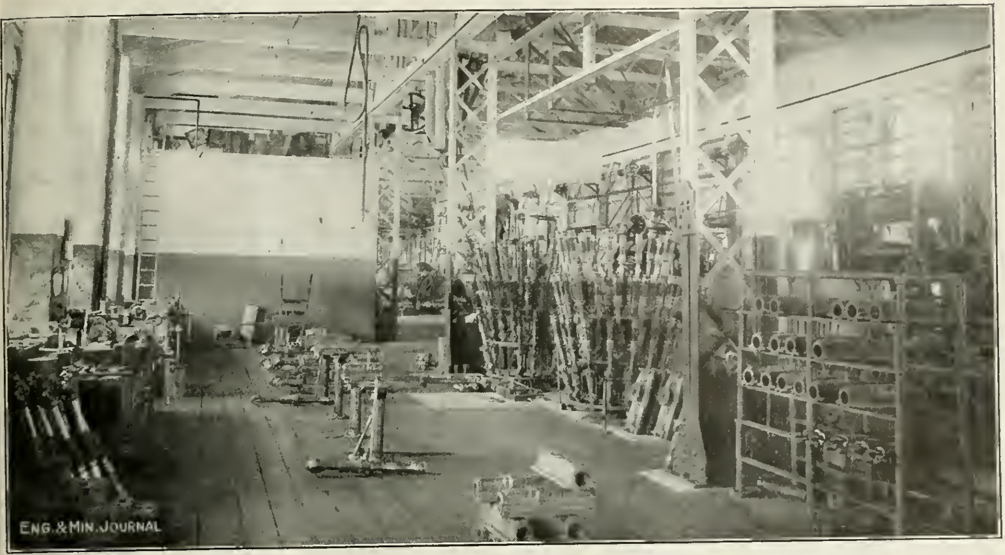

Fig. 2. Rock-Drill Department of the Calumet & Hecla

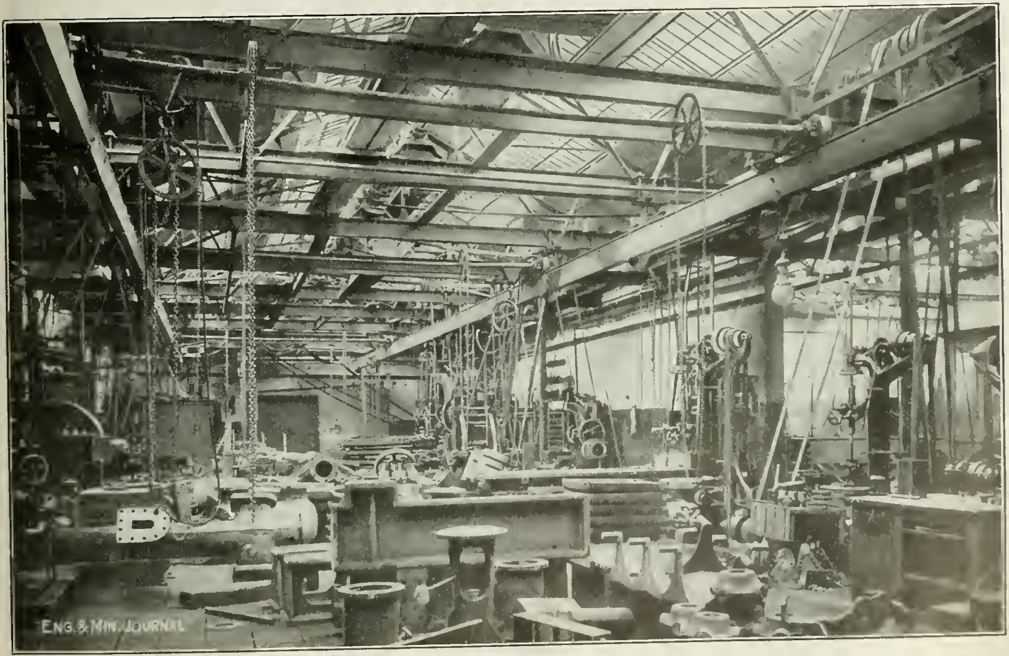

Fig. 3. The Anaconda Company's Machine Shop, Anaconda, Mont.

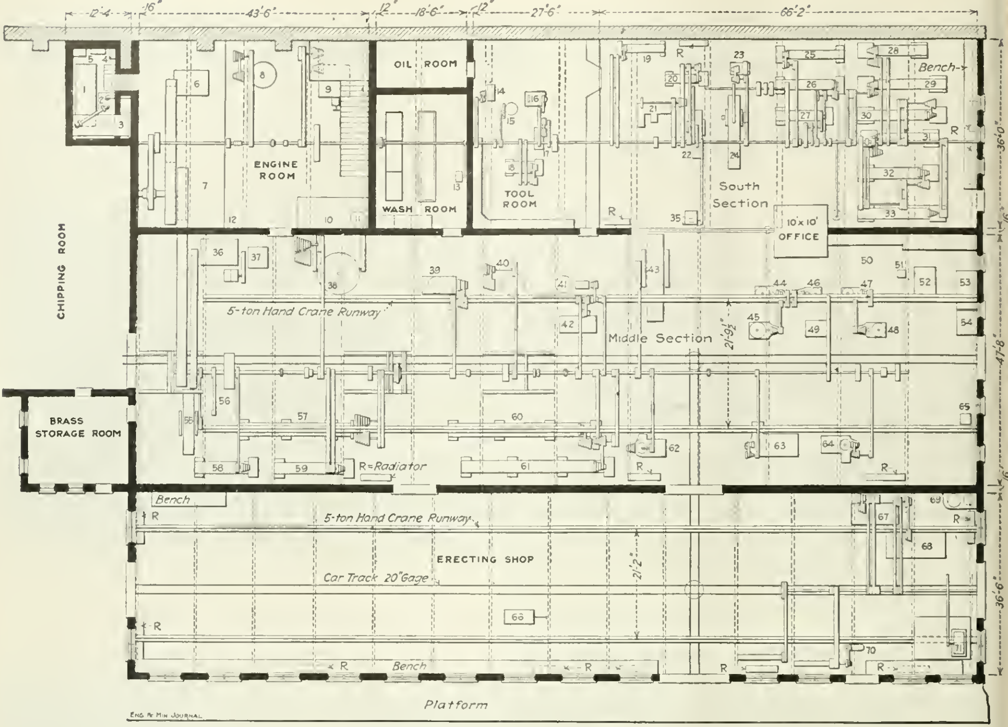

FIG. 4. LAYOUT OF THE FOUNDRY OF THE ANACONDA COMPANY AT ANACONDA

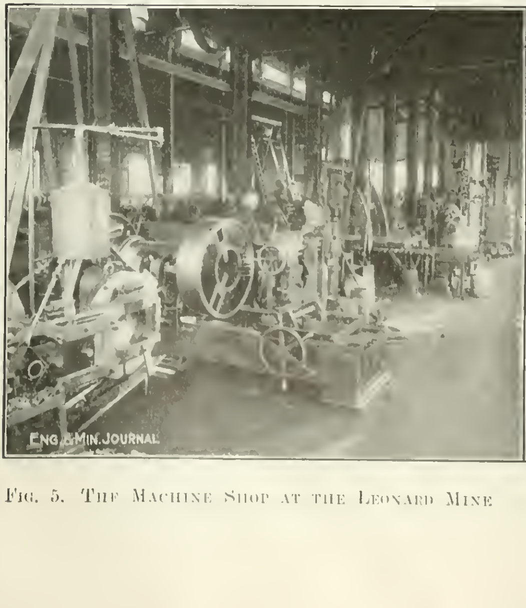

FIG. 5. THE MACHINE SHOP AT THE LEONARD MINE

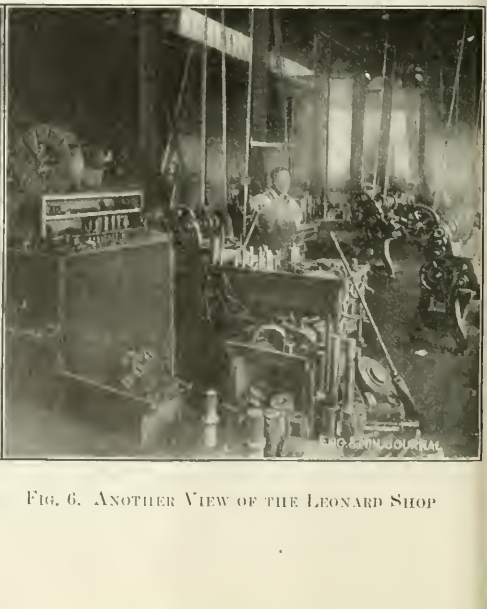

FIG. 6. ANOTHER VIEW OF THE LEONARD SHOP

the mechanical equipment is given in Table I, the serial numbers corresponding to the numbers on the drawing, thus enabling the positions and dimensions of the various tools to be found at a glance.

The largest of the Anaconda Copper Mining Co.'s shops in Butte, Mont., is that at the Leonard mine, two views in which are shown in Figs. 5 and 6. This shop was erected only two or three years ago and is of concrete and steel. Its equipment throughout is of modern construction and a good idea of the size and character of the tools will be obtained from the illustrations, which show the machines located in the side bays.

Other Shops of the Copper Companies

The machine shop at the reduction works of the Copper Queen Consolidated Mining Co., Douglas, Ariz., is in a building 80x214 ft., with steel frame and brick walls. The equipment is given in Table II:

TABLE II. MACHINES OF COPPER QUEEN SHOP, DOUGLAS

1	20-hp. motor
1	32-hp. motor
1	10-ton traveling crane
1	20-in. slotting machine
1	8-ft. boring mill
1	3-ft. 6-in. by 13-ft. plauer
1	24-in. by 10-ft. planer
1	hydraulic press
1	18-in. shaper
2	30-in. table drill presses
1	5-ft. radial drill press
1	5½-in. pipe machine
1	12-in. pipe machine
1	1-in. head bolt cutter
1	3-in. head bolt cutter
1	18-in. by 3-ft. lathe
1	18-in. by 8 ft. 6-in. lathe
1	10-in. by 10-ft. lathe
1	18-in. by 3-ft. lathe
1	30-in. by 12-ft. lathe
1	24-in. by 24-ft. lathe
1	7-in. by 8-ft. 4-in. wheel lathe
1	cutoff saw
1	saw grinder
1	screw press
3	emery wheels

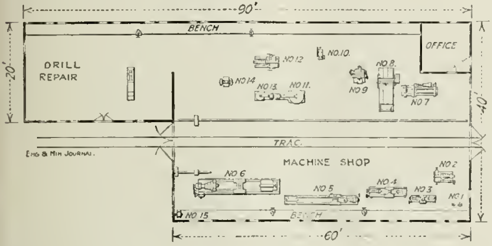

Fig. 7. Bunker Hill & Sullivan Shop at Kellogg

At the Mason Valley copper mines, Yerington, Nev., the machine shop, sheet iron shop and blacksmith shop occupy one building 4[illegible]98 ft. The building is of heavy timber construction covered with corrugated iron. The equipment is given in Table III:

TABLE III. MASON VALLEY MACHINE-SHOP EQUIPMENT

1	28x57x19-in. gap lathe
1	36x36-in. by 10-ft. planer
1	16 in. by 8-ft. lathe
1	20-in. upright drill
1	30-in. upright drill
1	cold saw
1	12-in. double emery stand
1	1½-in. single bolt cutter
1	16-in. back-gear shaper
1	pipe machine
1	set 5-ft. bending rolls
1	8x12-in. compressor
1	30-hp. induction motor
1	power punch
1	splitting shear

The Lake Copper Co.'s shop, at Lake Mine, Mich., is 24x40 ft. It is equipped with one 21-in. by 12-ft. lathe, one 24-in. by 24-in. by 6-ft. planer, one 16-in. shaper, one 20-in. upright drill press, one 14-in. saw table, one 1½-in. bolt cutter, one emery grinder and one grindstone.

TABLE IV. EQUIPMENT OF BUNKER HILL & SULLIVAN SHOP

No.	Tool
1	tool grinder
2	No. 2 milling machine
3	15-in. lathe
4	16-in. lathe
5	22-in. lathe
6	26-in. lathe
7	6-in. pipe mnchine
8	24x24x6-in. plnner
9	16-in. shapers
10	hacksaw
11	38-in. drill
12	2-in. bolt cutter
13	21-in. drill
14	grinder
15	10-hp. motor

Silver-Lead Mine Shops in Idaho

The plan of the Bunker Hill & Sullivan Mining & Concentrating Co.'s machine shop, at Kellogg, Idaho, is represented in Fig. 7. The dimensions of the building are given on the print and the positions of the different tools clearly indicated. The sizes of the machines will be found in Table IV, designated by the numbers of the drawing. Other repair departments at this mine, but not shown in connection with the machine shop, are the blacksmith shop, the car repair shop, equipped with metal shears, punches, etc., the tool-sharpening plant for keeping drills in order, and the carpenter shop.

The machine and blacksmith shops of the Federal Mining & Smelting Co., at Wallace, Idaho, are under one roof; the machine shop itself is 58 ft. long by 36 ft. wide. Its equipment is shown in Table V:

TABLE V. FEDERAL SHOP ITEMS

1	24-in. by 6-ft. planer
1	28-in. drill press
1	25-in. drill press
1	car-wheel lathe, swing, 60 in. by 9 ft.
1	14-in. by 3-ft. lathe
1	23-in. by 9-ft. lathe
1	250-ton hydraulic press
1	150-ton hydraulic press
1	power hacksaw
1	1½-in rod-threading machine
1	2½ to 6-in. pipe-threading machine

The blacksmith shop has two fires and is equipped with combined punch and shears, a steam hammer and a home-made drop hammer.

In addition to the above, there is an electrical shop equipped for repairs, such as armature winding; a saw mill for timber framing, wedge making and general light sawmill work; and mine carpenter shop and framing sheds.

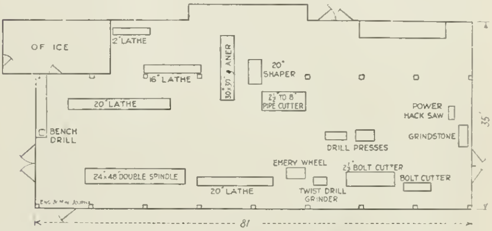

Fig. 8. Shop of the Penn Company at Vulcan

Michigan Iron-Mine Shop

Fig. 8 represents the floor plan and shows the equipment of the machine shop of the Penn Iron Mining Co., at Vulcan, Mich. The dimensions of the shop and the capacity of the tools are plainly indicated on the drawing.

Flame Reactions

From a survey of the available data with regard to the luminosity of gases, it is concluded that an absolutely transparent gas will emit no light at any temperature unless a chemical reaction takes place (W. D. Bancroft and H. B. Weiser, *Journ. Phys. Chem.*, p. 281, 1914). A colored vapor may emit thermal luminescence, but it does not follow that all light from colored vapors is due to thermal causes, even when the radiation has a lower intensity than that of a black body at the same temperature. Since luminescence is often due to chemical action, the authors made a qualitative study of the flame reactions of tin and copper and their salts with a view to deciding what reactions cause the luminescence. Care was taken to distinguish between colors due to emission and to absorption, respectively. The reaction tin→stannous ion gave a carmine color, and tin→stannic ion a green color, the latter being more intense as a rule. The differences between the spectra of the halides of tin were due to differences in the absorption and emission of light by the halogens. In flames containing copper the reaction copper→cuprous ion gave a green color, Cu→cuprous salt a red and cuprous ion→cupric ion, or cupric salt, a blue color. The intensity of the green luminescence was so great that the unaided eye could not distinguish any blue in the ordinary copper flame even though the copper was burning chiefly to cupric salt. The violet red color of undissociated cupric chloride vapor (observed when chlorine acts upon very hot copper) must not be mistaken for luminescence.

*

Holmes on the Need of Increased Bureau of Mines' Appropriation

Washington Correspondence

Working for the increased appropriation for which the Bureau of Mines has made request, Director Holmes, of that Bureau, has just given elaborate testimony before the House Committee on Appropriations with a view to convincing that body that the extra $100,000 suggested should be granted. Mr. Holmes stated that he particularly wants this money for the study of waste in smelting and for the ascertainment of the best use to be made of gases from the smelters. He said that the gases contained primarily sulphur and arsenic, one smelter in Montana thus throwing out into the atmosphere many tons a day. "The damage is extending for miles beyond," added Doctor Holmes. "In the case of another smelter in California, the damage can be traced 25 miles, where the drift of the wind is constant for a considerable period of time, and the area is extending. We have demonstrated how to take care of arsenic and the metalliferous materials given off in small quantities, such as lead fumes and that part of the sulphur given off in the form of sulphuric acid, the so called combination which goes into sulphuric acid, and which in that form is decidedly injurious."

> We have found cases of damage from the arsenic, from the lead and from other metallic fumes. About the smelter itself, where the employees of the company operate, most of the damage done has been from the lead and arsenic gases. The policy we have followed is the proper policy to follow, that wherever it was feasible to do so investigations of this kind which were totally local in their character, should be paid for by the companies themselves rather than by the Government.
>
> In connection with the smelter investigations there were certain problems which the smelting companies have practically declared to be unsolvable, and they did not think they ought to be called upon to spend money to solve problems which they did not think could be solved and which apply to other smelters as well as to themselves. Of the appropriation last year for this general work we have expended in all for smelter work $15,000. Wherever the problem was at all a local one we have required the smelting company to do the investigation. We have selected the men and we have mapped out the line of examination which we thought should be followed, but every dollar of expenditure and the employment of the men and the handling of the moneys has been entirely within the hands of the smelters What we do is entirely laboratory investigation on our part to determine, primarily with reference to sulphur gases, what can be done.

Doctor Holmes also made mention of the Cottrell process, invented by a government employee, which, by virtue of the use of metal plates charged with electricity produces a deposit eliminating smoke.

"It is now being used in smelting operations in various ways," he said. "It is being used to take the arsenic out of the smelter gases as refined arsenic. It is being used in connection with petroleum in California, where the petroleum becomes so thoroughly mixed with water that it forms an emulsion so that the water will not separate from the oil by gravity.

"It has been tested by several smelting companies to such an extent that they are now actually installing large-scale plants for such purposes. Another interesting application was in southern California, where two large cement plants in the center of orange groves were destroying them. The process completely settles the dust.

"With the expenditure of $15,000, we have this year conducted the more abstract of these investigations, which could not be considered local in their character. Three of the smelters, under our general advice, are conducting investigations, each one of which costs practically as much as the amount we are spending. It seems our duty to get other people to bear these burdens just as far as feasible."

Doctor Holmes was asked by members of the committee about the waste of sulphuric acid.

"The only possible use of this acid," he said, "will come when it can be collected, and its collection involves the storage of an enormous quantity. Unless there is a market for the sulphuric acid, there would be the question of storage, and it would be leaking into the streams, which would be just as vigorously opposed as turning the gas loose in the atmosphere. What we are trying to do is to find some means of collecting it as sulphur in the form of a solid, so that it can be compressed into cakes; then it can be stored without any difficulty or loss in storage.

"Sulphuric acid is used in a good many manufacturing operations in the East, but the supply comes in the main from Sicily, because the cost of transportation from the West makes its price greater. Nevertheless, we are trying to get some of the larger smelting companies to go into not only the manufacture of sulphuric acid, but also of the phosphates."

Doctor Holmes mentioned other lines of investigation—such as safety and waste investigations in certain metallurgical plants, like those for the extraction of silver and gold.

He asked for an additional appropriation of $20,000 for the next year. It is especially desired to use this money, he explained, with reference to investigating the explosives used in metal mining and quarrying. In metal mining, he said, they want quicker action, because they want to shatter the ore or rock, but they do not care anything about low temperature. What they want is an explosive that will produce the minimum of poisonous gases, because, as he said, in metal mining there is no such extensive ventilation system as in coal mines.

*

Employment of Boys in Alabama Mines

The Alabama law, which forbids the employment of boys under the age of 14 years in mining, was recently interpreted by the Supreme Court of that state as extending to ore, as well as coal mines. (Cole vs. Sloss-Sheffield Steel & Iron Co., 65 *Southern Reporter*, 177.)

Analyzing Mining Prospectuses

By R. W. Hadden*

SYNOPSIS—Ignorance of proper procedure, inexperience, the innate nature of man to take a hazard are as responsible as fraud for the facility with which so many promoters of worthless mining schemes find investors. Business caution is often forgotten by those who are successful and careful in other commercial pursuits. The remedy—consult the mining engineer, who is the credit man of the mining business. Often the prospectus brands the enterprise as is shown in an example herein cited.

* * *

It is unfortunately too often the case that men who have been successful in commerce or manufacturing when they undertake to conduct a mining enterprise prove themselves incompetent, and it is hard to understand why the hard-headed business man, who intrusts the management of his business interests to competent assistants and insures himself against losses through the guidance of a cold-blooded calculating credit man will jump into some wildcat mining venture with an investment of thousands of hard-won dollars, without first making a careful investigation. The credit man of the mining business is the competent engineer, but seldom is he consulted by the intending investor.

Take the average prospectus of a mining company. How often is it subjected to the careful analysis of an experienced engineer? And yet the investor, did he contemplate purchasing a business, would scrutinize every detail of the prospective purchase before parting with his money. Whenever a manufacturer or wholesaler contemplates selling to a new customer, the credit man first secures from the purchaser a statement of his resources, he secures reports on his business record and ability from Dun or Bradstreet, and inquiries as to his character, honesty and financial ability through local bankers. Should the resulting information prove satisfactory, the merchant may then decide to invest with that customer to an extent equal to the value of the goods for which he will grant say a 60-day credit.

Mining Too Widely Thought of as a Gamble

In mining, however, all this prudence and investigation seems to be eliminated, and the shrewd man of business too often invests in a mining venture as he would play roulette or the races; he makes it a gamble. Is it then any wonder that so many lose their so called mining investments? The wonder is, rather, that so many win.

Let us assume a hypothetical case of a man contemplating an investment in a mining venture in course of promotion. He has either seen some advertisement, read some of the company's alluring literature or heard of the opportunity through some friend. Say he contemplates an investment of $10,000. Now, following the ordinary rules of business, the first thing would be to investigate the promoters, then analyze their literature, which would show whether those who are to be responsible for the success of the venture are careful, competent men, possessed of ability in mining, men not given to exaggeration and foolish statements, nor looking for the accomplishment of impossibilities. That much being settled, the next move would be to secure the services of an uninterested, competent and experienced mining engineer, not a mere student, to make a thorough examination of the company's properties, and secure an abstract of title. The engineer's report will show if the property can be worked profitably, it will check up the statements in the prospectus; his valuation of the property, and his opinion of its possibilities will show if the capitalization is overgreat, and if the price asked for the shares bears a proper relation to the value of the property. The engineer will also be able to advise whether the property can be successfully equipped, developed and operated with the amount which the company contemplates providing for that purpose. The abstract or title will show whether the company owns the property, an important point. If the mine be located in Mexico, the question of title should receive the most careful scrutiny by a lawyer experienced with Mexican titles.

What Reports and Opinions Cost

Such a report will cost anywhere from $250 up and expenses, depending upon the time required and the reputation of the engineer employed. But is it not worth it? In the first place it may mean the saving of thousands of dollars, and in the second, should the investment be advised and made, the investor will be posted and in a position to criticize the reports which the company may issue from time to time.

I have been consulted in many such instances, and in the majority of cases it was not even necessary for me to leave my office in order to advise; the prospectus and literature containing all the necessary evidence to condemn the proposition as unworthy of consideration.

Frequently the investor feels warranted in making the investment because the proposition is recommended by financial advisers in the current magazines, forgetting altogether that such opinions are usually biased to secure much needed advertising for the columns of the magazine in which such advice appears, and forgetting also that the data upon which this advice is based is usually supplied from interested sources. The investor should be particularly on his guard against being influenced by that class of magazine controlled and published by certain brokerage houses to sell their own wares, also that class having all the appearance of an independent organ, whose sole source of revenue is derived from its advertising columns, and the goods of the advertisers are lauded to the skies. Nor should too much credence be placed upon the adverse criticism appearing in such columns, which, in many instances, are merely forms of blackmail practiced upon lawful enterprises which scorn to use such an advertising medium.

An Example of Results of Analyzing a Prospectus

In 1906, I was consulted in New York as to the prospectus of the Alpha[1] Consolidated Gold Mining Co., the bonds and stock of which were at that time being advertised generally in the Eastern dailies and weeklies. I made a careful analysis of the literature of that company, and advised against the investment. My predictions have all been fully confirmed by subsequent events, and it may not be out of place to give my report made at that time as an example of how such a prospectus should be analyzed, it being a fair average sample of the ordinary mining prospectus one so often receives in his mail. The report follows, and it was made without having to leave my office, being based wholly upon the prospectus and other literature handed to me by my client:

---

*Mining engineer, 220 Higgins Bldg., Los Angeles, Calif.

[1] This, and the names and initials following are not the correct ones.

> The president of the company is an ex-United States senator from New York. Regarding the personnel of the directors I know little, but can only say that no conservative business man should allow his name to be attached to such extravagant statements as this prospectus contains. In fact so ridiculous are the statements and absurdly unreasonable the expectations held out to the public that it is right and proper strongly to advise the leaving of this alluring proposition severely alone, and this for the reason that the board of directors, showing such palpable ignorance of what is necessary in the way of development, what may be looked for in way of production, and what expected in the way of profits from mining, is certainly one not calculated to bring to a successful issue any mine, no matter how good or promising.
>
> The property of the company is in the Lost Animals, Hilltop district of New Mexico, and the principal holdings are the Snake and Opportunity mines, the latter of which was full of water when Mr. B. K. T——— made his examination in 1902, consequently its value is merely conjectural. As to the Snake if it contained such valuable orebodies, a pertinent question is, why did the former owners cease to operate the mine? Was it because the mine could no longer be worked at a profit? Mr. T.'s map shows plenty of explored ground blocked out, which had evidently not paid to work, inasmuch the former operators went beneath it to get pay ore. The report gives as an asset 99,615 tons of stope fillings of an average value of $5 per ton. It is pertinent to ask how this value was arrived at, and also as to how these fillings could possibly be sampled in order to arrive at a valuation. Again, 17,336 tons of dump ore, averaging $3.38 per ton, should scarcely be figured at this time as an asset, when, on p. 7 of its prospectus, the company estimates the cost of converting its ore into money at $4 per ton.
>
> This report of Mr. T. shows some 60,000 tons of ore in sight, having a gross value per ton of $8. The five-year mortgage bonds of the company, amounting to $1,000,000 mature Jan. 2, 1908, showing that the company has already been before the public for three years. The directors claim to have purchased $200,000 worth of these bonds at par. The treasury consequently should have had ample funds with which to prosecute development. It is therefore pertinent to ask what has been done since January, 1903? Has the interest been met on the bonds already sold? If so, from what source? It is safe to say that the erection of the mill, building of pipe line for water, completion of working shaft, installation of machinery and pumps, and opening up of the mine for a large production of ore will occupy the remaining months of 1906. From what source will interest on bonds be paid Jan. 2, 1907?
>
> A mine requires to be opened with many thousands of feet of drifts, upraises, etc., before it can maintain a daily production of 200 tons of ore; but we will give the company the benefit of all doubts, and granting that they may commence in January, 1907, with a daily production of 200 tons and keep it up for 340 working days of that year, what do we find? A production for the year of 68,000 tons of ore, which, at their own figures of $4 per ton net, will yield $272,000 with which, on Jan. 2, 1908, to meet the interest and pay off the bonded indebtedness.
>
> This should be enough to show you what run you will get for your money, but just let us look a little further into this prospectus. Before doing so I want you to get an idea of what a 200-ton daily production means. It amounts to the hoisting every five minutes of the 24 hours of two mining cars of ore, in addition to the hoisting of waste, lowering of mining timbers, hoisting and lowering of men, tools and material. The gold mines maintaining a 200-ton daily production are the exception rather than the rule, consequently when this company talks of making a 2000-ton daily production, one has to laugh. Again the gold mines showing yearly net earnings of $1,000,000 are indeed rare, and one is forced to ask how many pipes this board of directors had to smoke before they had such a glorious dream as that contained in the last paragraph of p. 7 "We believe therefore we are conservative in anticipating that within five years the output of ore from these mines will be 2000 tons daily, with a daily net earning of $18,000, and a yearly net earning of $6,480,000." It is pertinent to state here that the total production, not merely profits, from placer and lode mining from the whole Hillsboro district from 1877 to 1904 does not exceed $6,000,000, and yet here is a company asking the public to believe its so called conservative statement that its property alone will not only produce, but earn, greater profits than that amount in one year.
>
> A mining investment should pay at least 10%. The capital of this company is $3,000,000 on which 10% would be $300,000. This sum earned annually in dividends might make the stock worth par, $1. We have already shown that it might make a profit of $272,000 in 1907, and yet in the face of all this we are told that the directors believe their stock will then sell at $5 per share (p. 7 of prospectus).
>
> Mr. T's estimated gross value of the ore in the Snake was evidently considered too small, so these careful, conservative directors took out 250 tons from the 420-ft. level, from which a "selected" shipment of "first class ore" was sent to El Paso smelting works. Size of shipment is not given, although it would appear to have been a ton. The return was $93.18 per ton. Seeing that this small lot was selected from 250 tons what do the figures $93.18 mean? Nothing. From the remaining 249 tons a carload was sent to Henry E. Wood at Denver for the purpose, it is said, of finding out the value of the "second class ore." Returns showed $20.22. Was this carload also selected? Most likely, as a prospectus must show up well, and the best is never too good.
>
> On p. 5 Mr. B. L. X.—— refers to his examination of the ore in the Opportunity mine. Mr. T says in his report he could not examine that mine because it was full of water, and I cannot find any reference to its having been pumped dry subsequent to Mr. T's visit.

MONEY LOST IN SWINDLE NOT IN MINING

From the foregoing one can readily see how a little study and analysis of mining-company literature will enable an intending investor to satisfy himself as to the value of the investment. This is an example of where it is unnecessary to employ an engineer, the company itself supplying all the evidence necessary to condemn it. One too often hears the statement, "I have lost too much in mining." In 99 cases out of 100 that man never lost a dollar in a mine. He was caught in a swindle and mining was the bait. In all probability a scrutiny of the prospectus along the lines indicated above would have disclosed a similar warning to keep out.

PROMINENT MEN, AS OFFICERS, ARE SOMETIMES ONLY VICTIMS OF PROMOTERS

Needless to say, my client did not invest in Alpha Consolidated Gold Mining Co. Instead he published my report in a New York mining journal, and the whole fabric went to pieces. The unfortunate thing was that this exposure carried to his grave, the president, who was a most worthy man, and whose name had merely been secured by the promoters to give standing to the promotion, and secure the attention of the public. He never got over the scandal connected with the exposure, and died of a broken heart. This circumstance should be a warning to men of prominence against lending their names to promoters without first carefully investigating.

In the last few years investors in America have got drubbing after drubbing in the market for railways and industrials. Even the bond markets show a loss so serious as to be felt by the savings banks. Railways have been watered to such an extent that they cannot now find capital for needed equipment and improvement, and they are now being pestered by legislators engaged in making capital for popular clamor. During all of this, most of the first-class mining stocks maintain an even tenor, and t is only among the copper issues that earning possibili-ies have been somewhat interfered with. Make the comparison as you will. Railways and industrials are the investment issues which must retire with second honors, while mining issues come to the front as bearers of first honors for investment preferment, and are becoming more and more popular among investors.

In these days when mining has been reduced to a manufacturing procedure, and a safe one at that when properly conducted, with, in the main, a commodity that does not fluctuate in market price as do other commodities, why should not legitimate mining be preferred as an investment? The profits are not the result of pauper labor, as miners at all times receive good wages, nor are the dividends the result of stock-market manipulation. The ore in sight in a mine is just as safe an asset as a stock of goods in a store; in fact it is safer, as it is not subject to loss through age or otherwise; it does not go out of style, and the product of a mine can most always find a profitable market.

It may be well to bear in mind that whereas agricultural products, such as grains, fruits, vegetables, etc., can be replaced from year to year, the ores extracted from a mine can never be replaced, and in making a mining investment, it is judicious to investigate as to the reserve, and compute whether or not the price of the shares bears a proper ratio to the physical condition of the property; especially is this so in the case of a property that has been producing for several years.

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The Watts Underground Transit

In the Journal of April 18 was published a description of a mining transit brought out by E. R. Watts & Son, of London. In commenting on this instrument, we criticized certain points in its design. It appears that the manufacturers make another model for mining work which embodies many of the features which we noted as desirable in an underground transit and is more specifically adapted to such use. In this model, the vertical circle is protected in a dust- and water-proof case, an auxiliary telescope is provided for attachment at any one of four points and a long bubble is mounted directly on the telescope. This should prove a splendid underground instrument.

⁂

Platinum in Westphalia

Doctor Fischer, director of the Royal Mining Academy, at Clausthal, Germany, writes a cautionary letter to the *Deutsche Bergwerkszeitung* in reference to an article published in that paper on the platinum occurrence in Germany, in which the Clausthal Mining Academy is given as authority for certain statements. In this letter he says: "It must be observed that the Mining Academy has absolutely nothing to do with this matter. Professional opinions given by Doctor Hommel have been delivered by him as a private person, and not in his capacity as teacher at the mining college. The Mining Academy regards this correction as specially important, because of late reports have repeatedly been published in the daily press, which even went so far as to speak of borings carried out by the Clausthal Academy, and also because the names of the Academy as well as of Doctor Hommel have repeatedly been misused for publishing most monstrous misstatements and exaggerations." Statements concerning the Westphalian platinum operations appear in the Journal of June 20, p. 1252, and July 4, p. 10.

⁂

Types of Journal Bearings for Mill Use

By Herbert A. Megraw

At first glance, it might appear that mill operators generally were overlooking an important economic point through the exceedingly small amount of interest manifested in the line-shaft bearings of mills of all kinds. Such an opinion might easily be confirmed, even in large and important mills where every detail is supposed to receive discriminative study, but the source of the loss is not necessarily involved in the type of bearing used.

There are three distinct types of bearings in general use for industrial purposes, these being plain bearings lined with anti-friction metal, roller bearings, and ball bearings. The plain bearings are susceptible of refinements, such as ring-oiling devices and aligning adjustments. Roller and ball bearings exist in various degrees of perfection. The principal question, then, for the mill operator, is which of these types of bearings ought he to install in a mill, and approximately what will be the saving obtained by the most satisfactory type?

Before attacking the question of type, however, it might be profitable to say a few words about the practical application of the types already in use. Undoubtedly, plain anti-friction metal journals are principally installed, and just as undoubtedly, they receive too little attention, a condition which surely entails an insidious loss of money. Lack of care costs a good deal more than improper selection of the type of bearing, even if it can, in reality, be shown that any one type is better than all others for the purpose. The principal fault is improper alignment, a condition which involves a greater waste of power than any other. Even where alignment was good at the time of installation, it is not always so maintained. It cannot be expected that a delicate adjustment like shaft alignment will be maintained through the settling of mill foundations, drying of timbers, twisting of steel members, or any and all of the changes attendant upon the tuning up of a mill. Often long shaft installations are never realigned after installation, and the inevitable result is an inordinate amount of friction and consequent waste of power.

Lack of attention in keeping bearings clean and properly oiled is responsible for loss of efficiency. Proper oiling does not mean the wholesale application of lubricant. That is waste which simply runs in and out of a bearing. Only the required amount of oil ought to be used, and bearings ought to be carefully cleaned out at frequent intervals, because the dust and dirt which accumulates in them in any kind of a mill, is sufficient in a very short time appreciably to increase the friction. By taking proper care of even the simplest form of bearing, great increases of economy can be secured, nor can the same care be safely omitted even when the most advanced types are employed.

The actual utility of the three types of bearings, ring-oiled babbitt bearings, roller bearings, and ball bearings, can be appreciated by the conclusions reached in an article on the subject by C. C. Thomas, E. R. Maurer and L. E. A. Kelso, presented to the American Society of Mechanical Engineers. Twenty bearings of each type were used in the tests.

The apparatus consisted of 25 ft. 10 in. of line-shafting in five equal sections, mounted in hangers, which were inverted and used as floor stands. The hangers were bolted to two 8-in. I-beams, which were leveled upon the floor. The shafts were of cold-rolled steel, $2\frac{7}{16}$ in. in diameter. Each section was 5 ft. 2 in. long; the adjacent sections were coupled together by means of a flexible leather disk or two straps connecting the two flange couplings. The flexible couplings prevented the transmitting of any part of the load applied on one shaft to either adjoining section, and also prevented binding between shafts and bearings due to possible lack of alignment.

A direct-current Fort Wayne motor was directly connected to one end of the shafting by means of a flexible coupling. Its rating was 7½ hp., 28 amp., 400/1600 r.p.m., four-pole, 230 volts.

The load was applied through levers upon hardened knife edges and pin points as fulcrums. Across the top of the 8-in. I-beams and at right angles to them were bolted short 6-in. I-beams to which, the fulcrums were attached. Standard 1000-lb. scales were set upon the 6-in. I-beams. A double system of leverage was used in order to get sufficient load upon the bearings with as short a length of leverage as possible. A pressure ratio of 8.33 at each bearing to one at the scale was realized.

TABLE 1. COMPARISON OF COEFFICIENTS OF FRICTION

Peripheral speed of shaft = 150 ft. per min. corresponding to 235 r.p.m.

Bearing	Average Load per Bearing = 727 Lb.		Average Load per Bearing = 1227 Lb		Average Load per Bearing = 1727 Lb.	
	Temperature Bearing = 77° F Coeff. Friction	Temperature Bearing = 100° F. Coeff. Friction	Temperature Bearing = 77° F. Coeff. Friction	Temperature Bearing = 100° F Coeff. Friction	Temperature Bearing = 77° F. Coeff. Friction	Temperature Bearing = 100° F. Coeff. Friction
Ball ..	0.0025	0.0019	0.0022	0.0018	0.0020	0.0016
Roller	0.0069	0.0055	0.0055	0.0047	0.0049	0.0042
Babbitt . . .	0.0112	0.0075	0.0082	0.0058	0.0070	0.0051

The loads were applied to the shaft by two bearings between each pair of hangers. These bearings were identical with those in the hangers. The bearings were prevented from turning by short levers fastened to the bearings and resting upon uprights from the floor. Only one type of bearing was tested at a time, so that no complications might arise in establishing the losses for the particular bearing under test. The reason for using 20 bearings was that the amount of power necessary for a single bearing was so small as to be difficult of measurement. Also any single bearing might not truly represent results from that type of bearing in general.

The three kinds of bearings tested were: The Hess-Bright ball bearing, manufactured by the Hess-Bright Manufacturing Co.; the ring-oiled bearing, manufactured by the Dodge Manufacturing Co., lined with babbitt metal made from their formula, and the Hyatt roller bearing, manufactured by the Hyatt Roller Bearing Co. All bearings were for the same size shaft and, in fact the same pieces of shafting were used for all tests, except that two sections bent during the tests were replaced.

To avoid the endwise thrust of the shaft, when supported by the roller bearings, it was necessary to interpose two ball-thrust collars. Before this was done, excessive vibration of the motor and of the apparatus resulted from the tendency of the shaft to move endwise. This was particularly troublesome at high loads and speeds.

The speeds used in the tests were between 150 and 450 r.p.m., corresponding, respectively, to about 100 and 300 ft. per minute peripheral speed. Most of the loads used were between 700 and 1800 lb. per bearing, corresponding respectively to about 30 and 80 lb. per sq.in. for the babbitt bearings. All statements of results, therefore, are subject to the above limitations as to speed and loads.

Two lubricants were used in all the tests: Atlantic Red Engine Oil in the babbitt and roller bearings, and No. 2 Keystone Grease in the ball bearings.

The data included in Table 1 regarding coefficients of friction for the three types of bearings at various loads and temperatures of bearing, and at a peripheral speed of the shaft of 150 ft. per min., corresponding to the average lineshaft speed of 235 r.p.m., are interesting:

TABLE 2. COMPARISON OF RELATIVE AMOUNTS OF POWER CONSUMED IN FRICTION

Bearing	Peripheral speed = 100 ft. per min corresponding to 157 r.p.m.		Peripheral speed = 300 ft. per min. corresponding to 470 r.p.m.	
	Temperature of Bearing = 77°F	Temperature of Bearing = 100°F	Temperature of Bearing = 77°F.	Temperature of Bearing = 100°F
Ball	1	1	1	1
Roller	2.2	2.5	2.7	3
Babbitt	3	3.6	4.5	4

Table 2 presenting the comparison in a different way is given. It gives the relative amounts of power consumed in friction by the three types of bearings, assuming the relative amount of power consumed in friction by the ball bearing as 1. The relative numbers given are based in each case on the average power for three loads: 710, 1210 and 1710 lb. for ball bearings; 740, 1240 and 1740 lb. for roller bearings: 730, 1230 and 1730 lb. for babbitt bearings.

The power for the babbitt bearing is higher than for the others except perhaps at low loads and speed, and the power for rollers is higher than for balls. The excess of power for babbitt over rollers and rollers over balls increases with increase of speed for all loads.

For babbitt and roller bearings there is a marked difference between the average coefficient of friction for the first hour and for the second hour. Thus in one of the runs, the average coefficient for the first hour was about 0.0058 and for the second hour about 0.0018. Hence the energy wasted in friction in the second hour was about 85% of that in the first hour. This effect is less marked with roller bearings.

The clear result of this test is to show that ball, roller and babbitt bearings are efficient in a general way in the order named. The difference in power consumed for the ball bearing and plain bearing is, at low speed, as 1 to 3, the roller bearing coming in between, while at higher speeds the difference may be as great as 1 to 4.5. It is to be understood, of course, that conditions in the tests are the best posible in every case, and that the difference is that due to type alone.

In an article dealing of the power consumed by bearings in a former issue,[1] it was shown by a series of tests that the average reduction in power consumption by using roller bearings, over plain bearings, was 0.1 hp. On a 2-in. shaft, the plain bearing used 0.133 hp., while the roller bearing used only 0.026 hp., a reduction of about 80%. The information was obtained by testing a large number of bearings which were driven by electric motors. In this way, the power requirements of the motors with different loads was measured, and that required by the shafting alone arrived at by difference.

The difference between the amount of power required with the belts on and with the motor running free, represents the power absorbed in bearings, subject to a slight correction on account of the change of efficiency of the motors at different loads. The extra tension on one side of a belt, when operating a machine, and the consequent increased friction, is not measured. This amounts to about 20%, but as the increase is due to work done, and occurs only when the machine is operating, it was not considered in the calculations.

While the superiority of ball and roller bearings is evident in all comparisons, it is noteworthy that the actual power difference is not extreme and some careful study will have to be given to each instance in order to select the most satisfactory installation.

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Mond Nickel Co.

The Mond Nickel Co., Ltd., after an existence of nearly 14 years, has just voted to reincorporate under the same name and increase its ordinary-share capital. It is not often that an extremely prosperous company goes into even formal liquidation, but in this instance it was considered advisable to recapitalize on a basis commensurate with the favorable developments at the company's copper-nickel mining properties in the Sudbury district in Ontario. This corporation has been reticent in the past about giving out information relative to its properties, but it is interesting to note that at the recent general meeting the chairman announced that at the present rate of production the ore reserve would last for "something like half a century," and that even at a greater rate of production, now contemplated, the known ore reserve would outlast the lives of most of the present stockholders. Within the last year the company has completed its new smelting plant in Canada and has acquired additional mining properties, the most important of which was the Levack No. 1. The company has also acquired a valuable water power on the Spanish River, which is now being developed and will insure cheap electric power when an increase is required. With its new and uptodate metallurgical plant, the treatment costs will be reduced, and improvements in the mining equipment will also lower underground cost, so that the company now finds itself in a most satisfactory condition. The new Mond Nickel Co., Ltd., will reissue the 5% debenture stock, amounting to £375,000, and £500,000 of preference-share capital will also be reissued, but preference shareholders will receive five new £1 shares in place of the old £5 shares, the change being made so as to provide a more marketable security. Deferred shares, accepted by Dr. Ludwig Mond in lieu of any cash profit for transferring the assets which he had acquired before the formation of the company, have now been eliminated by increasing the ordinary-share capital of the new company to £900,000, which will be divided equally between former ordinary shareholders and the deferred shareholders. The reincorporation will thus have a tendency to simplify and unify the interests of the various bodies of shareholders, and we trust that the company will long enjoy the period of prosperity which is now in prospect.

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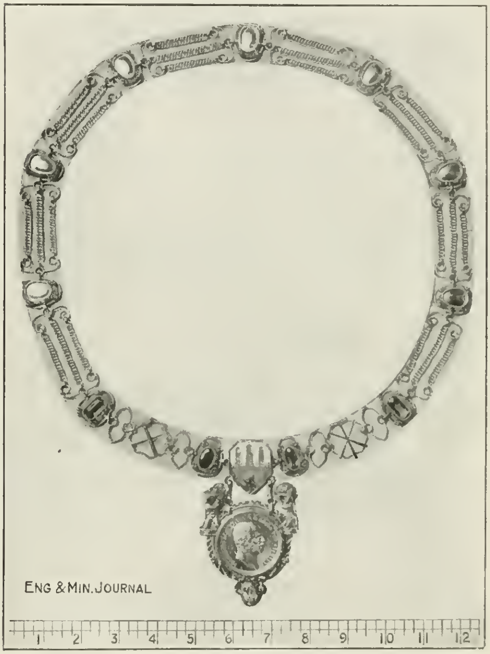
Dr. Kolbeck, of Freiberg

The old Freibergers in America were greatly pleased by the visit of Dr. Kolbeck, rector of the Bergakadamie, who came to New York to attend the 50th anniversary of the School of Mines at Columbia University. Dr. Kolbeck brought with him the official chain of the rector of the Bergakadamie, which was conferred by the Government in 1906, the official inscription being the following:



RECTOR'S CHAIN, FRIEBERG, BERGAKADAMIE

Amtskette für den Rektor der Kgl. Sachs. Bergakadamie zu Freiberg auf Grund Allerhöchster Verleihung überreicht am 27. Oktober, 1906. von Seiner Excellenz Herrn Staats- u. Finanzminister Dr. Rüger.

There was an interesting incident about this chain soon after Dr. Kolbeck's arrival in New York. He attended a meeting of the New York section of the American Institute of Mining Engineers. In talking with some friends he mentioned that he had his insignia with him. "Where is it?" he was asked. "Oh, in my trunk at the hotel," he replied. His friends were distressed that so valuable a thing should be unguarded in a bedroom of a New York hotel. This was at the hour of midnight, but Dr. Kunz was with the party; so they went to the hotel, obtained the Freiberg insignia, and took it to the vault of Tiffany & Co., to which, of course, Dr. Kunz had the entry.

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[1] Eng. and Min. Journal, Aug. 30, 1913.

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Radium and Mining Commission Legislation

WASHINGTON CORRESPONDENCE

Considerable interest has been expressed in the situation and prospects of the various bills relating to the mining of radium and to the establishment of a mining-law commission, whose duty it shall be to revise the existing legislation of the United States relating to mines and mining. The present prospect is that the Smoot bill for a mining-law commission, which passed the Senate some time ago, will be adopted by the House before long. It is now on the speaker's table and may be called up at any time. This bill was abstracted in the JOURNAL of May 16, 1914, p. 1016.

Present prospects do not favor the adoption of either of the radium bills now pending. One of these was introduced by Mr. Foster, on Jan. 31 (H. R., 12,741) and was ultimately committed to the committee of the whole house on Feb. 3, where it still remains. The other was presented by Senator Walsh of the Senate Committee on Mines and Mining and is substantially identical with the Foster bill. Neither bill is receiving much attenton now and both have been sharply opposed by the anti-conservation element in Congress. Harm has been done to their prospect by the discouraging statement with reference to the utility of radium in the cure of cancer. In reporting the bill in the Senate, Senator Walsh said in part:

"The bill as reported gives the Government the prior right to purchase radium-bearing ores mined from the public lands located after the passage of this act at such prices, to be fixed by the Secretary of the Interior and published in advance, as will encourage the prospecting for and mining of such ores by private parties. It also authorizes the Secretary of the Interior to provide the necessary building and equipment with which to extract the radium from these ores; to sell the byproducts obtained in connection with such operations. The prospector and miner is thus given the assurance of a steady market and prompt payment at reasonable prices for the ores which he mines; and, if at any time the Government is not prepared to purchase such ores, he is authorized to sell them in the open market."

The report of the House Committee on Mines and Mining (H. R., 211) sets forth so clearly the radium situation and the need for such legislation that it calls for but brief further treatment.

In the first place, the call for this legislation has a humanitarian basis because of its relations to public health, and the arguments which might be raised against the Government's entering into mining or metallurgical operations in relation to other mineral substances, which might have a purely commercial basis, might not apply in this instance.

The experiences of the few surgeons in this and other countries who have been able to secure a sufficient quantity of radium for use in the treatment of disease, have demonstrated beyond reasonable doubt the importance of radium as a cure for certain superficial types of cancer, and give promise of its value in supplementing surgical operations in the treatment of other forms of cancer if this treatment can be begun in the early stages of the disease and as surgeons secure radium enough to become more experienced in its application.

Best statistics available show that there are in the United States at the present time no less than 200,000 persons suffering from cancer, and that the death list in the United States from this dread disease is not less than 75,000 persons each year.

At the present time there are not more than 40 grams of radium in all countries available for the use of medical science, and of this quantity not more than 2 grams are available for use in the United States.

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Buffalo Mines

The Buffalo Mines, Cobalt, Ont., for year ended Apr. 30, 1914, shows that while dividends amounting to $660,000 were paid it was necessary for the company to draw on its quick assets to the amount of $271,813 to meet this payment. This indicates that the actual net gain from operations was $388,187. The report shows the net income after adjustment to have been $389,782, the difference is in a slight gain in the capital accounts.

The company produced and sold 1,637,809 oz. of silver valued at $974,082 or about 59.5c. per oz. Freight and treatment charges were $123,216 or about 7.5c. per oz. Other income, $7958, made total income, after deducting freight and treatment, $858,824. According to the statements the net income from producing this silver was about 23.8c. per oz. indicating a total cost of approximately 35.7c. per oz. including freight and selling charges. The mines produced 77,616 tons of ore as follows; 824 tons from raising, 11,561 tons from drifting, 42,615 tons from stoping, and 22,691 tons from reserves in stopes and on surface. All this ore was treated in the mill and based on this tonnage the costs were as follows; per ton milled:

Mining ($2.80 per ton broken)	$1.99	Cobalt office	$0.33
Milling	1.41	New York offices	0.16
Cyaniding ($4.03 per ton cyanided)	0.71	Insurance, taxes	0.38
Repairs and renewals	0.18	Royalties	0.04
Depreciation	0.45	Adjustments	0.03
Ray Lease, operating	0.09	Freight and treatment	1.59
Boarding house	0.14	Total	$7.70
Shops	0.06	Less credits	0.10
Stable	0.04	Net cost per ton	$7.60
Assaying, surveying, drafting	0.10		

The mill treated 77,616 tons of ore averaging 25.31 oz. of silver per ton and recovered 76.14% by concentration. The cyanide plant treated 13,388 tons of slime concentrates from the mill averaging 10.13 oz. of silver per ton of which 77.8% was recovered. The total mill recovery was 81.5%. The amalgamation plant and refinery treated 20 tons of high-grade ore direct from the mine, 301 tons of jig concentrates, 923 tons of table concentrates, and 6157 lb. of metallics from the low-grade mill, and 17,317 lb. of precipitates from the cyanide plant. The total production of refined bullion from this plant was 1,682,759 fine ounces or 18,707 oz. more than silver contained in the ores treated during the period, the difference being process silver from ores previously treated.

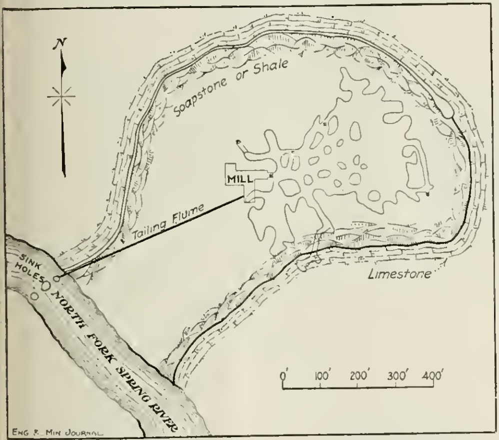
The reserves from development during the year are approximately 51,116 tons, averaging about 25 oz. silver per ton or a total of 1,352,900 oz. There are approximately 28,039 tons of ore broken in the stopes, containing 707,725 oz. In addition to this ore, there are stored over 200,000 tons of sand tailings containing over a million ounces of silver which will possibly be treated.

Details of Practical Mining

Plugging Water Channels into a Mine

By J. E. Reno*

The Little May mine is situated on a flood plain of the North Fork of Spring River, three miles northwest of Neck City, Jasper County, Mo. The mill was erected and started to operate in the summer of 1910 and mining was carried on successfully until some time in March, 1911, when the river, through sink holes in its bottom and a solution channel following the contact of the shale and limestone as indicated on the map, broke into the mine workings. The water came into the workings from all sides and its volume was so great that the mine was flooded and work had to be abandoned until the high water in the river subsided, when various schemes for stopping up the sink holes were tried.



Map Showing Relation between River and Mine

A drought of about four months' duration followed the wet period and while the river was extremely low, coffer-dams of burlap sacks filled with soil from the river bank, were built around the sink holes. The holes were then filled with hay and dirt and covered with boulders. During this time, June 1 to 17, the mine was dewatered. The channel had still not been closed, since muddy water came into the mine, and it was evident that dirt was not the material with which to choke off the water.

It was next attempted to seal the sink holes with rock and concrete, but in August when another flood came, new sink holes developed and the water flow into the mine for about two months was as heavy as ever. In the meantime more pumps were installed, capable of handling the water, which had increased from 700 to about 3000 gal. per min. For two weeks more the former methods were tried, at a further cost of $1000, but without success.

I then devised the plan of running a tailing flume from the mill to the river, a distance of 600 ft. and extending it to the various sink holes. This cost $600, but did away with carting the tailings.

The tailings contained a good deal of cementing material and were found to be a cheap and efficient material both for the coffer-dams and for filling the sink holes. In two hours after the tailings had been turned into the holes, the water had been cut down to the normal flow of 700 gal. per min. When nearly filled, boulders were piled on the tailings up to the level of the bottom of the river to serve as ballast and kept the river from washing out the tailings.

Three other breaks in the river, at different periods, were stopped in the same manner, and the river permanently choked off.

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*Superintendent, Little Mary Mine, Webb City, Mo.

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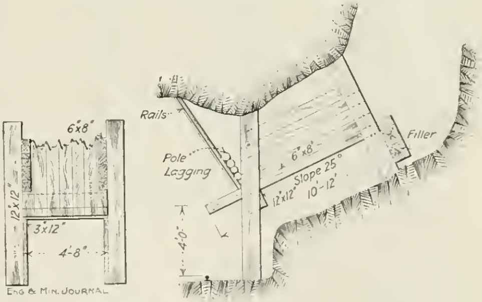
Chute for Handling Boulders

By Henry J. Volker*

The accompanying drawing represents a chute designed to handle large boulders from a shrinkage stope. Its chief feature is its door, which is simply pole lagging in lengths of about 6 ft., extending clear across the front of the chute and resting against two inclined rails set in hitches in the back of the drift and notches in the chute bottom just opposite the sides of the chute. The inclination of the rails, which is greater than 90° to the chute floor, makes the effort of raising the poles with a bar less than if the rails were vertical. Vertical rails were tried, using 3-in. planks instead of poles, but great difficulty in raising the planks was encountered.



Wide Chute with Gate of Lagging

Between the back posts of the chute and the ground, filler pieces are usually required, and also at least one under the back cross-piece, depending on how the ground breaks. An iron plate is placed on the floor of the chute to resist wear and permit the material to flow more easily. The plate is not shown in the drawing. Spikes, about 10 in. long, made by the mine blacksmith, are used in putting the chute together.

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*No. 3 Mine, Canadian Copper Co., Sudbury, Ont.

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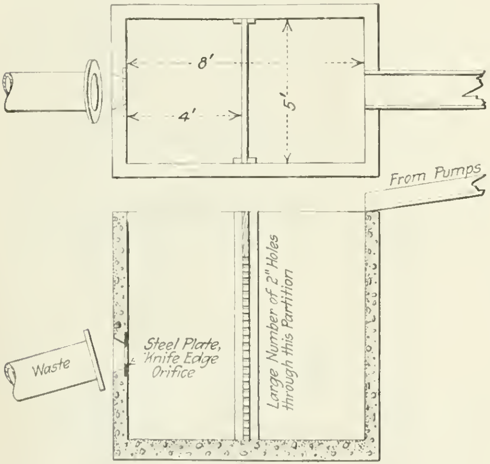
Permanent Measurement Tanks for Mine Pumps

Permanent concrete tanks have been installed at both the East Vulcan and West Vulcan shafts of the Penn Iron Mining Co., so as to obtain a continuous record of the amount of water pumped. (*Bull.* A. I. M. E., February, 1914.) One of these tanks is shown in the accompanying illustration. There is a division wall in it pierced with a great many 2-in. holes. The water from the mine flows into the back part of the tank and through the holes in the division wall into the front part. This breaks up the flow and eliminates the "velocity of approach" to the orifice. In the front wall of the tank there is a plate of steel with a circular knife-edge opening of exact size.


8'
4'
5'
From Pumps
Waste
Steel Plate, Knife Edge Orifice
Large Number of 2" Holes through this Partition

ENG. & MIN. JOURNAL

CONCRETE MEASURING TANK WITH ORIFICE

The quantity of water that flows through the orifice depends on the head above the center of the orifice. This head is continuously recorded on a water-level gage and tables for each orifice show the gallons per minute corresponding to each tenth of a foot of head. The recording chart is circular and when the pumping is regular, the recorded line approximates a circle. When the pumping is irregular the average is ascertained by the use of a planimeter. Orifices of different sizes are used when the quantity of water changes, so as to keep the water at somewhere between 2 and 4 ft. above the center. With these permanent measuring tanks and suitable electrical instruments a test of pumping efficiency becomes a simple matter.

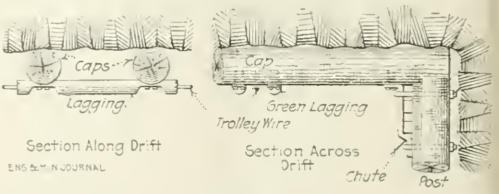
⁂

In Making a Primer It Is Essential, according to the "du Pont Magazine," that the detonator be so placed as not to become jammed in the hole, or be struck by the tamping stick or be pulled out. It must be entirely embedded in the dynamite and should have its closed end point toward the bulk of the charge. The fuse should come in contact with the dynamite only for about ½ in. near the detonator, hence lacing is not permissible. Metal should not be used to secure the detonator to the stick of dynamite.

Trolley-Wire Protection of Round Lagging

By W. H. Jobe*

The accompanying illustration from my annual report for 1912-13, represents a method of protecting underground trolley wires, devised by Capt. E. Carlson, of the Bristol mine, near Crystal Falls. Lengths of round green tamarack lagging are notched and spiked to the drift caps on both sides of the trolley wire. This material is readily had and is cheap. It is more easily placed than the ordinary inverted trough and is much stronger and capable of resisting the shock of blasting in the chutes, which is frequently necessary.



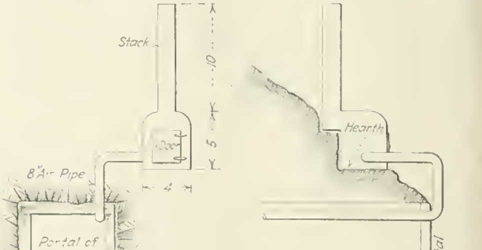
POLE GUARDS TO PREVENT CONTACT WITH TROLLEY WIRE

⁂

Adobe Stove for Tunnel Ventilation

By T. Swift†

The illustration shows a modification of the stove ventilator, as used in Mexico. This stove was built of adobe bricks and was rather large, 4x4 ft. square, 5 ft. high, with a stack 10 ft. high. It was built outside of the tunnel and above the portal. The air pipe was run from the last set of timber near the face of the tunnel and entered the stove at the top of the hearth. A roaring wood fire would suck the powder smoke from the 400-ft. tunnel after shooting, in 10 or 15 min. The arrangement seems to require only that the top of the hearth, where the pipe enters, be above the elevation of the pipe at the face. In cases when the draft does not start readily and "*la estufa no quiere*" a damper in the pipe at the stove will over-



STOVE FOR SUCKING GASES FROM TUNNEL

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*Inspector of Mines for Iron County, Crystal Falls, Mich.

†Mining engineer, Mineville, N. Y.

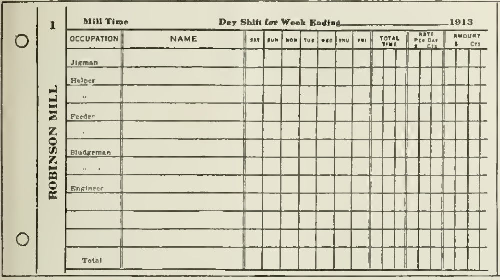
come the difficulty, if kept closed until the fire is going briskly and then opened. This arrangement was not scientifically built or investigated, but it worked well and is handy where natural ventilation or compressed air are lacking.

⁂

Loose-Leaf Time-Keeping Forms

By R. R. Heap*

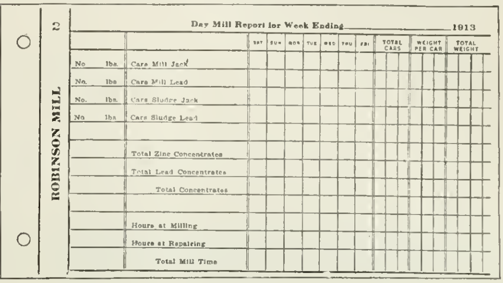
It is customary in the Joplin district to pay off each week on Saturday, holding back from the wage only one day, Saturday of the day shift and Friday night of the night shift. When the ordinary commercial type of time book is used, beginning the week on Sunday, the foreman has to begin his week in the last column, or two columns, and then jump to the first column. Furthermore, he has to fill in the occupation of each man in an extremely limited space. Since this entire arrangement is awkward, I attempted to get a book printed to begin the week with Friday, but was told by the manufacturers that to warrant the change they would require a larger order than I could place and I therefore devised a loose-leaf system. While no one else in the district is using this system, it has proved thoroughly satisfactory and with us no return to the old method would be considered. We use 10 forms in all, of which six are illustrated here, the other four differing in only a few details.


1 Mill Time Day Shift for Week Ending ____ 1913

ROBINSON MILL

OCCUPATION	NAME	SAT	SUN	MON	TUE	WED	THU	FRI	TOTAL TIME	RATE Per Day $ Cts	AMOUNT $ Cts
Jigman											
Helper											
"											
Feeder											
"											
Sludgeman											
" "											
Engineer											
Total											

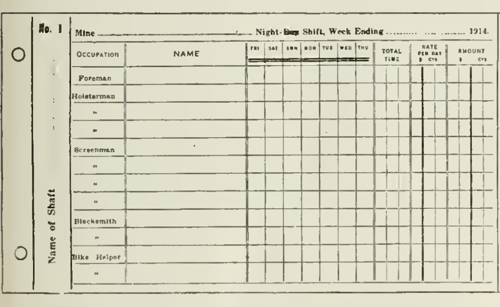
FIG 1


2 Day Mill Report for Week Ending ____ 1913

ROBINSON MILL

		SAT	SUN	MON	TUE	WED	THU	FRI	TOTAL CARS	WEIGHT PER CAR	TOTAL WEIGHT
No lbs.	Cars Mill Jack										
No. lbs	Cars Mill Lead										
No. lbs.	Cars Sludge Jack										
No lbs	Cars Sludge Lead										
	Total Zinc Concentrates										
	Total Lead Concentrates										
	Total Concentrates										
	Hours at Milling										
	Hours at Repairing										
	Total Mill Time										

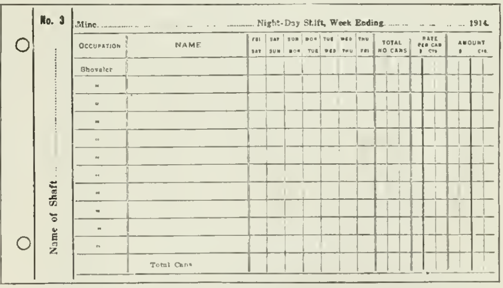
FIG 2


No. 1 Mine ____ Night-~~Day~~ Shift, Week Ending ____ 1914.

Name of Shaft ____

OCCUPATION	NAME	FRI	SAT	SUN	MON	TUE	WED	THU	TOTAL TIME	RATE PER DAY $ CTS	AMOUNT $ CTS
Foreman											
Hoisterman											
"											
"											
Screenman											
"											
"											
"											
Blacksmith											
"											
Blks Helper											
"											

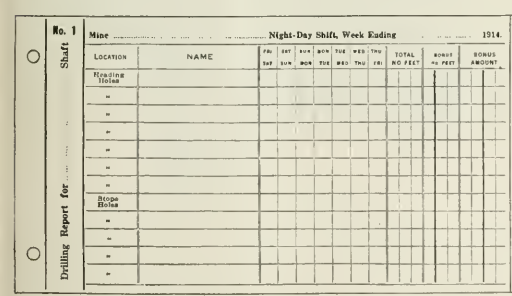
FIG 3


No. 3 Mine ____ Night-Day Shift, Week Ending ____ 1914.

Name of Shaft ____

OCCUPATION	NAME	FRI SAT	SAT SUN	SUN MON	MON TUE	TUE WED	WED THU	THU FRI	TOTAL NO CARS	RATE PER CAR $ CTS	AMOUNT $ CTS
Shoveler											
"											
"											
"											
"											
"											
"											
"											
"											
"											
"											
	Total Cars										

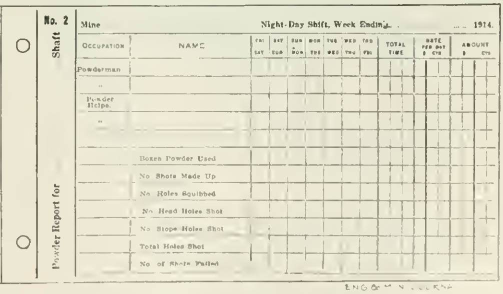
FIG 4


No. 1 Mine ____ Night-Day Shift, Week Ending ____ 1914.

Drilling Report for ____ Shaft

LOCATION	NAME	FRI SAT	SAT SUN	SUN MON	MON TUE	TUE WED	WED THU	THU FRI	TOTAL NO FEET	BONUS PER FEET	BONUS AMOUNT
Heading Holes											
"											
"											
"											
"											
"											
"											
Stope Holes											
"											
"											
"											
"											

FIG. 5


No. 2 Mine ____ Night-Day Shift, Week Ending ____ 1914.

Powder Report for ____ Shaft

OCCUPATION	NAME	FRI SAT	SAT SUN	SUN MON	MON TUE	TUE WED	WED THU	THU FRI	TOTAL TIME	RATE PER DAY $ CTS	AMOUNT $ CTS
Powderman											
"											
Powder Helps.											
"											
	Boxes Powder Used										
	No. Shots Made Up										
	No. Holes Squibbed										
	No. Head Holes Shot										
	No. Stope Holes Shot										
	Total Holes Shot										
	No. of Shots Failed										

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FIG 6

Some of the Forms Used in the Loose-Leaf Time-Keeping System

Four forms were used for the mill, those for the day shift being shown here, Figs. 1 and 2; those for the night shift are identical except that the week begins with Friday. The second mill sheet provides for tallying production.

The six sheets for the mine are interchangeable for night or day shifts. Thus, Fig. 3 shows the sheet prepared for the night shift by crossing off the word "Day" and the lower row of daily headings. There are always at least two spaces given to each occupation so that in case a man is discharged during the week, there will be a blank line in which the name of his successor can be written. Fig. 4 shows the sheet for the shovelers, and differs in being arranged to show the total number of cans instead of the total number of days worked, inasmuch as the shovelers are paid by the can. The total for each shift gives at a glance the production of the shaft for that shift. Another form, similar to that of Fig. 3, contains six lines for machinemen and six lines for machine helpers, while a fourth sheet is also similar, but devotes two lines to "hookers," four to trammers, two to trackmen and two to "brunomen," while two are blank.

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*Superintendent, Lennan Zinc & Lead Co., Miami, Okla.

The drilling and blasting are taken care of by the two forms shown in Figs. 5 and 6. A bonus system of drilling is used, based on the footage made for the week, and for the powdermen, a bonus system based on the saving of powder per ton.

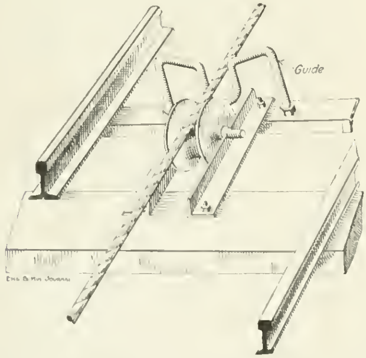
The sheets measure 3¾x6¾ in. and are printed on one side only. The timekeeper prepares them for each mine shaft and shift, puts them in a ½-in. ring binder and gives them to the foreman. At the end of the week they are returned and filed. The result has been that little trouble is experienced with the payroll, the labor employed on any shift can be seen at a glance and the foremen are highly pleased with the arrangement.

⁂

Rope Guide to Footwall Sheaves

By Clarence M. Haight[*]

A simple but effective method of guiding a hoisting rope to its sheaves on the foot wall of an inclined shaft is shown by the accompanying drawing, which explains itself.

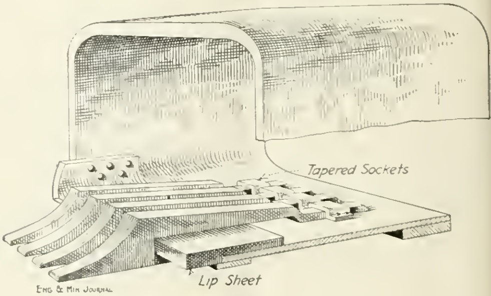


Bracket for Guiding Hoisting Rope to Sheave

The brackets are used by the New Jersey Zinc Co. on its main shaft at Franklin Furnace, N. J. This shaft dips about 50°; the tracks are 6½ in. deep, and are supported on concrete piers. The guides are made of ⅞-in. round iron, supported by angles, as shown. The sheaves are of iron with a wearing surface of hard rubber.

New Tooth for Steam-Shovel Dipper

A new dipper tooth has been invented by Edward Webb and Vernon Keech, of Virginia, Minn. (U. S. Pat. 1,087,631). It is arranged for holding to the bucket by friction. The shank end is slipped into a tapered socket as shown, and the digging end is carried by a lip-sheet, the front edge of which is notched to admit the teeth.



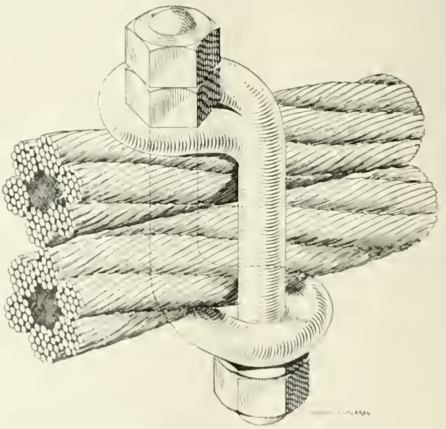
Method of Inserting Teeth

⁂

Home-Made Cable Clamp

By Walter R. Hodge[*]

The chief virtues of the clamp illustrated here are simplicity of operation, ease of fabrication and tenacity of grip. An ordinary blacksmith can turn out a dozen an hour without straining himself. For ¾-in. cable the clamp is made of ⅜-in. iron bent into a 1¼-in. eye and welded. A shank 3 in. long is threaded half its length and turned at an angle of 90° to the plane of the eye and two nuts provided for each shank. The clamps are used in pairs, the shank of one being shoved through the eye of the other with the two thicknesses of cable between and the nuts placed and tightened and locked with the extra nut.



Application of Light Cable Clamp

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[*] Mining engineer, Franklin Furnace, N. J.

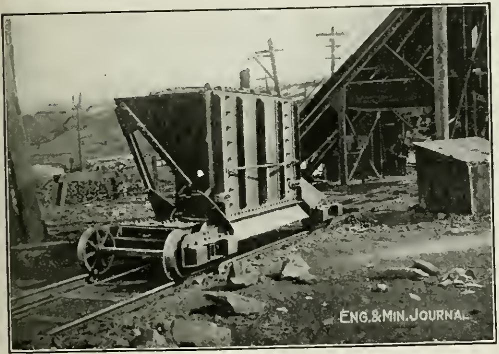
[*] Mining engineer, Ducktown, Tenn.

Details of Milling and Smelting

Steel Double Truck Car

By R. B. Wallace*

The double-truck surface car used at the Republic mine on the Marquette range, Michigan, is shown in the accompanying illustration. The capacity of the car is 60 cu.ft., or 3½ tons of ore. At two of the shafts the car is run to the stockpile and pocket by gravity, and at the third by endless-rope motor haulage. The car dumps automatically, and the dump is adjustable. The box is 7 ft. long, 4 ft. wide and 4 ft. 4 in. high. The bottom, door and end plates are ½ in. thick and the bottom and door are lined with ½-in. wearing plates. The underframe consists of three 5-in., 14¾-lb. per ft. I-beams reinforced with 2⅛-in. truss rods. The door is reinforced with one rod. The axles are 2½ in. diameter, and the bearings are outside the wheels. Hyatt roller bearings and manganese-steel wheels are used. The track gage is 3 ft. All the angles used in bracing are 3x3x½ in. The bottom of the box lies at an angle of 47° which allows the ore to run out freely. The car is 14½ ft. long and 5 ft. 10 in. high overall. Due to the heavy pounding of the hard ore, all parts are made extra strong and a considerable amount of steel is used in the car.



Steel Car Used at the Republic Mine, Marquette Range, Michigan

⁂

Salt for Clinker

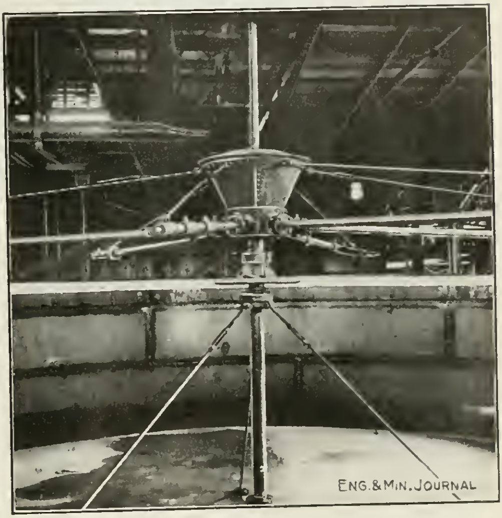
Clinker adhering to the sides of the furnace walls of a boiler and tending to bridge over the grate may be knocked off with a firing tool, but in this way damage is done to the brickwork, says *Power*.

In a Canadian plant serving a salt works, chain-grate stokers are used and trouble was caused by clinker adhering to the side walls and extending out over the grate. Much of the low-grade salt is thrown away at these works. One day last winter the laborers conceived the idea of dumping some of the waste salt into the coal pile in front of the boilers instead of wheeling it a long distance in the cold. Soon after using this "salted coal" it was noticed that the clinker on the side walls had vanished; investigation and experiment showed that the salt was responsible for its disappearance. Now, when it is desired to remove clinker on the side walls a few shovels of salt are thrown into the coal hopper feeding the stoker and a little is also thrown on the clinker.

⁂

Sand Tanks at the Dome Mill

With the new system of ore treatment at the Dome mill, South Porcupine, Ontario, it is designed to treat half the product as sand and half as slime. The leaching installation for sands consists of six 40x8.5-ft. steel tanks. They contain the usual bottom grating, and a filter bed of coco matting and canvas. The filter bed is caulked around the tank, between the grating and tank sides, with rope.



Types of Butters Distributor in Sand Tank at the Dome Mill

In order to assist in sluicing out the tanks, the filter beds are inclined from diametrically opposite sides, forming a V-shaped depression along the opposite diameter. In the tank side, flush with the filter mat, at the ends of this depression, are two side-discharge doors. In the center of the tank there is a round door fitted with a plug controlled by a wheel at the surface of the tank.

A wooden strip is fixed to the steel-tank side at the top, so that it may be accurately leveled, permitting an even overflow at all points. An annular canal around the outside of the tank side collects the overflow and conducts it to exit points, whence it returns to the battery-water tank for re-use. The leaching time for sands in the tank is calculated to be about five days. Incoming pulp is delivered to the tanks through a Butters distributor There are two of these, each serving three tanks. They operate on a truck overhead, traveling on girders.

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*Republic, Mich.

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Cost of a Reverberatory Bottom

By Percy E. Barbour*

The No. 6 Garfield reverberatory furnace, 19x112 ft., was built on a slag foundation and then 20 in. to 24 in. of silica sand was tamped in to form the hearth bottom The silica used was from the quarry at Draper, Utah, and was crushed to sand and delivered in gondola cars above the charge hoppers of the furnace, was dumped and shoveled into the hoppers and thence into the furnace by laborers. The sand was then distributed by wheelbarrows and tamped by Greek laborers using 8x8-in. blocks with plug handles. Tamping began at the verb end and the bottom, which resulted 200 tons of silica sand, was put in in 6½ working shifts.

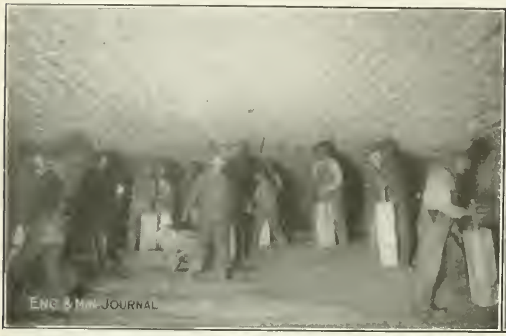
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Fig. 1. Tamping the Furnace Bottom

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Fig. 2. The Furnace Bottom Complete

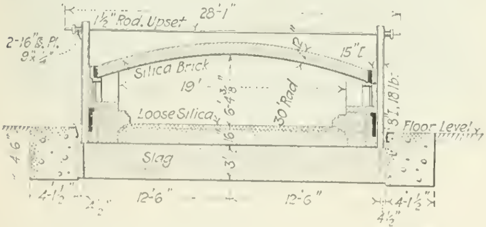


Fig. 3. Section of Reverberatory Furnace

The total cost was as follows:

COST OF FURNACE BOTTOM

200 tons of silica sand delivered at furnace		$31.26
Unloading sand		18.18
Making tamping blocks		8.25
Labor tamping in bottom		
Straw boss, 3½ shifts	$10.50	
Greek laborers, 42½ shifts	74.37	
Furnacemen, 6 shifts	21.00	
Furnace helpers, 18 shifts	36.00	
		141.87
Sundries		3.15
Total cost		$502.71

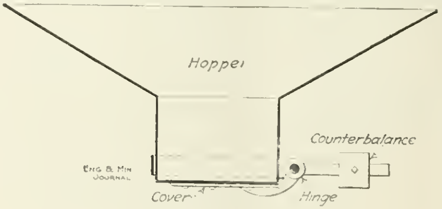
Fig. 1 shows the gang at work tamping, and Fig. 2 shows the furnace bottom complete, ready for heat and charge. Fig. 3 shows a cross-section of the furnace from the working drawing.

⁂

Dust Trap for Handling Fine Ore

In the handling of finely crushed ores at the plant of the Deloro Mining & Reduction Co., Deloro, Ont., dust is a factor which must be controlled, both because of its injurious effect upon the operators, and because of its high value, rich ores only being handled. With these facts in mind, a dust trap has been devised and is in use in several places about the works.

When cars of fine ore are to be dumped into a bin, the bin is covered with a shallow hopper, terminating in a short pipe of size appropriate to the material to be passed. Over the end of the pipe is a cover so balanced that the stream of material passing will open it, allowing the ore to pass freely, while with the cessation of the stream the cover closes automatically, prohibiting the escape of dust. This contrivance has worked so well that a number of them are being used in the plant; wherever, in fact, fine, dry material has to be transferred. It prevents the waste occasioned by loss of rich dust, and also enables the operators to work in comfort and safety. The accompanying sketch illustrates the idea.



Dust Trap for Fine Ore

⁂

Some Experiments in the Direct Smelting of the Copper-Nickel Sulphide Ores of Sudbury are about to be undertaken in Ontario. The Mond Nickel Co., at Coniston will use the Fink furnace in its experiments, while the Canadian Copper Co., at Coppercliff, will try the Knudsan furnace. The plan, at least in one of these works will be to blow up to about 40 per cent. matte, which will then be treated in the Peirce-Smith converters, making the usual 80% copper-nickel product.

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*Mining Engineer, 887 Middle St., Bath, Maine

The Cost of Doing Things

Mining Costs at Goldfield

The following figures were taken from the 1913 report of the Goldfield Consolidated Mines Co., Goldfield, Nev. The mines produced 349,465 tons of ore from the following sources; stopes, 310,927 tons; development, 25,782 tons; and dumps, 12,756 tons. The average grade of this ore was $15.56 per ton and total operating costs including milling, etc., $6.32 per ton. Stoping constituted 38.64% of the total expense; development, 14.73% and indirect mining and milling costs, 16.07%. The following, which includes a proper proportion of indirect costs, gives details of mining costs:

DETAILS OF MINING COSTS

Goldfield Consolidated. Year Ended Dec. 31, 1913

Supplies:	Stopes per Ton (a)	Drifts and Cross-cuts per Ft. (b)	Raises per Ft. (c)	Winzes per Ft. (d)	Diamond Drilling per Ft. (e)	Total Development per Ft.	Total Cost per Ton Ore Mined
Mine timbers	$0.432	$0.954	$0.679	$1.888		$0.861	$0.497
Powder	0.137	0.335	0.229	0.834		0.300	0.161
Caps	0.005	0.013	0.009	0.025		0.011	0.006
Fuse	0.016	0.039	0.027	0.095		0.035	0.019
Candles	0.018	0.064	0.030	0.054		0.051	0.023
Drills and fittings	0.025	0.060	0.041	0.082		0.053	0.029
Pipe and fittings	0.010	0.036	0.024	0.033		0.031	0.013
Track and fittings		0.047				0.029	0.003
Pump repairs*	0.034	0.082	0.056			0.072	0.039
Cars and repairs	0.003	0.008	0.005			0.007	0.004
Iron and steel	0.005	0.012	0.008	0.025		0.011	0.006
Blacksmith shop	0.002	0.004	0.003			0.003	0.002
Change room and office	0.006	0.014	0.010	0.067		0.013	0.007
Lubricants	0.007	0.016	0.011	0.011		0.015	0.008
Electrical supplies	0.010	0.024	0.016			0.021	0.012
Miscellaneous hoisting	0.012	0.028	0.019			0.025	0.014
Tools	0.007	0.018	0.012	0.070		0.017	0.008
Miscellaneous	0.028	0.022	0.011	0.133	0.536	0.061	0.033
Total supplies	$0.757	$1.776	$1.190	$3.317	$0.536	$1.616	$0.884
Labor:							
Superintendence	$0.029	$0.090	$0.060	$0.167		$0.080	$0.036
Shift bosses	0.049	0.152	0.101	0.267		0.134	0.061
Engineers	0.050	0.219	0.136	5.308		0.228	0.073
Miners	0.399	1.913	1.047	3.960		1.611	0.553
Muckers	0.449	2.192	1.180	3.702		1.833	0.625
Timbermen	0.124	0.548	0.318	0.167		0.461	0.168
Blacksmiths and helpers	0.021	0.086	0.053	0.067		0.074	0.028
Pipe and trackmen	0.027	0.110	0.068	0.033		0.094	0.036
Cagers	0.035	0.142	0.088	0.033		0.122	0.047
Pumpmen	0.012	0.038	..			0.024	0.014
Filling	0.158	....	....	..		......	0.146
Top carmen	0.081	0.122	0.101	0.017		0.114	0.088
Nippers	0.035	0.143	0.089	0.017		0.122	0.047
Mine and shaft repairs	0.048	0.196	0.121	..		0.167	0.064
Machine drill repairs	0.009	0.036	0.022	0.034		0.031	0.012
Timekeepers	0.008	0.034	0.021	0.033		0.029	0.011
Assay department	0.086	0.346	0.214	0.083		0.286	0.113
Mechanical department	0.049	0.199	0.123	0.067		0.170	0.065
Electrical department	0.034	0.139	0.086	0.067		0.119	0.045
Engineering department	0.024	0.097	0.060	0.067		0.083	0.032
Sampling department	0.006	0.024	0.015			0.020	0.008
Watchmen	0.022	0.089	0.055			0.076	0.029
Surface department	0.188	0.477	0.296	.		0.407	0.156
Diamond drill	...				2.165	0.167	0.019
Total labor	1.873	7.392	4.254	14.089	2.165	6.462	2.476
Power, electricity and air	0.115	0.302	0.262	2 0 5	0.505	0.341	0.145
Total mining	2.745	9.470	5.706	19.471	3.206	8.419	3.505
Dump moving including purchase of equipment, 12,756 tons							0.841

Notes—*Includes new equipment. (a) 310,927 tons of ore from stopes. (b) 24,203 ft. of drifts and crosscuts. (c) 14,193 ft. of raises. (d) 300 ft of winzes. (e) 3029 ft. of diamond drilling. Diamond drill costs include everything except carbons, 71c. per ft. drilled.

Stoping costs per ton of ore stoped, $2.54

Cost of development per ton of ore mined, $0.97

⁂

Mill Heating in Canada

Heating of the milling plants in the cold sections of America, the North and West, adds an appreciable item to operating costs. At the mill of the Nipissing Mining Co., Cobalt, Ontario, mill heating for the cold months costs $11^{3}/_{10}$c. per ton on the yearly tonnage. Approximately, the same figure applies to all the cyanide plants of the Cobalt and Porcupine camps, and perhaps to other eastern Canadian districts.

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Tonopah Belmont Mine and Mill Profits

The report of the Tonopah Belmont Development Co. for the year ended Feb. 28, 1914, shows a total profit. from operations at Tonopah, of $2,014,316. The accompanying table shows the operations in detail.

TOTAL OPERATING COST MINE AND TONOPAH MILL FOR YEAR ENDED FEB. 28, 1914

TABLE 1

	Dry Tons	Value		1913 Average Per Ton
Mine:				
Gross value ore milled	172,398	$3,636,861		$21.096
Net value ore stock on hand added to ore stock	248	2,038		8.217
Total mine production	172,646		$3,638,899	21.078
Metal losses in mill tailings	172,398	$203,266		1.179
Smelting losses in concentrates	172,398	18,657		0.108
Total losses in treatment	172,398	$221,923		
			221,923	1.287
Values realized	172,646		$3,416,976	19.791
Mining:				
Stoping	150,161	$452,664		3.014
Development	22,485	257,709		11.461
	172,646	$710,373		4.114
Transportation				
Milling:				
Milling	172,398	$441,354		2.557
Marketing bullion	172,398	55,555	0.322	
Marketing concentrates and slag	172,398	18,353	0.106	0.428
General Expense:				
Administration, taxes, office expense, depreciation	172,646	185,250		1.073
Total operating	172,646		$1,410,885	8.172
Realization from operation	172,646		$2,006,091	11.619
Miscellaneous profit			8,225	
Total profit			$2,014,316	

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Milling Costs, Virginia City, Nev.

The following costs were taken from the annual report of the Mexican Gold & Silver Mining Co., Virginia City, Nev., for year ended Oct. 31, 1913. The mill treated 29,365 tons of ore consisting of 15,973 tons of Mexican mine ore and 13,392 tons of Monte Cristo ore. Of the total tonnage treated, 118 tons were concentrates cyanided for the Monte Cristo. The cost of mill operation, not including construction, etc., was as follows: Crushing and conveying, 7.4c. per ton; power, 47.9c.; labor, 59.3c.; repairs and renewals, 33.8c.; chemicals, 66.6c.; water, 17.7c.; lubricants, 1.5c.; heating, 16.6c.; general mill expense, 23.9c.; melting, 7.5c.; marketing bullion, 20.7c.; assaying, 6.2c.; taxes and insurance, 10.9c.; total, $3.20 per ton treated. The extraction on the Mexican mine ores was 93.41% and on Monte Cristo ores 89.2%.

The highest cost for milling for one month was $4.28 per ton and the lowest cost $2.56 per ton. Details of supply consumption follow:

Average value of Mexican ore, $30.98 per ton.
Average value of Monte Cristo ore, $9.21 per ton.

	$ Per Ton	Lb. per Ton
Cyanide:		
Mexican ore	$0.495	2.00
Monte Cristo Ore	0.287	1.17
Lime:		
Mexican ore	0.034	4.02
Monte Cristo ore	0.039	5.26
Lead salts:		
Mexican ore	0.044	0.41
Monte Cristo ore	0.119	1.06
Zinc dust:		
Mexican ore	0.172	1.62
Monte Cristo ore	0.105	0.98
Shoes and dies	0.017	0.33
Chilean rings and dies	0.022	0.67
Chilean screens	0.011	....
Tube-mill liners	0.038	0.89
Pebbles	0.095	7.33

Fuel oil for heating, 16.3c. per ton ore, or 3.69 gal per ton ore.

Drilling Costs in Nova Scotia

In the Journal of May 9, a table of costs was omitted from an article on the cost of core drilling with government machines in Nova Scotia. The table is published herewith.

COSTS OF DRILLING IN NOVA SCOTIA WITH GOVERNMENT MACHINES

Hole No.	Class of Drill	Core	Material	Dip	Depth	Fastest Rate per Hr Ft.	Labor	Management	Light, Oil, Waste	Carbon, Wear	Casing	Repairs and Spare Parts	Fuel	Lumber	Freight and Trucking	Shot	Gravel	Man and Horse	Water	Total	Per Ft.
1	Diamond, steam.	2-in.	Coal	24°	287	12 75	$31.20	$30.80	$0.30	$1 17	$2 40	$5.00					....	....		$70 87	$0.25
2	Diamond, steam.	2-in.	Soft sedimentaries		415		194 38	652.60	2.50	64.45	11.31		$11.28	$5 68	$111.45		..	.		1083.65	2 61
3	Diamond, steam.	2-in.	Metamorphosed limestone	..	245	.	75.25	168 70	1 20	236.70		16.00	30 00	3.75	85.60	.	.....	.....		617.20	2.51
4	Diamond, steam.	2-in.	Granite and limestone	45°	468	5	130.25	254.25	2.00	320.00		30.40	93.50	5.25	14 35	....	...	.....		850.00	1 81
5	Diamond, steam.	2-in.	Quartz and limestone	90°	216	4 25	72.25	105.40	1 60	62 10		13.85	26 00	1.50	13 00		...	.....	.....	295.70	1 37
6	Calyx, steam.	6-in.	Shale and sand stone		218	4	209 25	113.00	5.00	..	40 00		25 00	23.00	86.00	$11.25			....	507.50	2 47
7	Calyx, steam.	6-in.	Soft sedimentaries		339	5	332 40	313.03	4.22		248.36		64 50	3 25	111.77	18 00			.	1095.53	3 22
8	Calyx, steam.	6-in.	Shale and coal	..	206		a232.73	..	.....	.....	...	14 00			.	9.00	$0.75		.	256.48	1.24
9	Calyx, steam.	6-in.	Shale and coal		168	..	205 45	327.37	..		.....	90 00	.....	.....	..	7.20	0 75	..	...	630.77	3 22
10	Calyx, hand or horse	1¾-in.	Sedimentaries		118	3	32 00	77.60	.....	.....	...	8 70	..	5 00	11.25	6 00		6 40	30.00	176 95	1 50
11	Calyx, hand or horse	1⅝-in.	Sedimentaries		95	3	26.00	46.56	.	...		..	.	....	6.00	3.00		13.19	24 00	118 75	1 25

a Includes management

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Costs of Air Compressors

By Percy Barbour*

A recent tender for bids for air compressors for a mining plant resulted in the following range of figures, which reduced to averages, give some good figures for estimating. There were twelve bids. One is thrown out of consideration on account of insufficiency of data and one is discarded on account of obvious error in weight. The 10 bids are on compressors with two-stage compression with either single steam cylinders in tandem with the air cylinders or duplex steam cylinders, with one exception, which had cross-compound steam end. The steam pressure was 100- to 125-lb. gage and the air pressure 100-lb. gage.

Piston displacement of these various machines ranged from 706 to 1380 cu.ft. per min. Total weights ranged from 16,800 to 35,000 lb.; total costs, f.o.b. factory, without air receivers, from $1960 to $3960. The cost of the compressors per cu.ft. of piston displacement ranged from $2.58 to $3.75, and averaged $2.95. The cost per pound of total weight ranged from 9.8 to 11.7c., and averaged 10.9c. The weight per cu.ft. of piston displacement ranged from 24.1 to 35.3 lb. and averaged 27 pounds.

⁂

Cost of Gasoline Haulage in Wisconsin

The Cleveland Mining Co., at Hazel Green, in the Wisconsin zinc and lead fields, is using mechanical haulage underground in the Cleveland mine. The unit in service is a 4-ton Whitcomb gasoline locomotive standard in all respects except gage. The specifications called upon the manufacturer to alter his design to an unfavorable degree by the requirement of 18-in. gage. The haulage in this district is over a short radius, so that data based on the ton-mile service is misleading, compared with other fields where mechanical haulage has usually become necessary on account of distance. Results in 1913, as given by the Cleveland Mining Co., are as given in the accompanying table. The performance of the locomotive has been satisfactory in every way.

Total tonnage hauled	123,150
Total miles traveled by locomotive (approximately half of this total is loaded and half empty)	6970
Operating labor, per ton	$0.015
Maintenance and supplies, per ton (this includes gasoline, oil, etc., for operation, supplies, labor and material for maintenance)	0.005
Total operating cost per ton	0.020

⁂

Cost of Drill Repairs

The cost of repairs on piston and hammer drills used for tunneling are about equal today, according to U. S. Bureau of Mines' *Bull.* 57. In 1905-06 on the Gunnison tunnel, they were 3c. and 13c., respectively, per foot of hole drilled. The hammer-drill cost was much less on later undertakings; being on the Yak tunnel, 1¾c.; Marshall-Russell, 1½c.; Carter, 2c.; Lucania, ½c.; Rawley, 1 cent.

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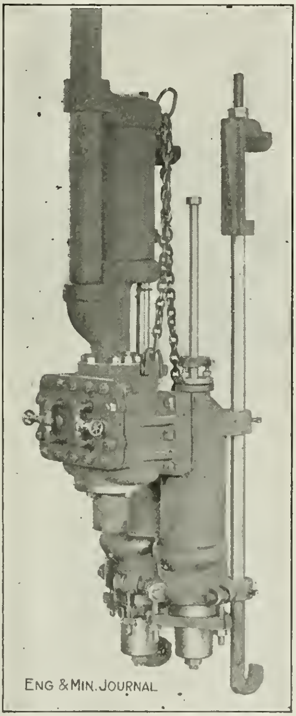
*Mining engineer, 887 Middle St., Bath, Maine.

Mining & Metallurgical Machinery

Luitwieler Sinking Pump



Water End of Sinker

The accompanying illustration, exhibits a sinking pump made by the Luitwieler Pumping Engine Co., Rochester, N. Y., and intended for use with the pumping engine made by this company. The pump itself does not differ materially from the water end of most reciprocating sinking pumps, except that the plunger rods, it will be noted, are not connected to anything. They are intended for attachment to other rods or direct to the pumping engine, and it is this part of the machine that is of the most interest. By using no cranks, the faults traceable to them are eliminated. Instead of cranks, a system of cams is used, the cams receiving their power from any source, such as electric, gasoline, steam or belt drive. Each cam transmits its motion to a sliding yoke through the medium of rollers, thus minimizing friction. In a duplex pump, the long axes of the cams are placed 180 deg. apart, and in a triplex, 120 deg. apart, to make the application of force uniform.

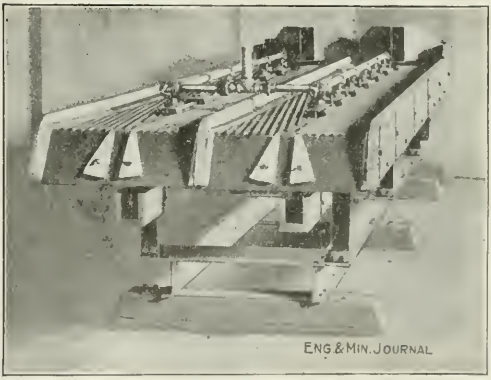
In this way the pump is made nonpulsating, and by being nonpulsating, a continuous flow of water is maintained, the entire load does not have to be started from rest at each stroke, less power is required, and dead centers never occur. The manufacturers also claim that the construction of the pumps is such that they are perfectly balanced; all moving parts are in equilibrium; minimum power is required for the service performed; load is nonfluctuating; causes of shock and break are eliminated; surplus of power to overcome inherent mechanical deficiencies are unnecessary, and that repairs are rarely required. The pumping engines are guaranteed to show an efficiency of 80 per cent. The users of Luitwieler pumps include the Moctezuma Copper Co., Nacozari, Mexico; Arizona Southwestern Copper Co., Kingman, Ariz., Rosiclare Lead & Fluorspar Mines, Rosiclare, Ill., and the Harvard Gold Mining Co., Jamestown, Calif.

* * *

The Isbell Concentrator

The Denver Engineering Works has acquired all the rights to this concentrator and will hereafter be its sole manufacturer. This machine is on exhibition in the laboratory at the factory and the demonstrations have created much speculation as to its ultimate capacity and efficiency when put into commercial service. It is claimed that, in one large mill, a single Isbell concentrator has taken the feed formerly going to six tables of well known make and has made just as good recovery.

Some of the features of this machine that are noted by an impartial observer are: Its seemingly large capacity, the flow of ore and water longitudinally of the deck, the deep bed of pulp on the table, the relatively small amount of water required, the feeding of unclassified or unsized ore, the apparent uniform efficiency under fluctuations in the feed, and the numerous points of discharge of the concentrate.



The Isbell Concentrating Table

As shown in the figure herewith, the table is duplex in construction. Each deck has two planes that form a slight gable along the center line. Riffles are so attached to the surfaces of the deck that the concentrate must actually travel slightly "up hill," notwithstanding the fact that the deck slopes toward the discharge end.

Pulp is fed with just sufficient water to render it quite fluid in consistency. The oscillations of the table are lengthwise. They cause the materials to stratify quickly according to specific gravities, irrespective of sizes of particles. In other words, the action is that of jigging and not hindered settling. A bed 3/4 in. or more deep may be maintained. Since the progress of the ore down the table is comparatively rapid, a heavy feed is permissible.

The concentrate lodges behind the riffles and is jolted along until it enters the so called cutouts—the discharges—in each of which it is met by a counterflow of wash water that acts as a classifying element and by proper adjustment permits only the heaviest material to pass down into the small pipe that constitutes the outlet. Should any concentrate be washed back onto the table, it will repeat its jigging or stratifying process and will approach one of the succeeding cutouts where it again encounters a flow of water.

Ordinarily, by proper regulation of the inflow of wash water, different minerals will be withdrawn from the six cutouts. If galena be present in the feed, it should be saved at the first spigot, while successive products will be of decreasing specific gravities. Inspection of the several products thus saved shows each to be composed of particles of many sizes, but of practically one mineral. Thus, slimes will be found collected with coarse grains. The feed may be interrupted or its quantity may be considerably varied without apparently changing the characteristics of the products. The amount of water required will vary with the tonnage handled and with the minerals to be recovered; an average is perhaps 10 gal. per min., and this quantity is fed almost entirely through the six cutouts.

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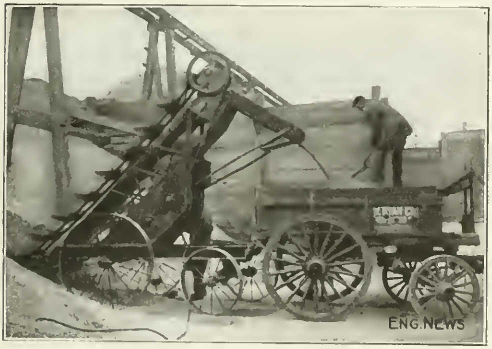
Portable Motor-Driven, Bucket Elevator Loader

An electrically operated portable wagon-loader of the bucket-conveyor type is illustrated herewith. No small gasoline engine has yet been found dependable enough to give constant service with the kind of labor ordinarily available for operating the loader, so the use of the machine is confined to situations where electric current is to be had. The motor is of 7½ hp., inclosed in a dust-proof casing (*Eng. News*, May 28, 1914).



Machine Loading Crushed Stone

When not in use, or when it is to be moved the loader is tipped down so as to rest on the bottom of the trapezoidal frame containing the motor. When tipped up as shown, the conveyor buckets are moved into the pile of material by sliding on the channel frame of the carriage; this is effected by a hand lever working a pawl and ratchet. There is 3 ft. of this movement.

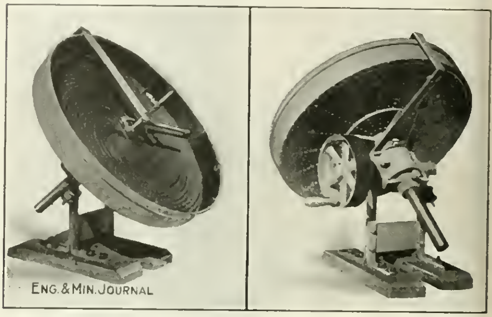
The overall height of the loader in collapsed position is 7 ft. 6 in.; when operating, it is 13 ft. The width is 5 ft. 11 in., and the length 12 ft. The two rear wheels are 60 in. in diameter and the front wheels are 42 in. The machine illustrated is loading crushed stone from a storage-yard pile. It can also be used to advantage in sand and gravel pits and for coal handling. It is manufactured by the George Haiss Manufacturing Co., Inc., 142d St. and Rider Ave., New York City.

⁂

The Arnold Concentrator

The Arnold concentrating machine works by gravitation and rotation, producing separation upon inclined graduated involute riffles. It consists of an adjustably inclined steel pan fitted with involute steel riffles secured to the inner surface of the pan. The pan is rotated slowly either by hand or belt power.

The crushed material is fed into the pan at the lower left-hand part by any hopper. This material is carried to the right of the pan where it rolls over and over, producing segregation and settling of the heavier parts of the mineral. The riffles then take up this precipitate and carry it to the central hollow shaft, and while sliding on the tapered riffle, it is further freed from gangue, so that it is discharged into the tube completely cleaned. The tailings discharge over the rim. This machine has been tried on over 200 different kinds of mineral and is said to give good results in all cases. It is claimed to be the lightest machine made, using steel only and weighing 100 lb. in the 18-in. size and in the 36-in., about 150 lb., with capacity greater than any table. It requires $\frac{1}{16}$ hp. for driving full load. For dry placering it is the only machine that can be carried into any of the dry deserts of Utah, Nevada, New Mexico and California, and take the gold out without the use of mercury, compressed air, etc. In addition the riffles are completely self-cleaning, and do not clog, as does a sluice box.



Arnold Concentrator

A demonstration plant is being installed at the Commodore tunnel, Lawson, Clear Creek County, Colo., of 50 tons capacity, to operate on low-grade lead-silver ores. When this plant is installed, it will be the only 50-ton mill in a building 12 ft. wide by 51 ft. long.

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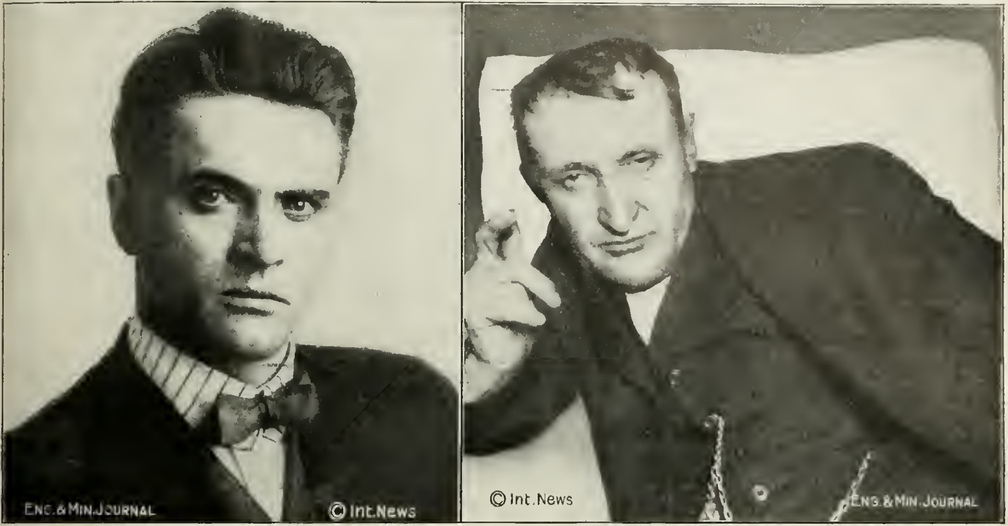
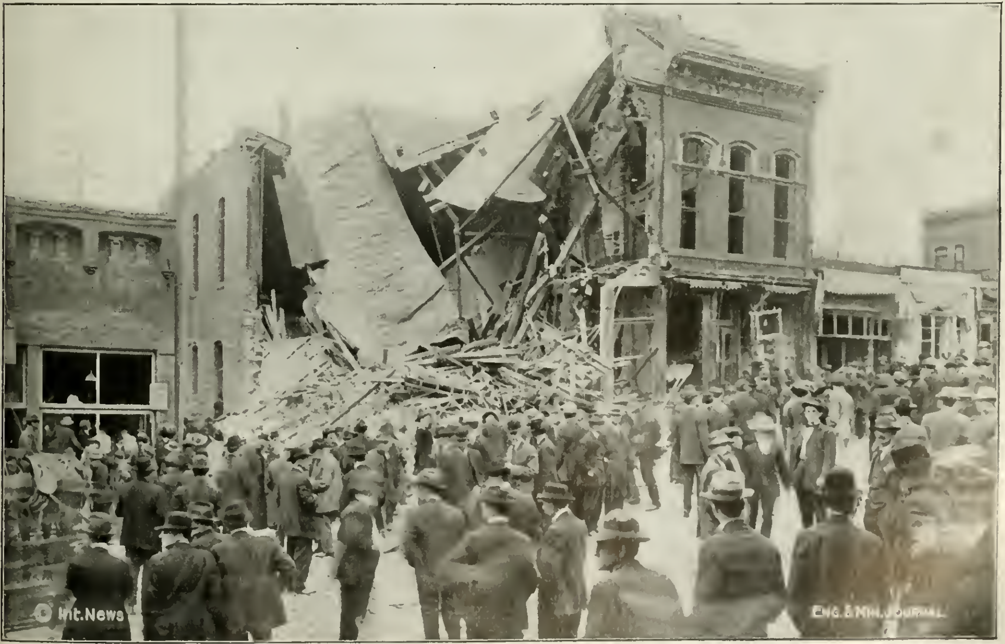
The Traylor Engineering & Manufacturing Co. announces that it has completed arrangements with Charles Jacobson, for the manufacture and sale of the well known Jacobson gas engines. The Jacobson gas engine is of the scavenging type, and can be used on natural, producer and illuminating gases of all kinds and characters. The engines are built in all sizes with single and multiple cylinders and particularly adapted for direct connecting to alternators running in parallel.

Photographs from Butte



William ("Muckie") McDonald and Charles H. Moyer, Leaders of the Union Factions at Butte

McDonald, who is opposed to the I. W. W., has been elected president of the new union. The photograph of Moyer was taken when he precipitately left Hancock, Mich., last December.



Miners' Union Hall, Butte, Mont., Dynamited June 23

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALLOY—Metallic Alloy and Process of Manufacture Thereof. Harry Ormiston Ormiston, Rockdale, near Sydney, N.S.W. (U. S. No. 1,101,089; June 23, 1914.)

ALUMINUM ALLOY. Charles P. Van Gundy, Catonsville, Md. (U. S. No. 1,098,137; May 26, 1914.)

ALUMINUM ALLOY. William A. McAdams, Bay Shore, N. Y. (U. S. No. 1,099,561; June 9, 1914.)

AMALGAMATOR. Joseph W. McGalliard, Los Angeles, Calif., assignor of one-half to Nicholas A. D'Arcy, Los Angeles, Calif. (U. S. No. 1,100,386; June 16, 1914.)

AMALGAMATOR—Combined Amalgamator and Concentrator. Paul Kuehn, Detroit, Mich. (U. S. No. 1,100,020; June 16, 1914.)

ANTIMONY AND ARSENIC ORES, Method of Treating. Alexander Trifonoff and Daniel Gardner, St. Petersburg, Russia. (U. S. No. 1,097,897; May 26, 1914.)

ARSENATE OF LEAD, Process of Making. Herbert H. Dow and Edwin O. Barstow, Midland, Mich., assignors to Dow Chemical Co., Midland, Mich. (U. S. No. 1,100,673; June 16, 1914.)

BARYTES—Method of Separating Barytes from Ores. Charles Jason Greenstreet, Webster Groves, Mo. (U. S. No. 13,735; May 26, 1914.)

BLAST FURNACES—Bosh Plate for Blast Furnaces and the Like. Luther L. Knox, Niles, Ohio, assignor to Keystone Bronze Co., Pittsburgh, Penn. (U. S. No. 1,101,700; June 30, 1914.)

CARNOTITE—Process for Treating So-Called Carnotite and Associated and Similar Vanadium and Uranium Minerals. Herbert N. McCoy, Chicago, Ill. (U. S. No. 1,098,282; May 26, 1914.)

CASTING—Process of Casting from Volatilizable Metals or Alloys. William D. Hall, Oak Park, Ill. (U. S. No. 1,100,132; June 16, 1914.)

CONCENTRATING APPARATUS. Perle T. Hambric, Drytown, Calif., assignor of one-half to Wilton E. Darrow, Sutter Creek, Calif. (U. S. No. 1,100,971; June 23, 1914.)

CONCENTRATION of Ores. Henry Howard Greenway, Melbourne, Victoria, Australia, assignor to Minerals Separation, Ltd., London, Eng. (U. S. No. 1,099,699; June 9, 1914.)

CONCENTRATOR—Ore Concentrator. John L. Signorette, Los Angeles, Calif. (U. S. No. 1,098,183; May 26, 1914.)

CONCENTRATORS—Driving Mechanism for Ore Concentrators. Emil Deister, Fort Wayne, Ind., assignor to The Deister Concentrator Co., Fort Wayne, Ind. (U. S. No. 1,101,186; June 23, 1914.)

COPPER AND NICKEL—Extraction of Copper and Nickel, Particularly from Low-Grade Ores and Products. Wilhelm Borchers, Aachen, Germany, and Harald Pedersen, Trondhjem, Norway. (U. S. No. 1,101,115; June 23, 1914.)

COPPER REFINING—Improved Process for Refining Copper and Other Metals. W. S. Rockey and H. Eldridge, Stapleton, N. Y. (Brit. No. 7409 of 1913.)

CRUSHER. Edouard Friedrich, Leipzig-Plagwitz, Germany. (U. S. No. 1,098,105; May 26, 1914.

CRUSHING MACHINE. Orton G. Dale, Plainfield, N. J., assignor to Mead-Morrison Manufacturing Co., Cambridge, Mass. (U. S. No. 1,100,174; June 16, 1914.)

CYANIDING—Apparatus for Clarifying Liquids and Thickening Pulps. Hugh B. Lowden, Denver, Colo., assignor to Colorado Iron Works Co., Denver, Colo. (U. S. No. 1,098,842; June 2, 1914.)

CYANIDING—Apparatus for Filtering Slimes. Charles Butters, Oakland, Calif. (U. S. Nos. 1,100,217; 1,100,218; 1,100,219; 1,100,220; 1,100,222; June 16, 1914.)

CYANIDING—Process for Treating Cyanide Ores Containing Deleterious Slimes. Wilton E. Darrow, Sutter Creek, Calif. (U. S. No. 1,098,020; May 26, 1914.)

CYANIDING—Process of Filtering Slimes. Charles Butters, Oakland, Calif. (U. S. Nos. 1,100,221 and 1,100,223; June 16, 1914.)

CYANIDING—Separating Apparatus. Walter E. Trent, Reno, Nev., assignor of one-third to H. C. Cutler, Reno, Nev. (U. S. No. 1,097,896; May 26, 1914.)

DRILL—Rock Drill. Louis W. Greve, Cleveland, Ohio, assignor, by mesne assignments, to the Cleveland Rock Drill Co., Cleveland, Ohio. (U. S. No. 1,100,071; June 16, 1914.)

DRILLS—Improvements in and Relating to Percussive Rock Drills, Bits and Like Appliances. W. H. Wakfer, South Norwood, Surrey, Eng., and S. Peck Wallington, Surrey, Eng. (Brit. No. 10,566 of 1913.)

DRILLS—Improvements in Valve Apparatus for Percussive Rock Drills and the Like. G. Rayner, Abbeydale, Sheffield, Eng. (Brit. No. 617 of 1914.)

ELECTRIC FURNACE. Florentine J. Machalske, Plattsburg, N. Y., assignor, by mesne assignments, to American Ferrolectride Corporation, Plattsburg, N. Y. (U. S. No. 1,099,559; June 9, 1914.)

ELECTRIC FURNACE. William F. McNabb, Pittsburgh, Penn. (U. S. No. 1,100,191; June 16, 1914.)

ELECTRIC FURNACES, Contact for. Frederick T. Snyder, Oak Park, Ill. (U. S. No. 1,100,993; June 23, 1914.)

ELECTRIC SMELTING—Method of Smelting Iron Ores. Florentine J. Machalske, Plattsburg, N. Y., assignor, by mesne assignments, to American Ferrolectride Corporation, Plattsburg, N. Y. (U. S. No. 1,099,709; June 9, 1914.)

ELECTRIC FURNACE for the Reduction of Copper and Other Ores. William H. Hampton, New York, N. Y., assignor to the Conley Electric Furnace Co., Inc., Wilmington, Del. (U. S. No. 1,100,972; June 23, 1914.)

ELECTRICAL INDUCTION FURNACE. Karl Albert Fredrik Hiorth, Christiania, Norway. (U. S. No. 1,099,440; June 9, 1914.)

ELECTRODE. Florentine J. Machalske, Plattsburg, N. Y., assignor, by mesne assignments, to American Ferrolectride Corporation, Plattsburg, N. Y. (U. S. No. 1,099,558; June 6, 1914.)

ELECTRO-METALLURGICAL PRODUCTS; Process for Treating to Remove Impurities. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Co., Niagara Falls, N. Y. (U. S. No. 1,099,674; June 9, 1914.)

ELEVATOR-BUCKET CHAIN. Oliver B. Finn, Colorado Springs, Colo. (U. S. No. 1,098,564; June 2, 1914.)

EXCAVATING—Shield for Excavating Tunnels and Shafts. Willie M. McDowell, Tacoma, Wash. (U. S. No. 1,100,142; June 16, 1914.)

EXCAVATING—Steering Mechanism for Excavating Machines. Charles B. King, Clarence B. Weston and Louis R. Russell, Marion, Ohio, assignors to the Marion Steam Shovel Co., Marion, Ohio. (U. S. No. 1,100,080; June 16, 1914.)

EXCAVATING MACHINERY. George Henry Dunlop, Auburn, Victoria, Australia. (U. S. No. 1,098,146; May 26, 1914.)

FLOTATION PROCESS—Process for the Separation of Metallic Sulphides from Gangue and Apparatus Therefor. Leslie Bradford, Broken Hill, N.S.W., assignor, by mesne assignments, to Minerals Separation, Ltd., London, Eng. (U. S. No. 1,101,506; June 23, 1914.)

FURNACE—Improved Liquid-Fuel Heated Tipping Furnace for Melting, Smelting and Other Like Purposes. S. W. Price, London, Eng. (Brit. No. 5436 of 1913.)

FURNACE LININGS—Refractory Lining for Furnaces. Ottokar Serpek, Paris, France, assignor to Société Generale des Nitrures, Paris, France. (U. S. No. 1,099,131; June 2, 1914.)

FURNACE for Roasting, Smelting or Otherwise Treating Ores. Ernest Buchholtz, Harrow, Eng., assignor to the Oil Flame Furnace Co., Ltd., High Holborn, Eng. (U. S. No. 1,100,711; June 23, 1914.)

FURNACE PREHEATER and Shield. Walter S. Rockwell, New York, N. Y. (U. S. No. 1,101,961; June 30, 1914.)

GOLD SAVING APPARATUS. James W. Neill, Pasadena, Calif. (U. S. No. 1,100,904; June 23, 1914.)

HAULAGE CLIP for Endless Ropes. William Galloway, Cardiff, Wales. (U. S. No. 1,100,552; June 16, 1914.)

HOISTS—Safety Appliance for Mine Hoists. Walter E. Housman, Scottdale, Penn. (U. S. No. 1,100,304; June 16, 1914.)

INGOTS—Method of Treating Ingots. Hiram W. Hixon, Aire Libre, Mexico. (U. S. No. 1,101,546; June 30, 1914.)

LAMP—Miner's and Like Electric Safety Lamp. Paul Wolf, Zwickau, Germany. (U. S. No. 1,100,336; June 16, 1914.)

LAMP—Miner's Carbide Lamp. Frank Guy, Springfield, Ill. (U. S. No. 1,097,716; May 26, 1914.)

LAMP—Miner's Lamp. William H. Logan, Carnegie, Penn. (U. S. No. 1,099,753; June 9, 1914.)

MAGNETIC SEPARATION—Improvements in and Relating to Magnetic Separating Machines. H. H. Thompson, Meadowside, Aldridge, and A. E. Davies, Abbey Farm, Hockley Heath, Eng. (Brit. No. 9725 of 1913.)

METALLIFEROUS MATERIALS, Art of Treating. Henry B. Hovland, Duluth, and George B. Frankforter, Minneapolis, Minn. (U. S. No. 1,098,668; June 2, 1914.)

MINING COLUMNS—Improvements in Mining Columns. F. Simon and J. W. Scott, Minnaar, Transvaal. (Brit. No. 16,145 of 1913.)

NICKEL AND COBALT—Process for Separating Copper from Nickel and Cobalt. Victor Ilyhinette, Fredericktown, Mo. (U. S. No. 1,098,443; June 2, 1914.)

ORE REDUCTION—Improvements in or Relating to Ore Reducing Machines. Copper Process Co., Chicago, Ill. (Brit. No. 19,301 of 1913.)

RABBLES and Rabble-Arm for Metallurgical Furnaces. Utley Wedge, Ardmore, Penn. (U. S. No. 1,100,461; June 16, 1914.)

ROASTING—Improvements in Roasting Furnaces for Ores and the Like. C. Gabrielli, Paris, France. (Brit. No. 8635 of 1913.)

SAFETY—Device for Protecting the Legs and Feet of Workmen from Injury by Molten Metal, Etc. Alexander E. Outerbridge, Jr., Philadelphia, Penn. (U. S. No. 1,097,354; May 19, 1914.)

SINTERING—Grates for Sintering Pans. John E. Greenawalt, Denver, Colo. (U. S. No. 1,098,035; May 26, 1914.

SMELTING AND BRIQUETTING Process. Bernard T. Colley, Rancagua, Chile. (U. S. No. 1,098,883; June 2, 1914.)

STEEL—High Speed Tool Steel. Reinhold Becker, Crefeld, Germany. (U. S. Nos. 1,099,531 and 1,099,532; June 9, 1914.)

THORIUM—Process of Obtaining Salts of Mesothorium and of Radium from Thorium-Bearing Minerals. Bruno Keetman, Treppow, near Berlin, and Fritz Jost, Oranienburg, near Berlin, Germany, assignors to Deutsche Gasgluhlicht Aktiengesellschaft (Auergesellschaft), Berlin, Germany. (U. S. No. 1,100,743; June 23, 1914.)

TIN—Improvements in or Relating to the Dressing of Tin Ores. W. M. Martin, Redruth, Cornwall, Eng. (Brit. No. 19,514 of 1913.)

TUNNELING CARRIAGE. Russell S. Carter, Hewlett, N. Y., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,098,614; May 26, 1914.)

TUYERE. Richard Bernhard, Cudahy, Wis., assignor to Power & Mining Machinery Co. (U. S. No. 1,097,907; May 26, 1914.)

Gas-Producer Operation*

Important requirements of a producer gas for power purposes are that soot and tarry matter be removed and that the temperature be lowered before the gas is delivered to the engine. The advantage of lowering the temperature is that the density of the gas is increased so that a given volume can develop more power because it contains more heat units.

INSTALLATION

In setting up the producer, care should be taken to facilitate proper handling by raising it to such a level as will aid in cleaning and removing ashes and clinkers. If it should be placed too close to side walls, the operator will be hampered. It must be in proper alignment and placed so as to avoid the use of unnecessary piping and fitting. Provision must be made for proper drainage from the scrubber, as the cleaning water is likely to gather sulphur and tarry matter, which sometimes gives trouble in clogging and causes deterioration of the piping.

After setting up the producer and aligning it, the grates are put in position and the shell lined with firebrick. The latter are usually of special shape and should be carefully selected, using only sound ones. Before placing the lining in the shell a template should be made and laid out on the floor. In making this template, allowance is made for an annular opening of at least one inch between the outside of the lining and the inside of the shell, this space being used for insulation purposes.

After the brick has been fitted to conform with the template, the laying of the lining is proceeded with. The mortar is made of fireclay and water, mixed to the consistency of cement mortar. All joints must be smooth, as any irregularity causes clinkers to adhere. The operator uses the brick wall as a guide for the poking bar, and if projections exist, the lining is likely to be damaged. After five or six courses of brick, the space between the lining and the shell is filled in with a cement of asbestos and fireclay. This serves as a bottom for insulation material, which usually consists of ordinary sand, although in some cases asbestos is used. The cement should be thoroughly tamped to a depth of 12 or 14 in., thus preventing the sand from running out. Further courses of firebrick are then laid and more sand poured in and lightly tamped until within 3 or 4 in. of the top of the lining, the remaining space being filled with asbestos and fireclay mortar. If the producer is equipped with sight holes, corresponding openings in the brickwork must be provided, these openings being filled with iron pipe. This completed lining should be examined for cracks, any of which ought to be well filled with cement.

The producer should be cleaned out, when it is ready for the cover to be bolted or riveted on. The charging hopper and poke-hole cover are connected. Some producers have water jackets or vaporizers to supply the incoming air with vapor on its way to the fuel bed. Others use a small boiler between the producer and the scrubber; where boilers are already installed, steam may be supplied from them.

There are many kinds of scrubbers for cleaning and cooling the gas before it is delivered to the engine. Some consist of cast-iron shells sealed at the bottom and filled with wooden slats, broken brick, charcoal, coke, or with special cast-iron baffles. At the top of the scrubber is a connection for cold water which flows down a spray through the shell and comes in contact with the outcoming gases, thereby cleaning and cooling them. The water passes down to the water seal, then to the sewer or other outlet. The amount of water is controlled to allow the gas to be cooled to nearly the surrounding temperature. There are also mechanically operated scrubbers, which impart centrifugal motion to the gases and at the same time inject cold water.

Some producers have both a wet and dry scrubber, the latter for removing any tarry matter or dust, which the wet scrubber does not remove, but the principal reason for the dry scrubber is to separate any undue moisture that may be in the gas after leaving the wet scrubber. The many designs of dry scrubbers consist essentially of a cylindrical shell filled with wood slats of excelsior and set in a water seal. Instead of a dry scrubber, some installations employ a cylinder attached to the gas line between the wet scrubber and the engine; this is called a separator. The outlet from the gas line has a running nipple about one-third the length of the separator connected at the top and the gas outlet is also so connected. If the gases contain any moisture, it will settle at the bottom of the separator and then pass out through a water seal.

Producers generally have a third pipe leading to the atmosphere, which is to be opened when the apparatus is shut down and closed when it is running. Some installations have fan blowers for draft when starting the producers; others employ a natural draft through the purge pipe, while others use a steam blower for the purpose. The latter method is possible where boilers are at hand.

In connecting up the piping, fittings and the various auxiliaries, care is to be taken to see that they are thoroughly clean and free from scale on the inside. When connecting scrubbers to producer, a heat-resisting packing is to be used. All bolts, nuts and screwed-pipe fittings should be coated with graphite and a good grade of oil, to facilitate screwing them together or apart when necessary.

OPERATION

The producer and its auxiliaries having been installed and connected, the machine is ready for service. All water seals are to be properly filled with water, the gas valve leading to the engine should be closed, and the valve on the purge pipe opened. The cleaning and ashpit doors should be opened, and in some types the air inlet to the producer closed and a blower attached. Before building the fire, scatter enough loose ashes over the grate and producer bottom to cover all metal work, then the fire can be started with wood or soft coal, which will produce smoke. By this means, it is easy to see whether all joints are tight. The producer should then be charged with a small fire of coal, which is kept up for several days to thoroughly dry out the lining.

It is important that the fire burn evenly before filling the producer, and at all times dead spots should be avoided, as they form air holes and permit air to pass through the fuel uncombined, and thus dilute the gas. A pilot light is usually connected to the outlet of the producer for ascertaining the quality of the gas. If a trycock is used, it should be covered with a piece of wire gauze to prevent the flame from flashing back. A second gas pipe is connected with the gas line near the engine for freeing the line of air, as all air should be expelled from the system before any flame comes near the outlet, otherwise an explosion may result. When gas burns freely at the pilot, the producer is ready for service.

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*Abstract of an article by E. G. Moon, published in "Power," Mar. 3, 1914.

The vent pipe at the engine should be closed, the air inlet at the bottom of the vaporizer opened, as well as back of the producer, and the purge pipe of the producer closed. Water is then turned into the scrubber and vaporizer and as soon as the engine is started, the ashpit and cleaning doors are closed.

Poking the fire at certain intervals is often recommended, and while it may be necessary to do this according to specified instructions, it may be better to do it more often. If this is true, it indicates that the producer is too small to carry the load. Some instructions are to clean the grate every 24 hr. and the ashpit once every other day, yet there are cases where the grate must be cleaned two or three times, and the ashpit once or twice during the 24-hr. period.

It is essential to poke down the fine ash which accumulates on the walls, as it is likely to fuse and form clinkers, which impair the efficiency of the producer. Before poking down, the operator should remove the ashes from the edge of the grate, so as to make room for those that are to be poked down from the walls of the lining. In cleaning the ashpit, the door should not be left open too long as it may allow too much air to be drawn into the fuel bed. Some producers are equipped with shaking grates.

In poking, a straight bar is used. The operator opens one poke hole at a time and bars down close to the wall of the producer in a scraping fashion, to remove all fine ash from the lining, keeping the poking bar as close to the lining as possible, so as to scrape it clean. Poking must be done quickly in some producers, as air is apt to be drawn in and weaken the gas. In cleaning the grate, it is necessary not to work the fire down too low, as burning and warping of the grate and metal work around it may result.

The eye should never be placed too near a sight hole, as a flash of flame may cause a severe burn. In shutting down the plant, assuming that the engine is already shut down, open an ashpit door slightly, shut off air inlets to the producer, the main valve on the gas line to the scrubber, and the water-supply to the scrubber; then open the purge valve just enough to maintain a proper draft while the producer is shut down.

After the producer has been in operation some months trouble may be had in getting a good gas. In such a case see if the water is of the proper height in all the water seals; look for clinkers, and if any are found, regulate the vaporizer. If the producer is equipped with a thermostat this may be found corroded or perhaps the baffles or filling of the scrubber may need cleaning or renewing. Leaks may form between the scrubber and the producer, or leaks in the gas line itself, or possibly air holes in the fuel bed. If the producer is equipped with a tubular boiler and the temperature of the water cannot be raised, the tubes may be covered with scale. If gas is not being delivered cold, the spray pipes in the scrubber may be corroded, or broken, or split, thus causing the water to flow down the side of the shell, or the tubing may need cleaning or renewing. If a centrifugal scrubber is employed the vanes should be examined for deposits of tarry matter.

If the producer has been heavily taxed, the brick lining may become burned. All burned brick should be thrown away. Those not entirely burned out may be used for upper courses and new brick supplied for the lower ones, but it is cheaper eventually to put in an entirely new lining.

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Oysters vs. Smelters

Norfolk Correspondence

An interesting case was fought out in the United States District Court at Norfolk, Va., and a decision given by the jury on Saturday, June 27, 1914. Mr. Hemingway, a wealthy oyster packer who is retiring from the oyster business, brought suit for $15,000 damage to his oyster beds by the Virginia Smelting Co.

Plaintiff produced receipts from the state inspector of grounds leasing him oyster ground near the smelting plant and showed that the Smelting Co. poured slag on some of his beds. The grounds for the suit were based on damage to oysters by the action of "copper and other deleterious substances" on the oysters.

Plaintiff produced an abundance of evidence from oystermen and others who swore that the smeltery had ruined the oysters for distances as much as 50 miles in all directions. A pamphlet from the state bureau of chemistry was put in evidence in support of the view that the smeltery did the damage. A chemist employed in government service was placed upon the stand and testified to the finding of certain percentages of copper in oysters from near the works and gave his explanation of how the copper came to them from the plant although he only found "traces" of copper in the slag.

The defense proved that copper in slag was not soluble; that its business is to recover copper and not to scatter it over the country; that enormous amounts of Paris green were spread on the lands in the surrounding districts yearly for a long time. That there were many other sources of copper and finally that copper is as necessary to the life of the oyster as iron is necessary as a carrier of oxygen in mammals.

It proved that oysters in Spain, Holland, England, New York, New Jersey and many other places had copper in quantities greater than was claimed by plaintiff in the oysters near the smeltery. The defense showed that oysters all over the district as much as 50 miles away and up the river had more copper than near the smelting plant. The prosecuting attorney claimed that the defendant was proving that the plant was taking the copper out of the oysters as they got nearer the works. The defendant solemnly repudiated any such claim, but proved that all the damage was due to sewage and showed by uncontrovertible evidence the oysters from these beds were not allowed to be sold for food and that copper had nothing to do with it, but that it was purely a question of sewage contamination.

During the proceedings both sides got busy opening oysters to prove their respective contentions. The results were often very amusing. The jury awarded the plaintiff $250 which was, of course, a practical victory for the smelting company.

Correspondence and Discussion

Disseminated Lead District of Southeast Missouri

I note, with some pleasure, the communication of Frank L. Nason in the JOURNAL of June 6, in which, he verifies the statement that the overlying Potosi limestone and Davis shale bear no relation to the existence or non-existence of the disseminated lead deposits in the Bonne Terre limestone. Mr. Nason cites his own experience in drilling through this Potosi limestone and Davis shale and finding the disseminated lead near the base of the Bonne Terre limestone beneath. His experience was antedated some months by the sinking of a hole, with the Davis Calyx drill, under my direction, through 100 feet of Potosi limestone, and the Davis shale, on property then owned by the St. Louis Prospecting Co. and now owned by the Federal Lead Co.; but Mr. Nason is entitled to all of the honors of a first discoverer, for he had no knowledge of this prior drilling. He is entitled to greater honor, for it requires more courage for the professional geologist to reject accepted theories, as he did, than for a layman to go ahead, as I did, because then ignorant of the existence of such a theory.

Confessedly a layman, geologically, and neither a professional ore finder, nor a professional fault finder, I yet am constrained to find fault with Mr. Nason's communication in several particulars. The extension of the field of occurrence of these great unique lead deposits which have already produced $200,000,000, and may produce a billion dollars more, is of great importance. This extension should not be defeated by the propagation of half-baked theories or imaginary difficulties. I had no intention of proposing puzzles in my first communication. I did hope to provoke a discussion by the scientists by which certain palpably erroneous ideas, which impede progress, might be eliminated.

What concerns all, and the scientist more than any, is the ascertainment of the truth; and the first step to that end is the rejection of the palpably false, whether it be alleged as a fact, or is an erroneous conclusion from facts. Nason eliminates the Davis-Shale theory, but he raises other difficulties equally as imaginary. He lays this specter of the Davis shale, which has deterred timid capital from exploring Washington County, in a decent grave; but he conjures to the eyes of capital other goblins equally as terrifying, but which must become equally as evanescent upon examination. He emphasizes that the important matter for consideration is the locality (*loci*) and not the origin of orebodies. Of course! It is only upon the hope that a discussion of the origin of orebodies might result in a more economical method of discovering the locality of orebodies that any publication of the theories of ore deposition, in either governmental publications or in the commercial-scientific press, is excusable; but it is the *locality* of the orebodies we are after. That "is the subject of the story!" It was the Davis-shale theory which excluded the possibility of the locality of orebodies in Washington County being determined. Nason says it is the "geo-structure" that is to be considered. It was in the hope of bringing out from men like Mr. Nason, who are equipped both by education and experience to furnish it, some information, that I suggested that the early prospectors sought the areas traversed by fissure zones as the likely places for ore deposition and that their only guides to these areas were the lines of "sink holes" and the old surface workings. Nason unqualifiedly states that the structure of the rock in Washington County is right for ore deposition. He quotes, approvingly, someone who has said that the cost of drilling in St. Francois County has totaled, to date, $15,000,000! These are wild and whirling words. There were never more than 120 diamond drills operating in the district, and these for only two seasons. For other seasons of the past 20 years, 40 drills is a big average. As the average cost of drilling is about 60c. per foot, it is certain that $6,000,000 would cover the full expenditure for diamond drilling from surface and underground, of which the greater part is properly chargeable to mine development, or mining.

It must be remembered that all development work in St. Francois County is carried on by diamond drilling. In other districts, shafts, tunnels, drifts, upraises, and crosscuts are run for purposes of development. Here, the diamond drilling dispenses with all other methods of development, and is used even for the purpose of determining the most economical attack for ore extraction from known orebodies. The statement of this exaggerated sum is out of place in the discussion of the advisability of prospecting the Washington County area. Its insertion in the communication is unfortunate, for those who are not familiar with the conditions may, improperly, conclude that such an enormous sum was necessary for prospecting for the location of orebodies. As a matter of fact, each of the orebodies now being worked in the Flat River district of St. Francois County was discovered by the first, second, or third drill hole sunk on the respective 40-acre tract where the orebody is situated. The total expenditure for preliminary location, and for the determination that a workable deposit existed, for all of the orebodies in the Flat River District, did not exceed $300,000, and I believe that the expenditure of that sum in careful prospecting in Washington County would expose an equal number of workable ore deposits. Nason states that the depth of the lead deposits in Washington County may be from 1500 to 2500 ft. from the surface. This statement, if not challenged at once, might do more harm than the Davis-shale theory did. My article published in the JOURNAL of Jan. 31, 1914, was in the office of the editor on Dec. 8, 1913. On Dec. 23, 1913, 15 days later, a drill hole was completed by "tenderfeet" on the New Diggings property south of Potosi, near the center of Washington County. The drill, after encountering a workable deposit of dissemirated ore in the Bonne Terre limestone, reached the La Motte sandstone at a depth of 920 ft. from the surface. The drill passed through 450 ft. of Potosi limestone and Davis shale which is the usual thickness in Washington County. Five drill holes were sunk, seven years ago, in the extreme Southwestern part of Washington County and encountered the La Motte sandstone at about 900 ft. from the surface. A record of one hole, sunk in that region, appears at p. 57, Vol. 9, Part 1, "Mo. Bureau of Geology and Mines," which Mr. Nason should know, that shows 900 ft. to be the depth there.

A drill hole was sunk near Richwoods, in the Northern part of Washington County, during the past year, which proved the thickness of the Potosi limestone there to be less than 500 ft. This hole, I am reliably informed, proved some lead in the Bonne Terre limestone. Four holes drilled near Caledonia, about seven years ago, encountered the La Motte sandstone at a depth less than 600 ft. from the surface. At least two of these holes encountered workable disseminated lead. Considerable drilling was done near Irondale, in the southeastern part of Washington County, more than ten years ago, pay ore was struck in several holes, and the La Motte sandstone was reached at a depth of less than 380 ft. from the surface. Here then is an area of at least 200 sq.mi. described within a triangle, the base of which extends from Irondale to the west line of Washington County, 20 miles, with the apex of the triangle at Richwoods, where the thickness of the lime formations is proven in five widely separated localities, in each of which the existence of the disseminated lead is conclusively proven. It is important to note that in the St. Francois County field the existence of the occurrence of this disseminated lead is found only when it exists in large bodies. The conditions under which occurred the metasomatic replacement of the dolomite by the lead sulphide appear to have been operative over a large area, when operative at all. This fact has not been commented upon by the geologists, but if it be true of the area in Washington County, as it appears to be true of the area in St. Francois Co., that the occurrence of disseminated lead is either not found at all, or else is found extending over a wide area, the importance of the discovery of the mere occurrence of this form of deposit at a given point cannot be underestimated. I don't propose to be drawn into a discussion of the causes of this, for I am not equipped for such a discussion. I only suggest this as worthy of investigation, and, if found true, of profound thought by the students of ore deposition.

The records of drilling already done, as mentioned above, show that Mr. Nason's difficulties of drilling in Washington County are, mostly, imaginary. The ridge pole which he erects between the two counties, upon the Washington County side of which he hangs a red flag, is not there! There is no difference between the counties, geologically. The line separating these political divisions was fixed by the General Assembly of Missouri without reference to geology, and without creating geological differences. There are areas in the southern part of the Flat River lead district in St. Francois County exactly the same as the areas of greatest difficulty in Washington County. The study of the "rock preparation" for preliminary prospecting in Washington County need not be extensive. Pick out a line of sink holes in Washington County, or an extended channel, along the course of which surface ore has been taken, or an area where there is a network of pipe veins that have produced ore, and bore to the La Motte sandstone with a driller who is drilling for ore, and not merely to make a foot record, and, I believe the results of the "tenderfoot" drilling at New Diggings, last December, will be repeated so often, that Flat River will dwindle in importance by comparison with the treasures that will be disclosed in Washington County. If the area marked "Washington County" on the map were marked "St Francois County," 50 drills would be operating there today, for there is no reason why they are not there, except that some of the doctors of geology have created a psychological condition which prevents capital from spending the comparatively small sum necessary for the development of this extension of the St. Francois County field. I want to correct Mr. Nason on one other statement. I have wasted no energy in "seeking possible leaks by means of suppositious fractures." I merely stated that the early prospectors took the surface indications of broken ground as indicating areas traversed by fissure zones, and as likely areas for lower ore deposition. Mr. Nason himself puts the factor of "lines of folding and zones of crushing" as paramount. It is the "lines of folding and the zones of crushing" for which the prospectors have been groping, and which many of the technical men have been disregarding. If Mr. Nason has any method for the determination of "lines of folding and zones of crushing" better than observing the strike of sink holes and the earlier surface diggings, he should not longer delay its publication, for everybody is awaiting that kind of useful information. Meanwhile I hope this discussion will go on but it should go on between the geologists. Leaving a layman in this kind of a fight alone is like putting a cave man with a club to charge a gatling gun. Mr. Nason has helped eliminate the Davis-shale bugaboo, and the drill records themselves have already corrected Mr. Nason's errors about the difficulties of drilling in Washington County and the depth at which deposits may be found.

Let us hope that the difficulties of the development of this promising field will hereafter be confined to those which the Creator put there.

St. Louis, Mo., June 20, 1914. H. J. CANTWELL.

Sulphur Bugs

The reference in the JOURNAL of March 28, to Mr. Goodale's mention of the sulphur bug, reminds me of an experience we had one hot summer when working Huntington-Heberlein pots. We were annoyed by swarms of a sort of large fly, which settled on the ropes and handrails and flew about in the strongest sulphur fumes. They swarmed on the side where sulphurous fumes were too strong for a man to stand, and on the hottest side. They were a metallic green color on the bodies, and larger than the house-fly, but smaller than a bee. They were found only near the H.-H. pots, in the fumes, and remained so long as the pots were worked. I never saw them elsewhere, and they were new to the workmen, most of whom were bushmen well acquainted with the insect life of Queensland. Perhaps they were the same "sulphur bug," but where did they come from in our case?

Silverspur, Queensland, May 19, '14. EDGAR HALL.

Editorials

The Crime of Great Success

Thomas D. Jones, president of the Mineral Point Zinc Co. (a subsidiary of the New Jersey), and a director in the International Harvester Co., whom the President appointed to the Federal Reserve Board and whose nomination has been held up in the Senate Committee on Banking and Currency, appeared before that committee on July 6, to answer its questions and explain that he is not a malefactor, nor of the class whose name is anathema. Instead of trying to excuse himself and trim his sails according to the popular wind, Mr. Jones said flatly that he approved of all the acts and practices of the International Harvester Co. since 1909; that he believed those acts were proper and legal and that the company had not offended against the anti-trust laws. He said, moreover, that he was fully in accord with the policy of the company at the present time. Mr. Jones also told the committee of his closer affiliations and more important financial interests in the New Jersey Zinc Co., the so called zinc trust. Mr. Jones said that the New Jersey Zinc Co. produced about 20% of the spelter, 85% of the zinc oxide, and 3% of the sulphuric acid that is made in the United States. Quoting from the New York *Sun*:

"Mr. Jones almost startled the Democratic members when he said that the New Jersey Zinc Co., of which he is a director, returned dividends last year of 50% on its $10,000,000 capitalization, and that it paid 40% the year before. . . . Members of the committee said afterward that the Chicago man had made a favorable impression because of his courage and independence, but they were fearful that the Senate would not be able to approve as a member of the Federal Reserve Board a man who defended the International Harvester Co., and admitted his identity with a great industrial corporation that is returning 50% in dividends on its consolidated properties."

Here we have an exhibition of the modern tenet that no man, or no corporation may longer participate in the government of this land, and perhaps may not even enjoy the protection of its laws, if he be in receipt of a very large income, no matter if that income be earned in an absolutely honest way. Last year it was the Agassiz and Shaws and the Calumet & Hecla Mining Co. who were the targets of abuse. Now it is Thomas D. Jones and the New Jersey Zinc Co. If the discoverers of the Great Bonanza of the Comstock were alive today, it might next be they.

The New Jersey Zinc Co. came into being about 15 years ago as the owner of a marvelous deposit of zinc and manganese ore in northern New Jersey. No other deposit of the same kind of ore has been known anywhere else in the world. The New Jersey Zinc Co. did not acquire its title by the location of Government land. The State of New Jersey was one of the original 13 colonies and its surface had been divided according to the British and Colonial law. The owner of the surface owned what mineral he might discover within his boundaries. The celebrated occurrence of zinc ore at Franklin Furnace was noticed and prospected as early as 1640. The first mining was done in 1774. It was many years, however, before any serious mining could be done, for the reason that the way to smelt zinc ore was unknown and after it became known this unique kind of ore was found to be very difficult to smelt. But in 1851, Samuel Wetherill invented a way of making zinc oxide directly from the ore, and this was the beginning of the utilization of the ore, though for nearly 50 years that utilization was carried on in a relatively small way. The surface of the mine was divided among several interests, there was confusion of titles resulting from ambiguities of early deeds. and the most protracted mining litigation in the history of the United States had been running half a century. There had been many failures of operating companies. The three that were in existence in the '90s were only moderately successful. The orebody, as a whole, was not then commercially workable; certain parts of it only could be skimmed and used.

About this time, John Price Wetherill invented a means for separating the run-of-mine ore into its constituents, which individually could be treated at great profit for the production of spelter, zinc oxide and spiegeleisen. August Heckscher quickly perceived the importance of the new invention and, recognizing the wastefulness of the apparently interminable litigation among the companies owning the great deposit of ore, and indeed the impossibility of extracting the orebody in an economical way unless it were extracted as a whole, conceived the idea of consolidating the three little companies. The New Jersey Zinc Co. was the child of his imagination. An industry which had previously been conducted at small profit, soon began to yield very large profits, nor was this by virtue of any exactions from the public. It was especially by virtue of the invention of John Price Wetherill. Previous to the date of that invention, the Franklin mine, great and unique as it was, had but relatively little value, other than potentially. The great dividends that the company subsequently earned were due to the Wetherill invention applied to the mine. Subtract that invention and it would scarcely be known how to treat the ore of the mine, certainly not at the great profit that has been realized from the invention. Then came Mr. Catlin, who revised the methods of mining and effected enormous economies in the extraction of the ore, which would not have been possible unless the orebody could be worked as a whole. With the abolition of the costly litigation, and with the exercise of good management in other respects, the New Jersey Zinc Co. became the earner of the very large dividends which have startled the senators. These dividends were not sucked out of the public. In subsequent years the company invested in zinc mines and smelteries in the West, naturally extending its interests along the lines that it knew by experience, but with all of its acquisitions the New Jersey Zinc Co. in the production of spelter is only one among nine or ten important interests. There is no branch of the metal business which has been less "consolidated" than the spelter business. In the production of zinc oxide, the New Jersey Zinc Co. occupies a more influential position, but the Wetherill patents for the manufacture of zinc oxide expired nearly half a century ago, and anybody may engage in that business who sees fit, nor does the consumer have to grovel at the feet of the New Jersey Zinc Co., since, if he finds the price of zinc white to be too high, he may use white lead or barytes, or some other substitute. In fact, the New Jersey Zinc Co. conducted an extensive propaganda to increase the consumption of zinc white at the expense of the consumption of white lead.

The men, who, like John Price Wetherill, August Heckscher, S. S. Palmer and Thomas D. Jones, create value by effecting economies, are the real conservationists. Why should they not reap the big dividends that their brains have earned, not by exacting toll from the public, but by saving what mediocre intellects have been wasting? Would the country be any better off today if the Franklin mine were operated as in the early '90s? But to return to our theme, it is absurd and reckless to refuse a man like Mr. Jones a participation in the affairs of our Government, in a capacity for which he is eminently suited, just because he has been prominently and constructively engaged in a great industry.

We have not written this about the New Jersey Zinc Co. because we hold any brief for that company. We do not hold a brief for any individual interest, but we do hold a brief for the mining industry, and we see jeopardy for that industry if the idea becomes prevalent that the winning of enormous profits be a crime against society. The possibility of being an Aladdin is the great inspiration of mining and the courting of risks wherein thousands are cheerfully lost in the hope that the lucky number may turn up. The optimism of Colonel Sellers, "there's millions in it," is the mainspring in the development of "prospects," out of which sometimes come mines; and it is the tradition of Mackay, Fair, Haggin, Hearst, Daly, Stratton and the other mining millionaires of the past that inspired those who have become the mining magnates of today. There are men who are drawing 50% dividends, and more, upon their investments in the porphyry copper mines, but 10 years ago those mines laid neglected. Who will begrudge the Guggenheims and Mr. Burrage whatever fortune they may cull from abandoned Chuquicamata? These opportunities laid long before a world which did not know enough to recognize them. Are the men who perceived them and seized them and became very rich to be disqualified as citizens and from serving their country?

Fiction and Fancy in Technical Literature

The 10-cent magazines are commonly regarded as the natural repository of fiction, not the engineering and scientific papers. However, the latter contain more romances than is commonly supposed. The explanation of this paradox is that readers generally are unable to recognize the fiction and fancy that is served them in the guise of technical contributions. We have long had it in mind to write something on this subject, when along comes George E. Collins, who, in his address retiring from the presidency of the Colorado Scientific Society recently, said about what we should have liked to say, but perhaps should not have dipped our pen in quite so tart an ink. Listen, then, to Mr. Collins:

> Whatever convenience of arrangement, whatever apparent completeness of flow-sheet a dressing-plant may possess, if at the end the waste products are not led to a single channel where an automatic sample can be taken, we are justified in regarding it with suspicion, and in declining to receive with confidence any claims advanced as to the extraction made. There may be commercial reasons why the losses from a milling plant should not be published. I have even known cases where there were valid reasons why such determinations should not be systematically made. It should, however, be considered the unpardonable sin to pretend that they exist when they do not; and to publish to the world as technical data of scientific value what are merely efforts to advertise men or plants, on the strength of partial misrepresentative figures. Nearly one-half of published accounts of mining costs and of metallurgical savings are unreliable; and are in fact advertising matter, not reports. The very first time that the margin of error happens to operate both ways, so as to enable him to figure out a high saving, our budding metallurgist breaks out into print, or hands his "data" to somebody else who does the same service for him. Directly a new plant attains its full tonnage, and before the inevitable budget for repairs, supplemental construction and depreciation begins to be felt, similar data of "costs," equally misleading, are published. Thus the columns of our technical journals are filled; and the great ocean of human misinformation expands. Other writers quote in good faith from such articles, so that in the end we all become loaded up with a great deal of knowledge of things that are not so. What we need is a board of censors, an "International Brotherhood of Knockers," who will devote themselves to the task of puncturing balloons and disentangling knots. The members of this noble band should pledge themselves to contradict misstatements whenever found, to expose absurd pretensions, to point out fallacies. The residuum of real information would occupy one-tenth of the present bulk; and there might be some prospect of the ordinary person keeping up with the march of achievement.

We are sure that Mr. Collins did not mean to refer to the engineering periodicals alone. On the contrary the transactions of our engineering societies, those ponderous tomes which soon become musty on our library shelves, contain a more or less regular proportion of reports and statements that "aint so." On the whole, we are disposed to think that errors run a severer gauntlet of exposure in the engineering periodical than they do in the engineering society. Who is there that has not been to a meeting where some speaker has expounded misconceptions and inaccuracies about a subject, while experts have smiled cynically but have refused to participate in any discussion? "What's the use?" they may say. "Personal experience is the only thing that teaches most people. If we reply to this man we may become involved in a disagreeable controversy. Persons who really want to know about this subject will inquire of us privately. The public relishes misinformation—the engineering public no less than the everyday public—so let them have it." All wrong, of course, but nevertheless quite human. The same conditions do not obtain in the engineering paper. If an editor wants to know if some special department of his paper is being read, the infallible test is to make intentionally some mistake in it. The corrections that come pouring in are the answer to his question.

But, of course, neither the editor of the engineering periodical nor the editor of the engineering society's transactions, nor the readers of the publisher of scientific books is omniscient, and being fallible and human, they pass things contributed by authors of fair repute that look all right, look to be merely the simple statement of fact, yet are not so if the truth were known, just as Mr. Collins avers so caustically. Perhaps the author has fooled himself—we recollect one who used to report 99% extraction from his concentrating mill, although tributers were making a good living out of his tailings—perhaps he is so overwhelmed by his optimism as to construe success out of what is really failure. However it be, it is undeniably the fact that many things are published as being so, which are not, and errors thus originating become eventually embodied in the books of the professors.

BY THE WAY

As indicative of the size of the Calumet & Hecla organization, testimony by the manager, James MacNaughton, before the Congressional Investigating Committee at the time of the late strike, is of interest. Mr. MacNaughton gave it as his opinion that the Calumet & Hecla Mining Co. had $21,000,000 to $22,000,000 invested in plant. The deepest workings of the Calumet & Hecla proper are 5000 ft. vertically, or 8100 ft. on the dip of the formation. The several companies which Mr. MacNaughton manages had a total of 8506 men employed on July 22, 1913. Compare this with 6000 men employed in mining in the State of Idaho and 5000 in the State of Nevada. Even in all of Montana the number of employees is less than twice as great, about 15,500. The complement of bosses for the Calumet & Hecla and its subsidiaries was between 750 and 800; this would be a large labor force for an ordinary mine.

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The careless handling of dynamite by those most familiar with its destructive effects is admitted by engineers and contractors engaged in blasting. A remarkable incident illustrating this type of foolhardiness was described in the "Travelers Standard" for May. A certain contractor had given what he considered adequate instructions to one of his men with regard to the handling of dynamite. The work was carried on in cold weather, and the dynamite required thawing before use. The contractor had provided a suitable thawing kettle by which the thawing could be done in a safe and proper manner. A fire was built on the ground to warm the water for the kettle, and the helper was then left to attend to the purely mechanical part of the process. The contractor returned sooner than expected, and discovered that his man had stood the dynamite sticks on end in a circle around the fire to thaw, and that several of them had caught fire and were burning. He called to his helper and told him to run for his life, but the man misunderstood, and seeing that he was detected in his disregard of the instructions he had received, he immediately snatched up the dynamite that was not burning and threw it away from the fire. He then stamped upon the burning sticks, to extinguish them, and subsequently rubbed the ends of them on the hard ground, to make sure that no sparks remained. The repeated cries of warning of the contractor was interpreted by the assistant to mean simply that he should work faster. By some remarkable chance, there were no serious consequences.

Walter George Newman told a really touching tale to the Senate Investigating Committee, which is inquiring about the use of official letter paper of the Census and Rules Committees for circulation of a letter praising the Gold Hill mine. Newman testified that he asked Senator Overman's stenographer to make copies of the letter and that a clerk in the Census Committee made others. Senators Overman and Chilton, chairmen of those committees, knew nothing of it, he said. Washington press dispatches relate that while Newman was telling the story of his struggles to promote the property, he wept, and once his sobs stopped him. Newman said that about 35 or 40 copies of the letter on Senate paper were sent to his personal friends among the Gold Hill stockholders. None was used to "boost" the stock, he protested. In a choking voice, continue the press dispatches, Newman told the committee of the early struggles of himself and his brother, J. J. Newman, to develop the mine. "My brother saw things going to pieces," he said, "and he took five sticks of dynamite and blew himself into ten thousand pieces. He left a letter saying his life's work was gone. He said North Carolina was the richest state in the Union. When I heard that, I took oath I'd never let go that property till I proved his statement, or went the way he went." This is almost as pathetic as the deaths of Little Nell and Uncle Tom. If Mr. Newman has got to prove by the Gold Hill mine that North Carolina is the richest state of the Union or else blow himself into ten thousand pieces, the outlook for Mr. Newman is not encouraging. However, his proposition may merely be equivalent to the hackneyed "I'll eat my hat if," etc.

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The *Rocky Mountain News* (Denver) prints the following correspondence relative to a recent more or less mythical happening in the radium field:

> Your correspondent located in Grand Junction is evidently in error in the write-up headed "Alleged Radium Thief Captured," in the "News" of June 25. The facts, which I have ascertained after considerable difficulty, are as follows: The said J. E. Stone, who was captured on the Utah desert with 30 sacks of radium ore, did not have it packed on horses as stated, for the weight was too much (3000 lb.), so Stone rented two elephants from a traveling circus near Cisco, Utah. After loading the valuable ore on them, he started toward Green River, Utah, where he expected to cache the ore until he could ship the same to a firm in Germany
>
> The theft was soon discovered. Deputy Sheriff Risley, fully armed, in a high-powered automobile and a bodyguard of cowboys recruited from a nearby ranch, was soon on the trail of Stone, who was sighted with a pair of powerful field glasses. He was overtaken after a chase of 50 miles. He refused to dismount. A cowpuncher threw a lariat 75 ft. and lassoed him. Stone then surrendered and was taken to the county seat to stand trial. The ore was the most valuable mined in this country. It was worth $60,000, and, had Stone made his getaway, he would have been independent for life.
>
> He now says if he had had camels instead of elephants he thinks he could have gotten away with the ore. The elephants, he declares, were too easy to follow after the scent was taken up. It was impossible for him to get away as planned, for the elephants suffered so much for the want of water that they were uncontrollable. There have been several write-ups on this matter. We are only writing this to give you the straight of it, as there is nothing like printing the facts. As your correspondent located at Grand Junction was so far from the scene, his errors are excusable.
>
> ALLEN DELCONAS.
>
> Thompsons, Utah, June 28, 1914.
>
> P. S.—We would like to act as your regular correspondent for this territory, as there are lots of exciting things happen around here that the public never gets the straight of.

We believe that last, Al.

Searles Lake Potash

By Lewis H. Eddy*

The potash deposits at Searles Lake, San Bernardino County, Calif., are about to be utilized by the American Trona Corporation. The corporation was formed some time ago and supplied with sufficient capital, to develop the property on a large scale. To carry out the contemplated plans, required the building of about 32 miles of railroad from Searles station, on the Owens River branch of the Southern Pacific R.R., to the site of the works, situated northwest of the crystal body or lake, as it is commonly called. Construction was begun in September, 1913, and in May, 1914, the railroad was ready for handling of traffic.

It was impossible for the company to complete the construction of a 3000-ton plant, without adequate transportation facilities. So advantage was taken of the time required to complete the railroad, and an initial unit or pilot plant was built and is ready for operation. This plant is not fundamentally experimental, as the various products were separated on a commercial, or at least tonnage basis, in 1912. This initial unit enables the corporation to test out various types of auxiliary apparatus, such as heaters, coolers, filters, condensers, etc. The plant is equipped with several different types of each machine, and after operating for a reasonable length of time, it will be known definitely which particular type of each machine is best adapted for the other units. The present plant has cost about $150,000, but the corporation hopes to save as much as this amount in the construction of the final works by reason of the knowledge gained during the operation of this large-scale testing plant.

The deposit[1] consists of a body of crystals, covering approximately 20 square miles, and averaging 70 ft. in thickness. These crystals are permeated by saturated brine, the average level of which is 1 in. below the surface of the crystals. The brine is substantially uniform in composition throughout, while the crystals vary considerably in different portions of the deposit and at different depths of the same well. More than 200 wells have been drilled and the deposit has been thoroughly explored. The raw material which will be used is the brine. The mining costs represent the cost of pumping the brine. This cost is ridiculously low, as the elevation of the works above the surface of the crystal body is only about 75 ft.; and to turn out the capacity contemplated in the large-scale works, it will be necessary to pump only 2,000,000 gal. per day.

The principal salts in the brine are sodium carbonate, potassium chloride, sodium borate, sodium chloride and sodium sulphate. The salts of value are potash, borax and soda ash, the potash being by far the most valuable. At present no value is attached to the salt or sulphate, but it is hoped some day to find a market for them, or to convert them into other and more valuable products.

As an interesting side-light on the situation, it may be said that the borax and soda ash must be removed in order to produce marketable potash, for the alkalinity of these products would destroy the value of the potash as a fertilizer. It will, therefore, be seen that the borax, as well as the soda ash, is obtained as a byproduct in the manufacture of potash; and its cost is obviously considerably less than where it constitutes the chief article of manufacture.

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Silica Output in 1913

The production of silica, excluding gem material and sand, in the United States for 1913 is reported by the U. S. Geological Survey as 232,192 short tons, valued at $953,832. This output is classified into the different varieties of silica as follows: Quartz, 97,902 tons; sand (finely ground material), 106,857; tripoli (commercial), 20,831; diatomaceous earth, 6602. The quartz production was less than in 1912, and the average value of the crude quartz was 73c. per ton, and for ground quartz $6.23. Most of the crude quartz is produced by North Carolina, Pennsylvania and Tennessee. The output was largely used for packing acid towers and for flux in copper smelting, the Tennessee Copper Co. being a large user. Ground quartz was produced principally in Maryland, Connecticut, Michigan and Wisconsin. Finely ground sand and sandstone, used for similar purposes to the finely ground massive, crystalline quartz, was produced in Illinois, Ohio, Pennsylvania and West Virginia, prices ranging from $3.25 to $5.25 per ton. Commercial tripoli, produced from silicified limestone (not true tripoli), is used as a light abrasive and was produced principally in Illinois and to a lesser extent in Missouri, Pennsylvania and Tennessee; the average price was $10.32 per ton. Diatomaceous earth, also known commercially as infusorial earth, kieselguhr and, properly, tripoli, was mainly produced in California, Nevada and Washington and in a minor way in the Atlantic Coast states. The average price was $10.50 per ton. There was no domestic production of flint, but the imports of flint pebbles were valued at $319,509, the principal exporting countries being Denmark, France, Belgium and Newfoundland.

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Clay Deposits in Indian Reservations Open to Exploration

Washington Correspondence

On June 30, the Senate passed the following act: That all lands containing minerals: Kaolin, kaolinite, fuller's earth, china clay and ball clay, within such parts of Indian reservations as have heretofore been opened to settlement and entry under Acts of Congress which did not authorize the disposal of such mineral lands shall be open to exploration and purchase and be disposed of under the general provisions of the mining laws of the United States.

Provided, that the same person, association, or corporation shall not locate or enter more than one claim, not exceeding 160 acres in area, and that none of the land or mineral deposits, the disposal of which is herein provided for, shall be disposed of at less price than that fixed by the applicable mining or coal-land laws, and in no instance at less than their appraised value for agricultural purposes.

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The Dexter White Caps Mining Co., Tonopah, Nev., for 1913 shows receipts of $15,819 and expenditures amounting to $6445. There is also due from the White Caps Leasing Co. $1674 in royalties. The total production of the property since 1911 is stated to have been 12,004 tons, mined and milled averaging $24.30 gross and 4500 tons on dump averaging $14 per ton. It is also estimated that the mine has 16,679 tons of $14.35 ore developed.

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*Associate editor, "Engineering and Mining Journal," San Francisco, Calif.

[1] "Eng. and Min. Journ.," Feb. 1, 1913, and Feb. 28, 1914.

PERSONALS

Kirby Thomas has returned to New York.

W. M. Henderson has left for England on a vacation.

John M. Fox is in Colorado on mine examination work.

B. B. Thayer went to Butte last week and will be absent from New York until September.

Joseph A. Inslee has changed his address to Casilla 378, La Paz, Bolivia, care Andes Tin Co.

Prof. J. F. Kemp has gone to Cuba to do some geological work, which will occupy him about a month.

R. M. Henderson, manager of the Wellington Mines Co., Breckenridge, Colo., has been in Denver on business.

Louis C. Jaquish has left Spokane for Liberty, Wash., where he has taken a lease on the Cedar Valley placers.

S. J. Lewis has moved from his temporary quarters at Calle Gante, 14 to a permanent office at 2a San Agustin, 56, Mexico City.

W. G. Carpenter has resigned his position with the Goldfield Consolidated mill to accept one with the Syndicate Mining Co. in the Philippines.

S. H. Conner has returned from Philadelphia to the Lardo River, B. C., to resume work in connection with efforts to recover gold by dredging.

B. Wallis Knowles, of Hedley, B. C., with the Hedley Gold Mining Co., was married on June 1, at Keremeos, B. C., to Miss Ellen Corrigan, of Hope.

Persifor G. Spilsbury, manager of the Aguacate mines, has returned to San Mateo, Costa Rica, after a two months' holiday in the United States and England.

F. Lynwood Garrison has gone to Nome, Alaska, where he will remain until the end of the season. He expects to return to Philadelphia early in November.

Morton Webber, who was recently engaged in the examination of a large low-grade gold deposit near Pioche, has gone to Idaho to examine a placer deposit.

J. D. MacMaster, of Rochester, N. Y., managing director of the Queen's Head Mining & Milling Co., is directing work at the company's Martney mine, near New Denver, B. C.

Arthur C. Terrill has been appointed field representative of the State Museum of New York, to be engaged in making preparations for the exhibit at the Panama-Pacific Exposition.

J. V. N. Dorr was given the honorary degree of Mining Engineer at the recent commencement of Rutgers College, New Brunswick, N. J., in recognition of his contributions to gold and silver metallurgy.

O. E. Cary and W. E. Henry, of Denver, Colo., each representing a zinc purchasing company, have been visiting mines in Slocan district, British Columbia, with the object of buying zinc ores there.

William Thomlinson, of New Denver, B. C., is collecting ore samples from mines in the Skeena country, Cassiar district, B. C., for the Canadian exhibit to be made at the Panama Exposition at San Francisco.

Vernon Freeman Marsters, geologist to the New York & Honduras Rosario Mining Co., was married June 17 to Miss Mary Effie Coleman, of Yonkers, N. Y. After Sept. 1 they will be at San Juancito, Honduras.

Dr. Hans Goldschmidt, the inventor of the Thermit Process and president of the Goldschmidt Thermit Co., is now paying his annual visit to the United States in order to keep in touch with his numerous interests in this country.

T. H. Jenks, of Denver, having completed some examinations in New Mexico, is now engaged upon professional work in the Globe district, Arizona. From there he will go to Las Cruces, N. M., before returning to Denver about the end of July.

H. G. Young, manager of the Trethewey Silver-Cobalt Mine, Ltd., has resigned to take the position of consulting engineer to the Algunican Development Co., Ltd., and general manager to its subsidiary companies. Mr. Young will leave Cobalt about the end of July.

Dr. Edward Dyer Peters has received the honorary degree of Doctor in Engineering from the Royal School of Mines, Freiberg, Saxony. The degree was conferred upon Prof. Peters in recognition of his distinguished academic and practical services and learned writing in the department of the metallurgy of copper.

C. V. Hopkins, chief engineer for the United Verde Copper Co., left on June 21 for San Francisco, from which point he will sail for Honolulu and Japan. Mr. Hopkins has been chief engineer for the United Verde Co. for 11 years, and for the past five years has never left his post. He is now taking a vacation for the benefit of his health.

At the recent commencement of Tufts College, Massachusetts, Dean Frank D. Adams, of McGill University, received an honorary degree. Incidentally, Dean Adams was the chief speaker at the annual dinner of the Association of Harvard Engineers, and Dr. and Mrs. Adams were also the guests of the Greater Boston geologists at a dinner at the University Club.

W. H. Storms, of San Francisco, formerly state mineralogist of California, was banqueted by the San Francisco Commercial Club on his return from Mt. Lassen. Mr. Storms gave a description of what he had seen at Lassen Peak at the time of the recent eruption, and stated that the eruption was strictly volcanic and really a volcano in embryo, sure to increase in proportions and repeat its spectacular performance. Mr. Storms did not predict that lava would flow from Lassen Peak, which he said was not necessary for a real volcano.

OBITUARY

John I. Mayers, a mining engineer of Ouray, Colo., died at the Mercy hospital in Denver, June 29, from injuries caused by a fall from a window while delirious from fever. He was a native of Wales, but had lived in Colorado many years, and had held some responsible positions as a mining engineer.

On June 29 Arthur Austin, chief testing engineer at the International Smelting Works, Tooele, Utah, was testing an oil burner for use on the assay furnaces. A steel oil barrel containing the oil was under a high air pressure, and the barrel exploding in every direction, covered him with oil, which was immediately inflamed from the fire a few feet away. He was most seriously burned, so that death occurred the same afternoon. He leaves a widow and a young child. He was the only son of L. S. Austin. He was a graduate of the Colorado State School of Mines and of the Michigan College of Mines. He had been with the Anaconda Copper Mining Co. since 1906, having been transferred in 1911 to the Tooele plant.

SOCIETIES

Lehigh University—The annual summer school fieldwork in mine surveying was done at Hazleton, Penn., during the week beginning June 14. This work is required of students in the mining course at the end of the junior year, and this year there were sixteen men taking part in the surveying of a section of the Wharton coal seam.

Colorado Metal Mining Association—A chapter has been organized at Denver, not because there are mines there, but because many mine owners and others interested in mining live there. Incorporators are W. G. Haldane, A. B. Frenzel and Harry W. Robinson. Directors named for the first year are Samuel D. Nicholson, Western Mining Co., Leadville; George A. Stahl, E. A. Colburn, Ajax Mining Co., Victor; John T. Barnett, Brad P. Morse, of Morse Brothers Machinery Co.; President Haldane, of the Colorado School of Mines; Allen L. Burris, of El Paso Gold Mining Co., Cripple Creek.

American Iron & Steel Institute—The directors of the American Iron & Steel Institute, at their monthly meeting in New York, June 26, decided to hold the autumn meeting of the Institute at Birmingham, Ala., on October 29 and [illegible] With the new hotel accommodations that have been provided in Birmingham in the past year it is believed the members can be taken care of comfortably. The important construction of iron and steel and coke plants that has added to the capacity of that district in the past five or six years should make the inspection features of the meeting of peculiar interest.

Dredgemasters' Association of Yuba County—This association was organized last winter by the dredgemasters in the Yuba basin district, California, with the object of promoting efficiency in the gold-dredge industry. The officers are George E. Sibbett, president; M. L. Summers, vice-president;

[illegible] Wil[illegible], secretary. The membership is not confined to dredge engineers, but includes superintendents and heads of departments. The meetings are held twice a month at Hammonton, and the attendance is not confined to the membership. Superintendents and dredgemasters and others, both mining and mechanical engineers, in any way interested in the dredge industry are welcome at the meetings and are invited to participate in the discussions, so that there is usually an attendance representing the dredge industry in the Feather River and the American River districts and some other parts of the state. A great many mining engineers from foreign countries come to California to study the dredging industry, and these meetings are frequented by the foreign engineers. Informal talks are given on various phases of dredging, followed by general discussion. The following subjects recently presented at the meetings illustrate the character of the work being done by the association: "Care of the Electrical Apparatus," by Edward Thunen, electrical engineer, Yuba Consolidated Gold Fields. "First Aid as Applied to Accidents Usually Made in Dredge Work," by Dr. Gray. "Manganese Steel," by R. D. Chapaman, Western manager Taylor-Wharton Iron & Steel Co. "Safety First and Accident Devices," by George J. Carr, superintendent, Yuba Consolidated Gold Fields.

International Congress of Mining and Metallurgy — The Sixth International Congress of Mining, Metallurgy, Engineering & Economic Geology will be held in London, July 12 to July 17, 1915. The Congress will be divided in the following sections: I, Mining; II, Metallurgy; III, Engineering; IV, Economic Geology. Participants in the Congress may be: (a) Honorary members; and delegates of foreign states. (b) Supporters of the congress, contributors of not less than $25 to the Fund. (c) Ordinary members who pay a congress fee of $5, which entitles them to registration in any one of the four sections. These may register in any other sections by making a further payment of $1.25 for each section. The honorary members of the Congress and the supporters will receive all publications of the Congress. Ordinary members will receive the "Transactions" of that section in which they may elect to register by payment of the fee, $5. They can, however, receive the "Transactions" of any other section on payment of the additional charge of $1.25 per section referred to above. The authorized languages at the meetings are English, French and German. The official language of the Congress is English. The Executive Committee has drawn up a list of selected subjects for discussion at the Congress and has invited authorities to prepare papers thereon. In addition to these the committee is prepared to accept a limited number of other papers, if found suitable for the objects of the Congress. All papers must reach the committee not later than Jan. 31, 1915. Papers may be submitted in any of the three authorized languages, (English, French, German) and must be accompanied by a short abstract in the same language as the paper. The papers will be printed in one of the three languages, and the abstracts will be printed in all three languages. At the meetings of the sections of the Congress the papers will not be read, but authors will be invited to introduce the subjects of their papers for purposes of discussion. Except in special cases, the time allowed to authors for the introduction of their subject shall not exceed 15 minutes. Copies of the papers will be circulated in advance, and the abstracts will, as far as possible, be placed at the disposal of the members of the Congress at the opening of each meeting at which the papers are to be discussed. Any inquiries for further information should be addressed to the Secretary of the International Congress, 28 Victoria St., London, S. W., England.

INDUSTRIAL NEWS

The Western Engineering Specialties Co. announces the removal of its office from 1727 Wazee Street, to 523 Boston Bldg., Denver, Colo.

Iron and Steelworks Mark, Wengern-Ruhr, Germany, manufacturers of carbonless metals and alloys, has appointed C. W. Leavitt & Co., 30 Church St., New York, as its American selling agents.

Taylor-Wharton Iron & Steel Co., High Bridge, N. J.; Wm. Wharton Jr. & Co., Inc., Philadelphia, Penn., and Tioga Steel & Iron Co., Philadelphia, Penn., announce the removal of their Seattle office to 1604 L. C. Smith Building.

The General Electric Co. reports an order received from the Calumet & Arizona Mining Co., Gila, Ariz., for a belt-driven electrolytic generator, 2400 amp. at 24 volts or 4800 amp. at 12 volts, with direct-connected exciter.

The Nordberg Manufacturing Co., of Milwaukee, Wis., is now building Diesel engines, particularly of the largest sizes, having recently entered into an exclusive manufacturing arrangement with Usines Carels Freres, of Belgium, builders of the Carels engines.

Owing to accidental destruction of current files, manufacturers of mining machinery and appliances are requested to send complete catalogs to the H. S. Renshaw Co., Ltd., New Orleans, La. This firm is exporter and purchasing agent for large mining interests in Latin America.

The Sullivan Machinery Co. announces that J. C. West, hitherto local manager at San Francisco, has been transferred to the general offices at Chicago, in the capacity of general sales engineer. Ray P. McGrath, for several years associated with the New England sales office of this company, at Boston, has been appointed district manager at San Francisco.

Harvey W. Bell, founder of the Bell Locomotive Works, Inc., is now working with the H. K. Porter Co., of Pittsburgh, Penn., in the manufacture of a gasoline-steam locomotive. This new class of locomotive equipment is particularly adapted for mining and tunnel construction service, but it is excellently suited for all operations requiring light compact locomotive equipment.

The Traylor Engineering & Manufacturing Co., of Allentown, Penn., has supplied to the Hercules Mining Co., of Idaho, a special "Traylor" 7x6-ft. tube mill, and some standard tube mills to the Colorado Mining Co., in the Philippines. The Traylor company has also received an order from James Breen for a 20-stamp mill and equipment for treating a free-milling gold ore in Montana; high-pressure three-stage pumps for the Timber Butte Mining Co., and a 30-in. centrifugal pump for the Gaston Gardens Co. of Oregon; this pump will be used for irrigation purposes.

TRADE CATALOGS

Buckeye Engine Co., Salem, Ohio. Bulletin No. 111-B. Buckeye-mobile. 16 pp. Ill. 8x10½ inches.

The Bury Compressor Co., Erie, Penn. Catalog, Noiseless Air Compressors. Four pages; illus., 9x6 inches.

H. K. Porter Co., Pittsburgh, Penn., catalog. Modern Compressed Air Locomotives. 80 pp. illus. 9x6 inches.

Bucyus Co., South Milwaukee, Wis. Bull. No. M-125. The Bates Rail Clamp for Steam Shovels. 2 pp. Illus. 11x8½ in.

The Lagonda Manufacturing Co., Springfield, Ohio. Bulletin. Automatic cut-off valves. 18 pp., illus., 8x10 inches.

Western Electric Co., 463 West St., New York. Catalog, Western Electric inter-phones and accessories. 48 pp. Ill. 8½x11 inches.

Sandycroft, Ltd., Chester, England. Catalog Single Speed Cascade Induction Motors Without Slippings. 164 pp. Illus. 9½x7½ inches.

American Concentrator Co., Springfield, Ohio. Catalog. New Century Disintergrating and Washing Screen. 12 pp.; illus.; 9x6 inches.

Ottumwa Iron Works, Ottumwa, Iowa. Catalog No. 30. Electric and steam hoisting engines and mine equipment. 116 pp. Ill. 7½x10 inches.

Schütte & Koerting Co., 12th and Thompson Sts., Philadelphia, Penn. Catalog 8, Section H. Schnicke Hydraulic Operating Valve. 4 pp. Illus. 11x8½ in.

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 34-C. "Chicago Pneumatic" gasoline and fuel oil engine driven compressors. 16 pp. Ill. 6x9 inches.

Lumen Bearing Co., Buffalo, N. Y., Booklet. Lesoyl, 8 pp. 6x3 inches. This booklet describes a new lubricant, a graphite concentrate, called Lesoyl, manufactured by the Lumen Bearing Co.

Sullivan Machinery Co., Chicago, Ill. Bull. No. 66B. Sullivan Rock Drill Mountings and Accessories. Thirty-six pages; illus., 9x6 in. Booklet No. 113. Core Drilling by Contract with Sullivan Diamond Core Drills. Thirty-two pages; illus., 5½x3½ in.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y. Bull. "Little David" Riveting Hammers. Sizes, 50, 60 and 80. Eight pages; illus.; 9x6 in. Rivet Set Retainer for "Little David" Riveters. Four pages; illus.; 9x6 in., and Leyner-Ingersoll Water Drills, 32 pp.; illus.; 9x6 inches.

Editorial Correspondence

DENVER—July 3

Roosevelt Tunnel New Work is slow owing to an unusual increase, this spring, in the flow of water. The enlargement of the ditch at the side of the tunnel and the laying of track has been difficult. There are several hundred feet of this work still to be done before the breast can be attacked and the bore advanced according to new plans.

Good Roads at Leadville are the cause of an annual celebration, a "good roads day" being observed in mid-June or as soon as winter's accumulation of snow and ice can be removed and road materials handled. Wagon roads about the city require more than ordinary attention since they are subjected to extremely heavy traffic, while the climate of the region makes frequent repairing necessary. This year three roads were dressed by large gangs of volunteers who worked without compensation one full day. These roads lead from the city to three important sections of the adjacent country and are known as the Little Strayhorse, Jonny, and California Gulch roads. Business men who could not personally undertake such labor furnished substitutes and the canvass for such laborers developed the fact that there are no idle men in Leadville, at least none necessarily so.

BUTTE—July 2

Labor Trouble Will Be Ended at Butte if the officers of the Western Federation of Miners remain away and "Muckie" McDonald and his followers are not interfered with, or called to account for what they have done in a dynamiting way, and are permitted to run Butte according to their own ideas, so far as the miners are concerned. There will be no more murder or dynamiting. That has been promised by McDonald himself and by Lewis J. Duncan, ex-preacher, former advocate of direct action, and for three years mayor of Butte. Governor Stewart appealed to the mayor for protection for some of the federation officers who desired to return to their homes in Butte, but the mayor advised the men to remain away because they started the trouble before, and McDonald added that Moyer had escaped once, but he would not again if he came back. To make the thing look right, the mayor and the city council offered a reward for the apprehension of the men who actually committed the murder during the last dynamiting riot at Butte, and for the discovery of the men who threw Acting Mayor Curran from the second-story window of the miners' union hall while Mayor Duncan was out of the state preaching Socialism and Vice-Mayor Smith was on a fishing trip. The county authorities are prosecuting an ex-convict and "dope fiend" for dynamiting the miners' union safe, and they are looking for the man who got the money, but nothing is said about the rebel leader who rode on top of the safe through the principal streets of Butte and harangued the crowds as he passed, and then superintended the dynamiting of the safe and the counting of the money taken from it. There has been a tendency to criticize the sheriff for his inaction and failure to handle the situation when the mayor refused to do so. The new miners' union, or rather leaders and speakers for that body, exhibited their real purpose when they issued a "statement" of their cause and grievance, devoting the entire statement to an attack on the Amalgamated Copper Co., which was blamed for everything. The chief accusation against the company is that it dominated the old union, put in its own officers, and corrupted the control. The Amalgamated may have been too largely interested in the union, for it is rather active in all affairs locally, even in school affairs and the nomination and election of trustees, but its property interests are also large and it has a right to look after matters that affect its interests. The fact is, however, that in all the history of mining and unionism in Butte there has never been a just grievance against the mining companies regarding working conditions, wages or hours of labor, and Butte has ever been pointed to by wage workers the world over as having ideal conditions and to the Amalgamated as the ideal corporation employer. Yet, at the conclusion of the rebel meeting a few nights ago, one of its members visited a newspaper office and gave vent to this expression: "We have the Amalgamated on the hip and by the throat. They may shut down the mines on us, but if they do we'll blow them up from the Silver Bow to the Butte & Bacorn." But the mines are being operated in the usual way, and the companies refuse to be drawn into the miners' troubles. The rebels say they will soon demand the abolition of the "rustling card" system, and later will ask for an increase in wages. When they do that the companies may be forced into the controversy. The Butte labor war may be over, or it may not yet have fairly started. [It is reported in the East that during the height of the rioting the Anaconda company purchased all arms of all descriptions and all ammunition in Butte at a total cost of $31,000 and secured agreements from all dealers in arms not to ship any more into Butte until the trouble is settled. A telegram from Butte states that Mayor Duncan was seriously but not fatally stabbed, July 3, by Eric Lantala, a Finn, I. W. W. leader, and a rebel, who attacked the mayor because he would not order Frank Aaltonen of Hancock, Mich., editor of the Finnish paper "Tyomies," to leave Butte. Aaltonen opposed I. W. W. leadership, rioting and dynamiting.—Editor.]

SALT LAKE CITY—July 2

Assay Offices in Utah, Montana and Nevada will be continued for another year, according to action taken by the conference committee on the legislative appropriation bill, June 29. The appropriation for the Salt Lake office is $6000. The Helena appropriation was reduced from $9900 to $8900. The effort to continue the assay offices was led by Senator Warren of Wyoming.

Recently Declared Dividends from the Utah Copper, Daly-Judge, and Silver King Consolidated, with that just declared by the Utah Consolidated, will bring the total of dividends thus far in 1914 to $3,462,560. This is the second dividend this year from the companies above mentioned, and the Iron Blossom has also made two payments. The other companies which paid dividends are the Bingham-New Haven, Chief Consolidated, Gemini, Grand Central, and Eagle & Blue Bell. The total of dividends paid by these mines amounts to $40,944,947.

Utah Power & Light Co., which recently consolidated most of the power plants in Utah and surrounding states, has completed its first year. During the period it has improved and brought up to date the plants under its control, as well as built extensive transmission lines. In all, the company owns 24 plants, and supplies power for mining, industrial enterprises, transportation, and agriculture throughout the intermountain region. Bingham, Park City, Eureka, and other camps are supplied. The Utah Copper uses 9000 kw., and now that a constant source is available more mining companies are substituting electricity for steam, gaining efficiency and economy. About 6000 kw. is used by two interurban lines, portland cement plants, etc. The company is developing new markets, and has ended the year with a net profit. D. C. Jackling was largely instrumental in effecting the organization of the company.

HOUGHTON—July 6

Mohawk's Expectations from the southern shafts are likely to be realized within the next few years. No. 6 shaft is being sunk below the eleventh level and is coming into the same formation that is mined at the North Ahmeek Nos. 3 and 4 shafts, sinking of which has been resumed. No. 3 shaft is to be sunk to the sixteenth level.

Calumet & Hecla has not renewed its option on the Nonesuch property, adjoining the White Pine. Notwithstanding the proved richness of the White Pine and the assurance of the Calumet & Hecla that its work will be successful in that field, no effort seems to be made on the part of the company again to secure control of the Nonesuch, at which there is now no work going on. The erection of the stamp mill to handle White Pine rock is being rushed. The mill will be close to the shaft houses and will differ from other plants in other respects. The rock will be crushed but little in the shaft houses, but will go to the gyratory crushers in the mill. The mill first will crush 40,000 tons of stockpiled rock that has accumulated during the opening of the two shafts, one of which has reached a depth of 1200 ft. and the other 600 ft.

Production at the Quincy, which is again operating three shafts at regular production rates, may within a month or six weeks reach normal. No. 2 shaft resumed operations

July 1, after being out of commission since March. During this period of enforced idleness underground conditions were greatly improved. Timber was used extensively in many openings, which formerly were without timber. Unusual efforts were made to make the workings safe against those disturbances generally called "airblasts" by local miners. In some instances the timbering was carried back 200 ft. in the foot wall. These airblasts have been the cause of much concern to Michigan copper miners within recent years. The Quincy has suffered more from them than any other mine. The deepest mines are the most seriously troubled, and it seems impossible to determine in advance when they are likely to occur or how much damage they are likely to do. Fortunately, there has been no loss of life due to the airblasts, owing to the care which the mining companies exercise in warning the men at the first signs of a blast. An idea of the damage that these blasts do may be gained from the fact that this important producing shaft of the Quincy mine has been out of commission since last March while the work of timbering, making safe and clearing up has been going on. Quincy is producing from three shafts, Nos. 2, 6 and 8, employing the normal force of workingmen. An increase in rock tonnage was made early this month, which will be further increased from now on for the next two months as fast as the underground force can be increased. It is too much, however, to expect that the Quincy will get back to regular output of copper before September unless there is a run of unusual good luck. All three shafts of the Quincy are at present opening a grade of rock that is a little better than the average of the Pewabic lode. In fact, all of the newer openings are showing well mineralized ground. The Quincy is now producing the bulk of its rock from a depth of between 6500 and 7000 ft. During June the two producing shafts, No. 6 and No. 8 or Mesnard broke all record for two-shaft tonnage in the history of the mine. Of further importance was the increase in the production of mass copper on the lower levels. During June over 100 tons were taken from these two shafts. The Quincy always was a heavy producer of silver and mass copper, and the coming in of mass copper again brings up the silver production. No plans for the resumption of the opening of the Pontiac shaft have as yet been settled, although the management has them under consideration. The Pontiac was shut down when the strike started and has not yet resumed. The installation of the permanent hoisting plant and engine is likewise held in abeyance. The Pontiac is the youngest mine of the Quincy's properties. It is farthest north of the last land purchased from the St. Mary's Mineral Land & Canal Co. The value of the Pontiac tract is generally known, because the Mesnard drifts were extended well over to the Pontiac boundary line before the Pontiac started to sink, and at the time the strike broke out it was becoming something of a helper in the grand total of Quincy's rock tonnage.

DULUTH—July 3

Niles-Chemung-Oliver Suit is being heard before the Federal court at Duluth. In 1902 the Niles Land Co., owners of the property in question, gave a mining lease to the Chemung Iron Co. on certain Mesabi range iron ore land; the latter company in turn sub-leased to the Oliver Iron Mining Co. Under the terms of the lease, an annual minimum royalty of $18,500 is being paid at present, or a total of $175,000 during the first 12 years of the 50-year lease. In addition, the Oliver company has expended $108,000 in explorations and $40,000 for taxes. Suit is brought specifically for the purpose of making the lessees or sub-lessees actually operate the property and pay thereon the royalty per ton, instead of paying the annual minimum royalty each year. The complainant claims that a lease of mining land, the rent for which is to be paid as royalty on the tonnage, with a provision for minimum royalty under any condition, carries with it an implied warranty on the part of the mining company to work the property. On the contrary, the defendant avers that leases which require actual mining must contain a clause so stating, and cites many leases with such a clause. Incidentally, the presiding judge has been called upon to decide whether the word "license" as used in this particular instrument means the same as the word "lease," which is customarily used, or, in other words, whether a mining license carries with it the same obligations and privileges as a mining lease. The property in question contains upwards of 20,000,000 tons of ore, of which none has been opened for removal. The Chemung Iron Co. is a Minnesota corporation, Chester A. Congdon, Duluth, treasurer and managing director. The court's decision in this matter will have a far-reaching effect in the iron districts of Minnesota, where but a small percentage of the mining land is not leased, and in many cases subleased several times. The system of leasing with the minimum royalty payment stipulation in lieu of actual mining has usually been held to be a desirable feature in iron ore circles, as, if each lease carried a clause demanding actual mining operations within a definite period, a surplus would rapidly accumulate and the lease would defeat its own object. However, the matter is being closely watched by iron mining men generally.

BRAINERD—July 3

Liquor Prohibition in Iron Mining Camps is an innovation. The town of Crosby, from whence comes most Cuyuna range tonnage, has recently been made "dry" through court proceedings following a recent election. A recent interpretation of a treaty made with the Indians in 1855 places the cities of Brainerd, Bemidji, Hibbing and Grand Rapids in Indian territory and hence prohibits the sale of liquor therein. This district includes the entire productive part of the Cuyuna range and a considerable portion of the Western Mesabi. The decision is being protested.

MARQUETTE—July 3

Largest Ore Carrier ever to take a cargo from the docks at Escanaba was the S.S. "William Grant Morden," of the Canadian Steamship Line, Montreal. On her recent maiden trip the vessel cleared from the Chicago & Northwestern piers for Port Colburne, Canada, with 12,606 gross tons. The ship drew 19 ft. 9½ in. of water.

Longest Train of Loaded Ore Cars ever hauled over a railroad in upper Michigan by a single engine was pulled into the Chicago & Northwestern's yards at Escanaba by one of that company's class "Z" locomotives. The train consisted of 136 cars, containing upward of 6000 tons of ore. The train was hauled into the yards at regulation speed and apparently without effort. Ninety of the cars were hauled by the single engine from the Menominee range and at a siding seven miles out of Escanaba the additional 46 cars were picked up. The train was nearly a mile in length.

Stripping the Balkan Property of Pickands, Mather & Co., of Cleveland, in the Alpha field of the Menominee iron range, involves excavating at the rate of 150,000 cu.yd. per month. The method employed is as interesting as it is unusual. Two drag-line machines are used, each working day and night. Clay, gravel and sand constitute the overburden. So much stripping is to be done and so deep will be the pit to be created that an area of 40 acres has been set aside as the dump, which tract will be wholly covered when the work is completed. The Balkan will enter the shipping ranks next year. It will be the second big open pit in upper Michigan at which mining will be done by steam shovel.

TORONTO—July 4

Mond Nickel Co., according to a circular recently sent to shareholders, has had a satisfactory financial year. It is estimated that the net profits wil show an increase over the previous year of about £50,000. On account of the present position of the company's resources, the directors will recommend a reorganization of the company's nominal capitalization in order to make the same more nearly equivalent to the real value of its assets, as, in the opinion of the directors, the company's properties in Sudbury have a much greater value than the figures that appear on the books of the company. The proposed reorganization will abolish the deferred shares. the owners of which will exchange for ordinary shares so that the company's new capital will consist only of cumulative and noncumulative preference and ordinary shares. The present holders of 10,000, 7% cumulative preference shares of £5 each will receive for each preference share now held, five cumulative preference shares of £1 each, fully paid, carrying the same rate of interest. The present holders of the 300,000 shares of £1 each, which have a preferential right to a noncumulative dividend of 7% per annum. will be entitled to receive one 7% noncumulative £1 fully paid preference share of the new stock for each fully paid ordinary share that they now hold and in order that holders of the ordinary shares in the company may participate in the same proportion of the surplus profits as at present, they will in addition receive 1½ fully paid ordinary shares of £1 each for one ordinary share they now hold. On the basis of the reorganization, the ordinary share capital will be 900,000 shares of £1 each of which the ordinary shareholders are entitled to receive £450,000 and the preferred shareholders the remaining £450,000. This allocation will give to each class of shareholders the right to receive half the surplus profits of the new company representing the same proportion as that to which they are entitled in the existing company. In order to carry these proposals into effect, the directors advise that it will be necessary to liquidate the present company and to transfer its assets to a new company to be known as the Mond Nickel Co., Ltd.

The Mining News

ALABAMA

Jefferson County

TENNESSEE COAL, IRON & R.R. CO. (Birmingham)—Bessemer rolling mills will be electrified, a contract having been made with Alabama Power Co. for current. A continuous heating furnace for heating steel, thereby securing a nearer approach to uniformity of product and reduced cost will be installed. Hot beds will be installed which will also improve product. These improvements will cost $55.000.

ALASKA

EBNER (Juneau)—More machinery is being purchased.

CYMRU—Shipment of 150 tons of copper ore from property on Moira Sound to Tacoma smelter will be made soon.

GRANBY CONSOLIDATED (Anyox, B. C.)—It and Dean mines, on Kasaan Bay, have been taken over and underground work is in progress.

TYNDALL & FINN (Cordova)—Building of a stamp mill and installation of other equipment on property on St. Patrick Creek, are being considered.

LYLE & CARLSON—A strike has been made by these operators on old channel of Copper Creek. Coarse gold encountered at grass roots was followed to a depth of 20 feet.

OLD GLORY—This group of claims on Smuggler's Cove has been taken over by Alaska Venture Syndicate, Ltd., of London. A 3-drill air compressor and power plant are being installed.

JAMES CLAIMS (Chisana District, P. O., McCarthy)—F. T. Hamshaw, who last year acquired largest holdings in Chisana, after systematic prospecting by crosscutting channels of Eldorado and Bonanza Creeks from shore to shore, with five thawers and 18 men has bought out Manley, Price & Ives, recent purchasers of James properties for $560,000. Hamshaw arrived in camp this year, with largest outfit including a sawmill and mining equipment and supplies. In four weeks he has cut 65,000 ft. of lumber, built three automatic dams and has all flumes and sluices completed ready for operating July 8. Season is backward because of frost. Property consists of 14 placer claims and four quartz claims. Depth of pay gravel is from two to five feet and width 50 ft. There is plenty of water.

ARIZONA

Cochise County

CALUMET & ARIZONA (Warren)—Drift being driven from Cole shaft to Higgins claim is expected to show up some good new ground. So far drift has been driven 200 ft., last 50 ft. being through hard limestone, making progress slow.

COPPER QUEEN (Bisbee)—Churn drilling on Sacramento Hill is advancing rapidly. Three drills are running, two electric and one steam. Two more electric drills are expected to arrive soon and work should be completed in six months. Test mill below Sacramento shaft is rapidly nearing completion. Low-grade ores from upper levels of Queen mines, are to be treated. It is expected that mill will be placed in operation early in July.

Gila County

INTERNATIONAL SMELTING CO. (Miami)—All steel for 300-ft. stack at smelter site is now on ground, but erection will probably not be started until bedding bins and waste-heat boilers have been completed. Work has been resumed on this boiler house and should be finished in a few days. Foundations for turbo-generators and blowing engines in engine house have been completed and erection of forms for exterior walls continues.

INSPIRATION CONSOLIDATED (Miami)—Test mill had not been in operation week ended July 2 due to breaking down of a high-speed turbine at Roosevelt. Enough power, however, has been supplied to keep mine plant in operation and power system should be able to meet full-load requirements in another day. Considerable trouble was experienced also during that week by breaking of launder that carries away surplus water from behind tailings dam. Several thousand sacks of sand were required finally to stop flow, but even with flow checked it is liable to break out anew, as whole mass of tailings is thoroughly soaked with water and will run like quicksand. A new drain launder has been put in, but does not pass underneath dam, and hence is not exposed to excessive pressure. Pneumatic-flotation machines and agitation tanks are now installed and will be put in operation as soon as power is available. Dorr thickener is also ready to be tried out, purpose being to compare it with the tank system for dewatering concentrates. Knight-Trent filter is undergoing several changes to increase its efficiency and a new vacuum pump has also been installed. A temporary, yet extensive water system for fire protection has been put in at concentrator. Steel shelving for warehouse is fast being assembled and should be ready to be put in use in a week or two. Offices of storekeeper and warehouse clerk have been finished and are now being occupied. Excavations are completed and forms have been erected for foundation of 35,000-gal. steel fuel-oil tank for locomotive use. This tank is near west end of trestle on low line, also being near locomotive water supply. Test hole for second well on Kiser ranch has been drilled and reaming out of hole is now under way. This hole is 12 in. in diameter and is 404 ft. deep. When reamed it will be 24 in. in diameter. All holes are lined with casing, either blank or perforated, depending on nature of formations passed through. A good flow of water is expected from this well.

Mohave County

CAFFERY (Kingman)—Braley & Suffler are shipping one ton of copper-gold ore per day. Mine is near Layne Springs.

GOLDEN STAR (Cerbat)—It is reported that this old mine is to be unwatered and opened to another level by O F. Kuencer.

SCHUYLKILL (Chloride)—Mine is being unwatered by same group of men that optioned old Distaff mine where a compressor and drills are being installed.

SOUTHWESTERN (Copperville)—Management is considering installation of rolls and dry concentrators which were recently tried out in a testing plant. Shaft is to be continued to 500-ft. level.

Pinal County

MONITOR—(Ray)—Haley & Soufferin are retimbering the shaft.

RIGGINS (Ray)—Tunnel being driven to cut main vein of recent gold strike at Gold Creek is 100-ft. in and has cut the first of several parallel veins. Oreshoot is 4 ft. wide. Heading is still 140-ft. from main vein.

KELVIN-SULTANA (Kelvin)—Two carloads of equipment, comprising coarse crushing equipment, for new concentrator, were recently received. Greater part of concrete work is completed. Timbering in No. 2 shaft has been completed and old drifts and stopes are being opened. Prospecting for faulted end of vein in west drift of second level from this old shaft has located vein which will be explored by drifting. As soon as pump station on 500-ft. level of main shaft is completed crosscutting will be started.

Yavapai County

SANTA MARIA VALLEY MINING CO (Cottonwood)—Big Stick 20-stamp mill has been tried out on Santa Maria ores. New wagon road from Cottonwood is completed and development work is in progress.

SWASTIKA (Mayer)—A 2-ft. vein of lead-silver ore has been cut on 400-ft. level, ore being of same nature as that from upper levels from which several cars were shipped assaying 800 oz. silver per ton.

CALIFORNIA

Amador County

HARDENBERG (Jackson)—Crosscuts are being driven to develop oreshoots and to provide for economic mining.

Butte County

DREXLER DREDGING GROUND on Butte Creek, near Chico, is reported to have been taken over by Guggenheim Interests. O. C. Perry, of Oroville, who is in charge of Guggenheim interests in California, it is said, will begin construction of a bucket-elevator dredge at a cost of $100,000.

Nevada County

NORTH STAR (Grass Valley)—Recent work has shown great development and production; 350 men are employed, and monthly pay roll exceeds $100,000.

EXCELSIOR (Truckee)—Mine is being reopened. New boarding house has been erected, as it is purpose to continue work throughout summer and possibly during winter. Property is owned by Worcester, Mass., men.

BRUNSWICK CONSOLIDATED GOLD MINING CO. (Grass Valley)—Dividend of 6c. per share, aggregating $18,000, was paid June 15. Brunswick has been developed into a dividend producer within last year. Stock is listed on San Francisco exchange, and is only local stock that is so listed.

Plumas County

ENGLE (Keddie) — Three machine drills are operating, and 65 men are employed in mine and on surface. Saw mill has been installed. Ore will be concentrated and concentrates shipped to Salt Lake City.

Shasta County

MOUNTAIN COPPER CO. (Keswick)—Camp at Minnesota station is completed and work of construction of concentrating plant has begun.

Sierra County

MONARCH (Sierra City)—Machinery for new hoisting plant, sawmill, and 10-stamp mill is being rapidly assembled, and deep development is being done on high-grade vein. Lee Bros. are owners, R. D. Gillespie, of Pittsburgh, operating under bond.

ALHAMBRA (Downieville) — A sawmill has been built, and mill buildings are being erected. It is anticipated that mill will be running early in August at this Jim Crow Cañon mine. Richardson & Rixey, with Downieville associates, own and operate property.

TIGHTNER—(Alleghany)—Drifting is in progress from shaft, and exploration work is being carried on along serpentine contact toward Red Star ground. Shoot is being stoped from a crosscut from main working level, supplying 20-stamp mill and bullion shipments are regular.

GOLD STAR (Alleghany)—A new company has been organized for operating this drift mine, and it will be reopened by July 15. Mine was formerly operated by Chinese who made good pay. A deposit of gravel extending full length of claim was overlooked by them, and this will be developed through one of the long tunnels which will be extended to give access to it.

COLORADO

Clear Creek County

MINT (Empire)—Development force has been increased. Company contemplates improvements and additional equipment in mill.

VINDICATOR (Idaho Springs)—Contractors are driving tunnel. Tom Tuck vein is being developed and stoping will begin soon as surface tramway is built along mountainside to mill.

LUCANIA (Idaho Springs)—Samuel Sternberger of Philadelphia has purchased this large group from master in chancery and will merge it with his Lotus group, to be hereafter operated by Pennsylvania Mining Co. Lucania group numbers 356 patented and 60 unpatented lode claims, numerous placer claims and millsites, making in all 2000 acres. Lucania tunnel will be main opening of proposed mine operations. This is already in 8000 ft. and will be extended 500 ft. to cut Pendleton vein.

Gilpin County

GUNNELL (Central City)—Mine dump is to be treated in 5-stamp mill being erected by J. Flynn, lessee. Bumping tables still appeal to Gilpin County miners and will be installed in this little plant.

RANDOLPH MILL (Black Hawk)—This mill has been leased to Arthur Most, manager of Colorado-Carr mine. He is remodeling mill to do custom work as well as treat ore from company's mine.

SQUARE DEAL (Central City)—Because of a serious water inflow, East Notaway shaft-sinking has been temporarily discontinued. Shaft is 940 ft. deep, but is planned to go 60 ft. deeper. Numerous sets of lessees keep up good production in upper workings.

Lake County

VIRGINIUS (Leadville)—Discovery of high-grade silver ore has been made in this Sugar Loaf Mountain adit. Because of caving in, back of adit required retimbering and ore was found lying beyond previously supposed wall of vein.

BIG FIVE (Leadville)—Equipment of Latshaw tunnel west of Buena Vista, on Mt. Princeton, including compressor, boilers, piping, rails and tools, has been purchased by George W. Boyce, manager of the Big Five Mining Co., and will be immediately shipped.

La Plata County

WILFLEY-MEARS MILL (Silverton)—Starting up has been delayed by owners of claims along flume-line from Silver Lake to mill. Right-of-way is now secured and mill should begin to receive its supply of Silver Lake mine tailings soon.

Summit County

MEKKA (Breckenridge)—One lease is operating three hydraulic giants.

BOSS (Breckenridge) Lessees recently dug 4800 lb. of silver ore from one pocket.

DREADNAUGHT (Breckenridge)—E. W. White, owner, recently shipped one carload of lead ore carrying good silver and a small amount of gold.

LUCKY (Breckenridge)—This Mineral Hill mine is being developed by a second level to expose Paducah vein carrying lead and zinc. It produced well in upper level.

D. C. W. (Breckenridge)—Claim, named after owners, Dyer, Cogswell & White, is on Mt. Baldy, where climatic conditions are bad, but this summer is producing silver ore on a small scale. General impression prevails that Breckenridge produces only gold, but truth of matters is that silver and lead are also important products.

IDAHO

Bonner County

IDAHO-CONTINENTAL (Port Hill)—Oreshoot recently encountered in raise between No. 4 and No. 1 levels has steadily increased, both in grade and size. There are now 6 ft. of high grade and 6 ft. of mill ore showing. Raise is up 330 ft. and will be completed within 30 days, three shifts being employed on work. The 200-ton concentrator has been completed, also hydro-electric station on Boundary Creek, midway between Port Hill and mine, 26 miles from town, together with transmission line, and entire equipment is ready for service. Considerable high grade is stored in bins at mine and a large amount of concentrating ore, which mill will begin treating July 15. Shipping of crude ore and concentrates at the rate of about 50 tons daily will probably be started Aug. 1, when wagon road to Port Hill is completed. To facilitate transporting ore to railway and also to reduce costs an aërial tram about 1500 ft. long will be installed over Kootenai River at Port Hill, emptying directly into shipping bins at railway. Contracts for equipment has been let to Riblett Tramway Co. Tram will be completed and ready to operate by time road is repaired. Ore will be hauled to river with caterpillar engines of the latest type, drawing trailers of 15 tons capacity, making one trip daily.

Cœur d'Alene District

NORTH BUNKER HILL (Wardner)—At a meeting of directors it was decided to resume work on property and develop as rapidly as possible. Long lower tunnel should soon cut ore.

RAINBOW MINING CO.—Work on claims on North Fork will be resumed soon. Crosscut tunnel, on which work will be done, is in 300 ft. It is thought vein will be cut within next 25 ft. This will give a depth of 175 ft. Vein is 6 to 20 ft. wide where cut in places above crosscut tunnel level.

LITLE NORTH FORK MINING & MILLING CO.—This property, better known as the Handspike, has been bonded for five years to Jerome J. Day, president of Tamarack & Custer Consolidated Mining Co. Plans regarding property are not generally known, but it is believed that a railroad will be built to haul ore as roads are practically impassible for teams. Property is 12 miles up Little North Fork, and 17 miles from Enaville. Under terms of bond and lease lessees are to work at least two men 20 shifts each month, starting within 15 days after bond is accepted. Lessees are allowed to ship ore from start and keep all proceeds first year, paying 15% royalty, remaining four years, this to apply on bond. Handspike is a copper property with, it is said, $200,000 worth of copper ore in sight.

FEDERAL MINING & SMELTING CO. (Wallace)—Justice Philbin in his recent decision dismissing complain of Sidney Norman and others, minority stockholders of company, against American Smelting & Refining Co. for purpose of having a contract between the corporations in 190 set aside, found that all charges of fraud and unfairness o contract were unfounded. Contract provided that American Smelting should purchase Federal Mining output at certain rates for 21 years from 1909. This was substantially same as a prior contract made in 1903, and court pointed out tha no question had ever been raised as to propriety or fairness of first contract. When first contract was made the Federa was entirely independent of American Smelting, but when the second contract was entered into American Smelting interests controlled a majority of Federal stock, and a majority of its directors were officials or employees of American Smelting company. Judge Philbin decided that the fact did no affect validity of contract, because defendants had not been guilty of any fraud and contract was not detrimental to minority stockholders' interests. Entire interest of plaintiffs amounted to only 2% of stock of company and there was no evidence that any of said shareholders wished to join in plaintiffs' protest or were in sympathy with it.

MICHIGAN

Iron

PURCELL (Iron River)—McGreevy Steel Co. has forfeited its right to this property. Mine has been turned over to a local company now being organized. Considerable new machinery will have to be bought if mine is to be operated and management plans on a new hoist and compressor. Shaft has been sunk 220 ft. and much drifting has been done. About 2000 tons of ore have been shipped since mine opened.

OLIVER IRON MINING CO. (Ishpeming)—Lake Superior Iron Co., a subsidiary of Oliver Iron Mining Co., has closed down No. 7 hard ore mine and workings are now filling with water. Pumps were not removed. About 100 men were thrown out of employment. This is first curtailing to be done at Ishpeming, but Oliver company suspended one shift at Prince of Wales mine at Negaunee two weeks ago. Order to reduce expenses not only hit hard ore mine, but all surface plants as well. Between 50 and 60 men were laid off in machine, blacksmith and carpenter shops, laboratory and office. Some men who were let out had been employed by company for 30 years. Places will be found for some at Lake Superior Hematite mine, which will add another shift. Some married men will be given work at Section 16 mine and single men will be let out. Orders from President Olcott were to reduce to minimum. No. 7 is in fine shape under-ground, with much ore in sight, but stockpiles are filled and only a few shipments have been made.

MINNESOTA

Cuyuna Range

CUYUNA-SULTANA IRON CO. (Crosby)—Company is sinking an exploratory shaft on its property northwest of Ironton.

Mesabi Range

MESABI RANGE SHIPMENTS—Aside from Leonard shaft and pit, Mahoning is largest shipper in Hibbing district just now, shipping 250 cars per day and working day shift only. Hull-Rust pit, for some years heaviest producer on Mesabi range, is now loading but 150 cars daily, with facilities for loading 2000 cars. At Nashwauk, Hawkins washing plant is shipping 100 cars daily, and Harrison and Quinn combined properties, operated by Butler Bros., are shipping 50 cars daily. More activity is now noticeable around Virginia. Pickands, Mather & Co.'s Hudson pit, at Aurora, started operations with three shifts and one shovel June 29. At Meadow mine of Inter-State Iron Co., at Aurora, shipping has started from 50,000-ton stockpile.

IRON ORE SHIPMENTS FOR JUNE—It is surprising to note that June, 1914, shipments from head of lakes totaled to about 70% of shipments for June, 1913. A comparative tabulation follows:

JUNE SHIPMENTS

Dock.	1914.	1913.
Great Northern, Superior, Wis.	1,944,601	2,231,117
Duluth, Missabe & Northern, Duluth, Minn.	1,045,786	1,895,728
Duluth & Iron Range, Two Harbors, Minn.	1,075,193	1,548,726
Chicago & Northwestern, Ashland, Wis.	441,261	649,763
Soo Line, Superior	50,569	145,955
Northern Pacific, Superior	19,492	......
	4,576,972	6,471,289

FOR SEASON TO DATE

Great Northern	3,871,367	4,474,133
Duluth, Missabe & Northern	1,779,875	3,995,948
Duluth & Iron Range	1,767,689	3,081,666
Chicago & Northwestern	716,878	1,254,123
Soo, Superior	96,854	203,206
Soo, Ashland	166,203	255,579
Northern Pacific, Superior	36,829	......
Totals	8,436,695	13,264,655

SHENANGO (Chisholm)—Mine shut down June 29. Officials say it will probably reopen in two weeks. No reason has been assigned for action. Mine is one of the large shippers of district.

LEONARD (Hibbing)—Output from this pit and shaft operation will no doubt exceed all others on Mesabi range this season. Property is controlled by Great Northern Ore Securities Co., and is under lease to U. S. Steel Corporation, whose lease expires by cancellation Jan. 1, 1915. This is reason for activity. Five shovels are being operated on day shift and four at night, and an average of nearly 600 cars per day are being loaded. This mine is shipping practically one-fifth of entire product of Hibbing district at present.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT CO. (Butte)—Due to prospects that construction work on proposed railroad to Elkhorn mines of this company will soon be started, development work at these properties is being done. Tunnel is nearly 400 ft. in and is being extended at rate of 8 ft. per day. From 141-ft. mark quartz stringers carrying ore have been showing.

Deer Lodge County

ORO FINO (Southern Cross)—By recent addition of a 3-drill Ingersoll-Rand air compressor to electric hoist already in place, equipment of this mine is now complete for operations on a commercial scale. Regular shipments of gold ore will be made from this property, which is close to Southern Cross mine, owned and operated by Anaconda company.

Silver Bow County

CLARK-MONTANA REALTY CO. (Butte)—Company has brought suit in equity in Federal court to quiet title to seven acres of placer ground against W. H. Ferguson and associates, who claim an interest in land. Placer is in southern portion of Butte district. Company claims to have purchased property July 28, 1909, from holders of original patent and therefore to hold a clear title in fee simple.

ALICE VS. ANACONDA (Butte)—Arguments were begun in Federal court at Helena June 25, after taking of testimony in suit brought by minority stockholders of Alice company to have annulled action of majority stockholders who transferred stock to Anaconda company, receiving Anaconda stock in payment. Senator Walsh, for plaintiffs, contends that transaction is in violation of Sherman anti-trust law and should therefore be declared void. According to estimates of complainants, stock involved is worth several million dollars.

BUTTE-MILWAUKEE (Butte)—At a special meeting of stockholders held June 29 sale of entire properties and assets of company for $500,000 was authorized. Butte & New York company, a holding company, made an offer of $500,000 for the Butte-Milwaukee. Butte & New York company is capitalized at $4,000,000 and majority of stock is held by Butte & Superior company. Properties of Butte & New York company, when sale is consummated, will consist of ground adjoining Butte & Superior with a 1200-ft. shaft on it that connects with Butte & Superior underground workings. By contract last-named company is to carry on active development work in Butte-Milwaukee ground.

BUTTE & LONDON (Butte)—In response to a general demand by stockholders as to exact relation of company to Greendale Exploration and Rainbow Development companies, following statement has been given out by officers of company: "Though the company owns its property and has no debts, only a few thousand dollars in cash were in the treasury and the company was unable to raise new capital for necessary exploration and development work. There were, therefore, no prospects of a resumption of operations. Then the Rainbow Development Co., organized by Thomas F. Cole and others, offered to equip and develop the Butte & London properties in consideration of a stock interest in the company. As it was not practicable to recall a major portion of the Butte & London stock outstanding, the Greendale Exploration Co. was organized, and to it was transferred the property of the Butte & London Co." In payment for development work executed under contract by Rainbow company, latter is to receive 51% of stock of Greendale company. Every 60 days 50% of amount of Greendale stock Rainbow company is entitled to receive, proportionate to amount of development work done, is to be transferred. It is estimated that cost of installing electric hoist, power plant, pumps, etc., and unwatering shaft, sinking it to an additional depth of 500 ft., and crosscutting 2400 ft., will be approximately $500,000. This means that Rainbow company is paying this sum for a 51% interest in Butte & London properties, and that the money is being used to equip and develop that property. John D. Pope, of North Butte company, under whose direction work is being done, states that shaft sinking will begin in six weeks.

BUTTE & BACORN (Butte)—This company was organized in 1906 and acquired title to 278 acres of land in northernmost section of Butte district. A shaft was started on Calumet ground which was held under option. In December, 1907, work was suspended for lack of funds. From that time on to 1910 various unsuccessful attempts were made to reorganize company and raise money to resume operations. Eventually an arrangement was effected whereby a mortgage for $50,000 was placed on property, which provided funds for maintenance of property for one year. In October, 1911, property was turned back to directors. From October, 1911, to November, 1913, no work was done, but money was raised by Bacorn to purchase Calumet ground, on which main working shaft was started. Encouraged by recent revival of activity in northern part of Butte district, many plans for resumption of operations have been discussed. One was adopted and communicated in a circular letter sent to stockholders last January. According to this plan no stockholder is compelled to put up money or to pay an assessment, and each stockholder can exchange his stock at a valuation of 8c. per share for stock in the Great Northern Ore Co., which will be name of company after reorganization. It is believed that this arrangement will provide necessary funds for resumption of operations. New company is to start out by acquiring Calumet ground for $150,000 of its own stock at par. It must have in treasury at least $140,000. Syndicate putting up this money is to receive stock at par for this amount and will have right to buy at par remainder of all issued stock of Great Northern Ore Co. How much of this stock is to be issued will depend on how much is taken by Butte & Bacorn stockholders. Plan amounts to a half-interest being given up for enough money ($670,000) to thoroughly develop property. Great Northern company will have a lease on Butte & Bacorn property, and any Butte & Bacorn stockholder can take his share of royalties or participate in profits of leasing company, just as he prefers. Lease for legal reasons stands now in name of F. W. Bacorn, but must be assigned to Great Northern company on organization of syndicate.

NEVADA

Churchill County

SCOTIA MINING CO. (Terrell)—Hoisting plant, destroyed by fire some time ago, will be rebuilt and development work will be continued.

Douglas County

LONGFELLOW MINING & MILLING CO. (Gardnerville)—It is expected that mill will be in operation soon.

WAR HORSE (Gardnerville)—Negotiations for purchase of this property in Red Cañon by Oakland, Calif., men have been closed and work will start at once. Old 200-ft. incline shaft will be repaired and hoist installed. This property was operated successfully in early days.

Elko County

ELKO PRINCE (Gold Circle)—It is reported that this property has been sold to an English syndicate. Former deal was not completed on account of death of head of company intending to purchase.

Esmeralda County

GREAT WESTERN CONSOLIDATED (Goldfield)—Shaft is being retimbered between 300- and 500-ft. levels and from 50-ft. level to surface. When this work is completed and some repairs made, crosscutting south on 1125-ft. level will be started.

JUMBO EXTENSION (Goldfield)—Mine production has averaged 600 tons per week since ore has been milled at Goldfield Consolidated company's mill. It is hoped to increase production to 100 tons per day. Development work on Velvet claim through Polverde workings is progressing with satisfactory results.

GOLDFIELD CONSOLIDATED (Goldfield)—Company exercised June 25, its option on Aurora Consolidated Mines Co., of Aurora, Nev. Goldfield acquires 592,000 shares, or 87% of issued stock, for $763,000, or $225,000 less than original option which expired several weeks ago. Aurora consists of 52 patented claims in the Aurora camp, one of boom camps over 50 years ago. Mark Twain was a pioneer in first rush. Aurora began operations over a year ago, and it is estimated there are blocked out over 1,000,000 tons averaging $5 per ton. Including mill, there has already been spent over $800,000. New owners will shortly issue a statement giving details as to ore reserves.

Humboldt County

PLACER STRIKE IN LEONARD CREEK DISTRICT is proving to be good. Best gravel has been found on Tepee Creek, a tributary to Leonard Creek. Prospecting to bedrock is greatly hampered by large flow of water.

HUMBOLDT (Lovelock)—Water has been struck at 115-ft. level in incline shaft and Huntington mill will be started.

Lander County

ACTIVITY IN McCOY, a new gold camp in western part of county, is now showing. On J. H. McCoy ground, 15 subdivisions have been made for lessees, and several leases have been granted. Several other gold strikes have been made and over 300 claims have been staked.

Mineral County

GOLD-SILVER STRIKE NEAR SODAVILLE has been made. Discovery was made in Calico Cañon, 2½ miles north of Sodaville.

WAGNER AZURITE COPPER CO. (Luning)—New copper-leaching plant is being operated and satisfactory results are being obtained. Iron has been used as a precipitant, and old railroad rails will now be tried, five tons having been purchased from Southern Pacific R.R.

Nye County

WHITE CAPS (Manhattan)—Compressor and 75-hp. hoist have been installed. Sinking of vertical shaft will be resumed and other extensive development work done.

Ormsby County

CONTENTION OF TAX COMMISSION that depreciation is not a legal deduction from value of gross yield of mines for purpose of determining net yield for assessment and taxation has been sustained by attorney-general.

Storey County

COMSTOCK PUMPING ASSOCIATION (Virginia City)—Extensive changes are being made in ventilation and drainage system on 2500-ft. level of C. & C. shaft, which is following recommendations made by an arbitration committee apointed by Pres. William C. Ralston, of association. Repairs are also being made to Ophir shaft, used as upcast of northend Comstock mines, all of which will improve the physical conditions.

NEW MEXICO

Grant County

GIPSY QUEEN MINING & DEVELOPMENT CO. (Animas)—A new shaft will be sunk on south end of No. 1 claim, 500 ft. to water level.

85 MINING CO. (Lordsburg)—Four carloads of siliceous copper, gold and silver ore are being shipped via Lordsburg to Douglas, Ariz., daily. Foundations are being built for new machinery. Ore bins and tramway from mine are under construction. Company is increasing its output and is encountering good ore on lower levels. Contract has been awarded Scott Auto Co. for hauling ore from mine to railroad.

RIO CHAMPA PLACER MINING CO. (Abiquiu)—Extensive tests have been made on ground and property leased by Colorado men from Henry Grant, totaling 1700 acres. Company is going to install steam shovel, to work gravel on benches above river, of 1000 yards daily capacity. Water for washing gravel will be pumped to bench level. Installation of dredge is planned to work sands of Champa River

NEW YORK

St. Lawrence County

ST. LAWRENCE TALC CO. (Natural Bridge)—This new company has lately increased its capacity by installing long, continuous-feed, tube mills to be used in connection with Hardinge conical mills. Tube mills are similar to those used in No. 6 talc mill of International Pulp Co. at Hailesboro, N. Y.

NORTHERN ORE CO. (Edwards)—Zinc concentrator was destroyed by fire June 26, with a loss estimated at $150,000. Building was a new one and elaborate concentrating machinery was result of two years of expensive experimenting for apparatus that would separate zinc blende and pyrites. Mill had only been running regularly a short time. Fire was discovered at 2 a.m. and is believed to have started from two barrels of lime. Loss is partially covered by insurance. It is said mill will be rebuilt. Company is controlled by Pilling & Crane, of Philadelphia. Underground developments of zinc deposits show unusually rich ore and a fair amount has been blocked out. Arrangements had been made to obtain power from a water-power company at South Edwards.

Wayne County

ONTARIO IRON ORE CO. vs. NEW YORK CENTRAL R.R. —In this case, Interstate Commerce Commission has handed down an opinion that present rate of $1.10 per gross ton for transportation of iron ore in carloads from Ontario region of New York to Emporium, Penn., and rate of $1.60 per gross ton on same traffic to Earlston, Saxton, and Riddlesburg, Penn., have not been shown unreasonable or unjustly prejudicial. Present rate of $1.60 per gross ton to Curtin, Milesburg and Bellefonte, Penn., is, however, found unreasonable, and reduced to $1.40 per ton. These places are in central part of Pennsylvania. At Fruitland and Ontario complainant owns and operates iron mines. Rates from both places are same and mining transportation conditions at both mines are similar. Ore is low-grade hematite, which is sold upon basis of guaranty of 44% iron. It comes in direct competition with Mesabi ore in Minnesota, which is sold upon a guaranty basis of 52½% iron. It is alleged by complainant that its ore also meets competition from Benson mines, in New York, which ore is shipped and sold as a concentrate under a guaranty of 65% iron. Benson mines are 150 miles northeast of Fruitland and on New York Central lines. Value of complainant's ore at points of destination is from $3.80 to $4 per gross ton; Mesabi ore is valued at same place at from $4.15 to $5.50 per ton; concentrates from Benson mines from $5.50 to $6.50 per ton. It costs complainant from $1.50 to $1.80 per ton to place ore on cars at its mines, and its cost of loading is greater than at Mesabi or at Benson mines.

OREGON

Baker County

RED LEDGE (Baker)—These claims have been taken over by an English syndicate, which will immediately start development work.

Douglas County

OLD PINEY MOUNTAIN NICKEL (Riddle)—This company is contemplating installation of new machinery.

UTAH

Salt Lake County

UTAH APEX (Bingham)—During May gross receipts were $66,153 and operating expenses $37,836, leaving $28,316 profits from operation. Deducting $3288 for construction, net returns, exclusive of Eastern office expenses, $25,033.

MONTANA-BINGHAM (Bingham)—This company's tunnel is in 3200 ft., and is now in Bingham Amalgamated ground. After passing through hard quartzite, face is again in softer, slightly mineralized ground. A vein carrying pyritic ore of medium grade was cut a short time ago, and will be driven on and prospected, when tunnel has been completed.

UTAH COPPER (Bingham)—The May output was 13,616,933 lb. copper, as compared to 13,133,770 lb. in April, up to that time the record month. Grade of ore has improved, being 1.3411% copper during first quarter of 1914 as compared to 1.2165% in the last quarter of 1913. In April of this year ore ran 1.5% copper, and a recovery of 19.43 lb. per ton was made. According to reports an increase in dividend rate, after December of this year, is probable, on account of increased earnings.

UTAH CONSOLIDATED (Bingham)—A quarterly dividend of 50 c. per share, amounting to $150,000, has been declared, payable July 27. On March 31, $1 per share was paid, or $300,000, making $450,000 this year. Total of dividends paid by company will amount to $9,550,000, or $31 per share on 300,000 shares. Ore reserves at beginning of year were placed at 287,038 tons, averaging 1.9% copper, $1 gold, and 0.7 oz. silver. There was also in reserve 51,409 tons of lead ore averaging 15.3% lead, 3.27 oz. silver, $1.08 in gold, and 0.98% copper.

Summit County

PARK CITY shipments for the first six months of 1914 were 33,225 tons; those for June amounted to 5622 tons, and during the week ended June 27 there were shipped 2,961,510 lb., largest week's output since February.

SNAKE CREEK TUNNEL (Park City)—Tunnel is in over 8000 ft. and daily progress of 12 to 14 ft. is being made. Two shifts are working.

SILVER KING COALITION (Park City)—This company is planning to sink its Silver Hill shaft several hundred feet from 255-ft. level, where it is in limestone. Bids are being advertised for. Ore of same character as that of large shoots opened on 900-ft. level has been found on 1100. Extent has not been determined.

SILVER KING CONSOLIDATED (Park City)—A winze from 1550-ft. level has been sunk 200 ft. This follows a bedded vein on its dip, and is in ore all way, with ore still strong in bottom. A new stope has been opened just above 1550 level near winze, which shows 4 ft. of high-grade carbonate-galena ore 40 ft. from mineralized fissure. Property is in excellent condition, 30 to 40 tons daily are being shipped, or 1000 tons per month. West drift on 1700 level, which is following fissure has begun to show strong mineralization.

WASHINGTON

Ferry County

QUILP (Republic)—After idleness of nearly two years this mine, one of the oldest developed properties in Republic, and first one located in the camp, will resume operations soon. Quilp originally was located as San Poil in 1896, subsequently relocated as Quilp, and later transferred to Quilp Gold Mining Co., which operated it 10 years, developing it extensively and paying $22,500 in dividends. About 1½ miles of underground workings have been opened, attaining a depth of approximately 500 ft. Three years ago it was bonded to J. L. Harper, who transferred bond to Republic Mines Corporation, which afterward forfeited it. Immediately afterward the Republic Mines company sunk an incline shaft on Surprise claim, adjoining, drifting over to Quilp lines, and began extracting ore, which it claimed under apex rights. Quilp company carried matter into courts, and in November, 1912, secured an injunction restraining Republic company from operations in property. A further settlement with that company of litigation then pending, involving four separate suits, resulted in absolute title being obtained by Quilp company to disputed territory and also a part of the original Surprise holdings.

WISCONSIN

Zinc-Lead District

PIERCE—Alexander N. McMillan, of Platteville, has proved a strong range of zinc ore by extensive churn drilling on William Pierce farm of 200 acres, just south of Cleveland mine at Hazel Green; shaft sinking will be started at once.

WYOMING

Fremont County

WYOMING COPPER CO. (South Pass City)—Crosscutting on 500-ft. level is expected soon to cut vein.

WORKING WONDER (Miner's Delight)—Unwatering this old mine is in progress with view to resuming operations.

N. L. (Lander)—Ranchers have made complaint concerning mill tailings and property is closed pending litigation.

IRISH JEW (Grosvenor)—John Eilman has been doing development work for several months and now has ore ready for shipment.

HELEN G. (Lewiston)—A. E. Minium of Denver, Colo., has acquired this mine from James Anderson and has workmen developing mine and erecting mill.

CANADA

Ontario

STRIKE AT SESEKINIKA was made by J. D. Smith and Labine Bros. while working on their claims one mile north of Sesekinika. There is an abundance of free gold, but most of it is found with telluride. A considerable amount of silver is also found. So far four veins ranging in width from 1 to 4 ft. have been uncovered for a distance of 1000 ft. First assay, made from ore containing no visible gold, showed $1203 per ton in gold and $123 per ton in silver. Since find was made great excitement has prevailed. Though country was staked for several miles around after discovery of placer gold on adjoining Maloof property last winter, yet crowds of prospectors are coming in to see if there is anything left for them. During the last nine years many claims have been staked and restaked here, but not till a year ago was gold discovered in encouraging quantities. Since then renewed interest has been taken, culminating in discovery of placer and telluride gold. Sesekinika now expects to become a mining town, not only on account of the gold find, but copper, nickel, zinc and lead are found there as well. Sesekinika is on height of land or watershed between Hudson Bay and Lake Huron. It is 1300 ft. above sea level, 300 miles north of Toronto and 60 miles east of Porcupine.

NIPISSING (Cobalt)—Profits for May were $150,000. High-grade mill will increase amount of customs ore treated.

HUNTER (Kirkland Lake)—Diamond drills on this property are reported to have cut a large section of mineralized ground carrying low-grade gold ore.

ONTARIO PORCUPINE GOLD FIELDS—Report shows a debit to development and general expenditure of £38,056. Cash balance at Dec. 31, 1913, was £6668.

MILLER LAKE-O'BRIEN (Gowganda)—A new high-grade ore shoot has been opened on 250-ft. level. This property is earning $250,000 net a year and is only property of much importance working in district.

SOUTH THOMPSON (Timmins)—This property has been purchased by an English syndicate and will be amalgamated with Krist adjoining, giving new company 128 acres in vicinity of Hollinger and Porcupine Crown mines.

MEXICO

Chihuahua

AMERICAN SMELTING & REFINING CO.—Only obstacle to immediate opening of plant at Chihuahua is difficulty of obtaining adequate transportation for materials and supplies, as most rolling stock of Northern Mexico is in southward movement of constitutional army. As company enjoyed excellent traffic relations while operating under Villa's protection before last shutdown, it is expected necessary traffic arrangements will be made. Since company ordered its men to leave Mexico it has not been in direct communication with its Mexican properties, but reliable reports from outside sources state that little damage has been done. Evacuation of Aguascalientes by federals brings last of company's plants into constitutionalist territory.

Sonora

GREENE-CANANEA—Mexican employees numbering 2500 went on strike July 1, their demands being 25% increase in wages, 20% reduction in prices of various commodities at company's general store and a weekly payday. Protests were made against establishment of a so called labor bureau and maintenance of a black list. It is reported that on advice of local Mexican officials, officers of company will at least temporarily grant demands to avoid further trouble.

The Market Report

METAL MARKETS

NEW YORK—July 8

More activity is evident in the metal markets, with some increase in buying and increased firmness of prices; in some cases actual advances.

Copper, Tin, Lead and Zinc

Copper—During the past week the market has been firm and active. A large business has been consummated, estimated in the trade to amount to about 75,000,000 to 100,000,000 lb. The bulk of the purchases was made by European buyers, who purchased for shipment over the next three months. American consumers also bought some fair quantities, for early shipment, but it is reported that there is still considerable near-by copper to be covered.

With the stimulus of this large buying the price naturally advanced, but the upward movement was not quite so impressive as was heralded on the tickers. The producers, who had been pressing copper for sale but a few days previous, began to dangle asking prices over the heads of buyers, which gave them a chance to knock off ⅛c. or so in trading. On Tuesday and Wednesday, 13⅞c., delivered, usual terms, was asked, but copper in large quantity was to be had at 13¾c.

On July 7 the Calumet & Hecla was reported as raising the price for its special brand from 14c. to 14¼c.

The average of electrolytic quotations for the week is 13.465 cents.

The report of the Copper Producers' Association for June showed an increase of about 22,000,000 lb. in the stock. Certain producers characterized the June report as "a good one." An outsider inquired, "What would have been a bad one?"

The London market has also been strong. On July 2, spot standard was £61 12s. 6d., and three months £62. On Monday, July 6, spot advanced to £62 10s., and three months to £62 17s. 6d. On realizations the market eased off somewhat, on Tuesday spot going to £62 5s., and three months to £62 12s. 6d. On July 8, spot closed at £62 6s. 3d., and three months at £62 12s. 6d. per ton

Base price of copper sheets is now 19c. per lb. for hot rolled and 20c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14⅞@15⅛c. per lb., carload lots at mill.

Copper exports from New York for the week were 8958 long tons. Our special correspondent reports exports from Baltimore for the week at 3673 tons.

Imports of copper in Germany five months ended May 31 were 99,785 tons; exports, 2969 tons; net imports, 96,819 tons, an increase of 1214 tons over last year. Of the imports this year 87,684 tons were from the United States.

Visible Stocks of Copper in Europe on June 30 are reported as follows: Great Britain, 14,720; France, 5740; Rotterdam, 3050; Hamburg, 3480; Bremen, 1080; other European ports, 600; total, 28,670 long tons, or 64,220,800 lb. This is an increase of 1410 tons over June 15. In addition to the stocks as given 1650 tons are reported afloat from Chile and 3550 from Australia, a total of 5200 tons, or 1050 tons than on June 15. The total on June 30, including copper afloat, was 33,870 tons.

Tin—The improvement in sentiment, which found expression in a much better market for metals generally, has also not failed to have an effect on tin. The efforts of buyers to depress prices having entirely ceased, the market became strong and advanced from day to day in an orderly fashion. The favorable statistics published at the beginning of this month were also an assisting factor. Consumers in this market who have bought liberally at the lower levels, have desisted from purchasing additional quantities, and the business, which some days last week was very active, was mostly between dealers. The market did not hold its entire advance, but closes steady at £146 5s. for both spot and three months, and about 32c. for July tin here.

Visible Stocks of Tin on June 30 are reported as follows: London, Straits and Australian, 7657; other kinds, 3080; total London, 10,737; Holland, 1188; United States, excluding Pacific ports, 4102; total, 16,027 long tons, which is a decrease of 1835 tons as compared with May 31, but an increase of 4926 tons over June 30, 1913. The stocks include tin afloat.

Lead—The market is quiet with somewhat lower offerings of Western lead, St. Louis being quoted 3.72½@3.75c. New York is unchanged at 3.90 cents.

The London market is quiet, Spanish lead being quoted £19 7s. 6d.; English lead 2s. 6d. higher.

Spelter—The market is featureless and remains quiet at last prices, 4.75@4.80c. St. Louis and 4.90@4.95c. New York.

The London market is a trifle easier, good ordinaries being quoted £21 10s. and specials £22 5s. per ton.

Base price of zinc sheets is now $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount, with the usual extras.

DAILY PRICES OF METALS

NEW YORK

July	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Dts. per Lb.
2	4 8750	56⅝	13 30 @13 35	31	3 90	3 72½ @3 77½	4 90 @4 95	4 75 @4 80
3	4 8760	56⅝	13 30 @13 40	31⅝	3 90	3 72½ @3 77½	4 90 @4 95	4 75 @4 80
4	.	.	.		.			
6	4 8765	56¼	13 35 @13 55	32¼	3.90	3 72½ @3 75	4 90 @4 95	4 75 @4 80
7	4 8770	56⅜	13 55 @13 65	32	3 90	3 72½ @3 75	4 90 @4 95	4 75 @4 80
8	4 8770	56¼	13 55 @13 65	32	3 90	3 72½ @3 75	4 90 @4 95	4 75 @4 80

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0 15c. representing delivery charges. The price of electrolytic cathodes is usually 0 05 to 0 10c. below that of electrolytic; of casting copper 0.15 to 0 25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triests, 22c.

LONDON

July	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
2	25 1/16	61⅝	13 39	62	65¾	140⅝	141¾	19	4 13	21½	4 67
3	26 1/16	61⅝	13 39	62	66	143	144⅝	19	4.13	21½	4 67
4	26	....	....	...		.	....	.			.....
6	25¾	62½	13 58	62¾	66	146	147½	19¼	4 18	21½	4 67
7	25 11/16	62¼	13 52	62½	66	145	146½	19¼	4 18	21½	4 67
8	25⅝	62 5/16	13 54	62⅝	66	146¼	146¼	19⅜	4 21	21½	4 67

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0 925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2 17¾c ; £15 = 3 26¼c. = £25 = 5.44c ; £70 = 15.22c. Variations, £1 = 0 21¾c.

Other Metals

Aluminum—The market continues slow. Sales are not large and there is some competition for business. Quotations are unchanged at 17½@18c. per lb. for No. 1 ingots, New York. The foreign market is also quiet.

Antimony—Business is quiet, but prices are firm and unchanged. Ordinary brands—Hungarian, Chinese, etc.—are 7.65@7.90c. per lb. Cookson's is 7.15@7.35c. per lb., with 6.90@7c. asked for other special brands.

Quicksilver—The market has been rather slow, both here and in London. Prices are nominally unchanged, but are inclined to be soft. New York quotation is $37.50@38.50 per flask of 75 lb., with 54@55c. per lb. quoted for jobbing lots. San Francisco, $37.50 per flask, with about $2 less for export. London, £7 per flask, with £6 17s. 6d. quoted by second brands.

Gold, Silver and Platinum

Gold—Demand for gold is still active abroad, but does not reach the point of paying a premium. The price in the open market in London was 77s. 9d. per oz. for bars. The outward movement from New York has ceased for the present, but many believe it will be renewed very soon.

Gold in the United States July 1, as estimated by the Treasury Department: Held in Treasury against gold certificates outstanding, $1,080,974,869; in Treasury current balances, $195,381,761; in banks and circulation, $614,321,674; total, $1,890,678,304. This is a decrease of $40,663,805 during June.

Platinum—The market is still quiet, but is steady. Dealers ask $43@44 per oz. for refined platinum, and $46@51 per oz. for hard metal, according to grade. The foreign market is reported a little more active and inclined to lower prices.

Our Russian correspondent writes, under date of June 24, that demand has been reduced and the market is weaker. Prices are easier, quotations being 9.50 rubles per pood at Ekaterinburg for crude metal, 83% platinum; 36.500 rubles per pood for the same grade at St. Petersburg; equal to $35.72 and $35.77 per oz., respectively. Stocks have increased, but are still smaller than is usual at this season.

Silver—The market has continued very narrow, fluctuating between 25⅞ and 26$\frac{1}{16}$d. There has been a small but continuous demand from India, while China has been a moderate seller. The market closes quiet but steady at 25⅞d. in London.

Shipments of silver from London to the East, Jan. 1 to June 25, as reported by Messrs. Pixley & Abell:

	1913	1911	Changes
India	£3,653,600	£3,875,000	I £221,400
China	344,500	40,000	D. 304,500
Total	£3,998,100	£3,915,000	D. £83,100

Stocks in London have been reduced to £550,000 by shipments to India and to the European Continent.

Zinc and Lead Ore Markets

JOPLIN, MO.—July 4

Blende is $42 high, a decline of $2 per ton, the base being $38@40 per ton of 60% zinc. The metal base range is $36.50@38. Calamine sold down to $21 early in the week, selling stronger at the close at $22@23 per ton of 40% zinc. The average selling price of all grades of zinc is $36.40. Lead sold as high as $48.50 per ton on a base of $46 per ton of 80% metal content, and the average of all grades is $45.72 per ton.

SHIPMENTS WEEK ENDED JULY 4.

	Blende	Calamine	Lead	Values
Totals this week..	9,061,590	1,920,320	1,887,150	$243,040
Totals 27 weeks..	278,838,670	20,162,980	48,088,890	$6,847,585

Blende value, the week, $178,640; 27 weeks, $5,464,530.

Calamine value, the week, $21,250; 27 weeks, $229,655.

Lead value, the week, $13,150; 27 weeks, $1,153,405.

PLATTEVILLE, WIS.—July 4

The base price paid this week for 60% zinc ore was $40 per ton. The base price paid for 80% lead ore was $46@47 per ton.

SHIPMENTS WEEK ENDED JULY 4

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,897,060	80,000	......
Year	76,640,400	2,862,610	20,708,330

Shipped during week to separating plants, 3,209,280 lb zinc ore. The net shipment of zinc ore to smelteries for the first six months of 1914 showed an increase of 923,650 lb. over the corresponding period of last year.

IRON TRADE REVIEW

NEW YORK—July 8

The iron and steel markets are showing a better tone, though some large interests seem to think it policy to keep up the cry of depression.

Southern Pig Iron Rates will be reduced by the decision of the Interstate Commerce Commission on the complaint of the Sloss-Sheffild Steel & Iron Co. The decision finds that rates now charged from Alabama furnaces to Louisville, St. Louis, Chicago and Boston are unreasonable and should be reduced. This also applies to rates to interior New England points. Proportional rates to the Ohio River are maintained, because any change would throw the entire reduction on the Southern lines. No opinion is expressed on the differentials between all-rail and rail-and-water rates to Eastern points. The decision directs that rates shall be revised so that the charge from Birmingham to Chicago shall not exceed $4 per gross ton, with other rates in proportion. The reduction involved will be from 35c. to 45c. per ton.

PITTSBURGH—July 7

July, which is usually a very dull month in the iron and steel markets, bids fair this time to maintain the record of activity established by June. While in some quarters orders have been slightly reduced the past two business days, the change is ascribed to the holiday and the general prediction is that buying will continue through the month at the June rate, with prospects of a further improvement in August. It is conceded on all hands as practically assured that the second half of the year will show much heavier buying and considerably greater production than the first half, but the opinion is equally strong that there will be little improvement in prices. There is no expectation that prices will decline further, but recovery from the present low and almost unprofitable level is expected to be slow. There have been no noteworthy declines in three or four weeks, but the efforts of mills to secure advances over prompt prices for third quarter and latter half contracts have met with little success. In merchant steel bars some of the mills have yielded to the demand of buyers and have closed contracts at the present market for prompt.

For prompt shipment the market is well established at 1.10c. for bars, plates and shapes; $1.50 for nails, 1.80c. for black sheets and 2.75c. for galvanized sheets.

A week ago three of the independent sheet and tinplate mills which operate union signed the Amalgamated Association wage scale. The other union mills closed for last week, but in a conference which ended Friday night an agreement was reached on the basis of the old scale. If any concession had been granted the mills previously signing would have gotten the benefit. The union sheet and tin mills comprise less than 20% of the total in the country.

Steel mill operations continue at the rate of about 65% of capacity, a slightly better rate than obtained at the close of May. Very few mills have closed for repairs, and the union sheet and tin mills which closed are resuming again.

Pig Iron—The sale of 10,000 tons of basic iron, mentioned briefly in telegram of last Wednesday, was made by the Shenango Furnace Co. (the Snyder interest) to the American Steel Foundries, delivery August, September and October in equal proportion to the Sharon and Alliance works, at an average price of $13, Valley furnaces. Two or three other sales of basic are mentioned, but without details being divulged. The interest mentioned recently sold 35,000 tons of off basic to the Wheeling Mold & Foundry Company, delivery over two years, for East River tunnel segments. This iron is to run not over 0.50% in phosphorus, 0.05% in sulphur and 2.50% in silicon, an analysis which will cover the bulk of off iron made by a furnace normally running on basic. Bessemer iron continues quiet, but makers regard both basic and bessemer now well established in price and look for slight advances in the near future. Foundry iron is selling fairly well in small lots. We quote: Bessemer, $14; basic, malleable and No. 2 foundry, $13; forge, $12.50 to $12.75, at Valley furnaces, 90c. higher delivered Pittsburgh, but it is to be noted that one or two furnaces having 75c. freight to Pittsburgh would sell foundry at $13 at furnace.

Ferromanganese—The market continues quiet, as consumption is not heavy and consumers are well covered. The regular price is $38, Baltimore, with $2.16 freight to Pittsburgh, but occasionally small lots are picked up at a 50c. concession.

Steel—Contracting for third quarter appears to have been rather limited, but consumers are showing little interest in the market. We quote billets at $19.50 and sheet bars at $20, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods

FOREIGN NOTES

The German Iron & Steel Union reports pig-iron production in May at 1,607,111 metric tons. For the five months ended May 31 the total was: Foundry iron, 1,347,272; forge, 187,230; steel pig, 1,025,827; bessemer pig, 126,254; Thomas (basic) pig, 5,070,318 tons; a decrease of 209,554 tons, or 2.2% from last year.

Steel Production in Great Britain for two years past has been as follows, in long tons:

	1912	1913	Changes
Converter	1,522,487	1,600,701	I. 78,214
Openhearth	5,273,657	6,063,175	I. 789,518
Total	6,796,144	7,663,876	I. 867,732

Of the total make last year, 4,860,154 tons were acid and 2,803,722 tons basic steel. The make of wrought iron for 1913 was 1,206,745 tons, a decrease of 119,272 tons from the previous year.

IRON ORE

Shipments of Lake Superior ore are rather slow, and the June total will not show up to last year. There has been some increase in shipments from Lake Erie docks to furnaces.

Very little is doing in the East in imported ore and no new contracts are reported.

COKE

Coke production for the week in the Connellsville region is reported by the "Courier" at 261,553 short tons; shipments, 270,397 tons. The production in the Greensburg and upper Connellsville districts was 34,603 tons.

Connellsville Coke—The market for contract furnace coke has not justified its early start, when three consumers a fortnight ago contracted for a total of 27,000 tons a month over second half at $2. This was particularly choice coke, and while fairly good coke could have been secured on contract at $1.90, or possibly $1.85, other consumers preferred to buy only for early delivery, prices being so much lower. Several sales for July supplies have been made at $1.75 and there have also been some lots at the same figure for shorter periods, so that the market has now turned quiet, with no demand for either prompt or forward. We quote: Prompt furnace, $1.75@1.80; contract furnace, $1.90@2; prompt and contract foundry, $2.30@2.50, per ton at ovens.

CHEMICALS

NEW YORK—July 8

The usual summer dullness prevails in the general market and business seems to be on rather a moderate scale.

Arsenic—The market remains quiet and easy, but prices do not change. The current quotation is $3 per 100 lb. for both spot and futures.

Copper Sulphate—Business continues fair and steady, with prices unchanged. Quotations are $4.65 per 100 lb. for carload lots and $4.90 per 100 lb. for smaller parcels.

Nitrate of Soda—While there is no special activity at this season, there is some business doing. Prices are a little easier at 2.10c. per lb. for spot and 2.07½c. for futures, up to the end of the year.

The Chilean government gives notice of a public sale to be held Sept. 24 at Santiago de Chile, which will include 15 important parcels of nitrate lands.

Pyrites—Imports at Baltimore for the past week included 4363 tons pyrites from Huelva, Spain.

Phosphates—The output of the four leading phosphate companies in North Africa—Algiers and Tunis—for the year ended Dec. 31 was, in metric tons:

	1912	1913	Changes
Gafsa	1,312,378	1,361,603	I. 49,225
Kalaa-Djerda	302,828	361,485	I. 58,657
Kalaa-es-Senam	141,322	192,000	I. 50,678
Korif	300,970	369,590	I. 68,620
Total	2,057,498	2,284,678	I. 227,180

During 1913 the value of phosphates declined owing to cheap ocean freights allowing the introduction of American phosphates, and to the increased production not having been fully absorbed by consumers.

PETROLEUM

The monthly statement of the "Oil City Derrick" shows new wells completed in June as follows: Pennsylvania grade, 664; Lima-Indiana, 202; Central Ohio Gas, 49; Kentucky, 33; Illinois, 180; Kansas-Oklahoma, 1057; Texas-Louisiana, 167. A total of 2342 wells was completed, with an initial production of 189,631 bbl. There were 398 dry holes and 187 gas wells. Compared with the May report there was a decrease of 257 in completions and an increase of 39,914 bbl. in new production. There were 74 fewer failures and 21 less gas wells. At the close of June the new work amounted to 617 rigs and 2294 wells drilling.

OTHER ORES

Latest foreign quotations for manganese ores are, c.i.f. United Kingdom port; Indian or Brazilian, 50% manganese, 18½@19c. per unit; 48%, 18@18½c.; 45%, 17½@18c. Caucasian, 50% 17@17½c.; 48%, 16½@17c. per unit.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	February	March	April	May	June
Alaska shipments	1,803,579	2,069,960	1,279,537	585,387	1,114,758
Anaconda	21,300,000	23,800,000	22,900,000	23,500,000	23,800,000
Arizona, Ltd.	3,062,000	3,286,000	3,570,000	3,092,000	....
Copper Queen	6,987,366	7,637,042	7,562,723	8,388,203	7,613,719
Calumet & Ariz.	5,596,850	5,875,000	5,450,000	5,495,000	5,682,300
Chino	5,642,426	5,399,814	5,926,591	5,496,875	....
Detroit	1,814,214	1,973,725	1,790,926	2,105,034	2,129,100
East Butte	1,193,960	1,546,180	1,178,000	1,179,962	....
Giroux	90,017	287,980	45,918	429,553	....
Mason Valley	1,254,000	1,250,000	862,000	916,000	....
Mammoth	1,400,000	1,800,000	1,850,000	1,750,000	1,725,000
Nevada Con.	4,588,243	5,218,257	4,880,043	4,959,589	....
Ohio	582,000	597,520	610,518	625,000	....
Old Dominion	3,066,000	2,997,000	2,779,000	3,302,000	2,937,000
Ray	5,432,000	6,036,908	6,089,362	6,300,847	....
Shannon	903,761	1,082,000	1,012,000	1,056,000	
South Utah	333,874	406,381	247,641	55,394	
Tennessee	1,232,812	1,262,184	1,370,800	1,336,950	....
United Verde*	2,700,000	3,100,000	3,000,000	3,100,000	....
Utah Copper Co.	9,207,111	12,323,493	12,739,757	13,208,483	....
Lake Superior*	8,500,000	11,000,000	13,000,000	12,500,000	16,000,000
Non-rep. mines*	7,600,000	8,200,000	8,000,000	8,200,000	....
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	....
Total prod.	96,790,213	107,036,667	108,554,846	110,082,277	....
Imp., bars, etc.	19,918,448	22,676,605	17,043,191		....
Total blister	16,708,661	129,713,272	125,598,035	....	....
Imp. ore & matte	9,713,164	7,029,646	10,400,122	....	....
Total Amer.	126,421,825	136,742,918	135,998,157	....	....
Miami†	3,316,482	3,361,100	3,130,772	3,347,000	3,124,750
Shattuck-Arizona	1,134,480	1,136,458	1,386,594	1,353,043	....
Brit. Col. Cos.:					
British Col. Cop.	....	....	....	....	....
Granby	1,661,212	1,775,852	1,692,102	1,669,334	....
Mexican Cos.:					
Boleo†	1,984,080	2,535,680	2,201,720	2,213,120	....
Cananea	2,688,000	4,260,000	2,632,000	2,222,000	....
Moctezuma	2,642,543	2,882,884	2,654,926	2,834,616	3,370,800
Other Foreign:					
Braden, Chile	2,362,000	1,810,000	2,720,000	2,480,000	741,440
Cape Cop., S. Af.	4[illegible]9,200	660,800	468,160	....	....
Kyshtim, Russia	1,534,400	....	....	....	....
Spassky, Russia	902,720	896,000	904,960	907,200	....
Exports from Chile	6,720,000	6,944,000	9,072,000	7,616,000	....
Australia	7,952,000	8,176,000	7,168,000	8,400,000	....
Arrivals-Europe‡	18,354,560	17,572,800	17,299,520	13,558,720	....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡ Does not include the arrivals from the United States, Australia or Chile.

COPPER STATISTICS

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year. 1912	1,581,920,287	819,665,948	746,396,452	....	....	....
VII, '13	138,074,602	58,904,192	78,480,071	52,814,606	77,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X	139,070,481	68,173,720	68,123,473	29,793,004	53,625,600	83,418,[illegible]
XI	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,[illegible]
XII	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,4[illegible]
Yr., '13	1,622,450,829	767,261,760	869,062,784	....	....	
I, 1914	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,3[illegible]
II	122,561,007	47,586,657	83,899,183	87,296,685	50,108,800	137,[illegible]
III	115,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV	151,500,531	63,427,633	82,315,216	64,609,319	46,435,200	111,044,[illegible]
V	142,308,287	55,592,170	72,710,477	70,337,001	52,371,200	122,708,[illegible]
VI	141,345,471	46,227,353	73,350,196	84,342,641	61,062,400	145,405,041
VII	....			106,110,663	61,220,800	1[illegible]

Note—Visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Atlas Wonder, Nev	July 6	July 29	$0.01
Caledonia, Nev.	July 3	July 24	0.05
Challenge Cons., Nev	July 21	Aug. 11	0.05
Crown Point, Nev	July 6	July 28	0.10
D. & M., Utah	July 11	July 31	0.05
Gould & Curry, Nev	June 24	July 15	0.03
Hamburg-American, Ida. post'd	.....	Aug. 6	0.001
Hypotheek, Ida.	June 12	July 14	0.01
Idaho-Los Angeles, Ida.	June 19	July 17	0.003
Idaho-Nevada, Ida	July 7	Aug. 1	0.001
Imlay, Nev.	July 1	July 18	0.005
Indian Pete, Utah	June 27	July 15	0.005
Laclede, Id.	June 20	July 14	0.003
Melcher, Utah	June 30	July 18	0.02
Nabob, Ida	July 20	Aug. 17	0.005
New Hope, Ida	July 13	Aug. 13	0.002
North Star, Ida	July 10	Aug. 8	0.0015
Overman, Nev	July 8	July 29	0.05
Paymaster, Ida	July 15	Aug. 12	0.002
Robbers' Roost, Calif.	June 20	July 15	0.01
Saltese, Mont.	June 20	July 20	0.002
Santaquin King, Utah	July 11	July 27	0.0025
Seg Belcher, Nev.	June 22	July 17	0.02
Silver Mt., Ida., postponed	...	July 22	0.003
Silver Pick, Nev.	June 22	July 27	0.01
Snowshoe, Ida. postponed	...	July 27	0.005
Springfield, Ida., post'd	..	July 18	0.002
Sunset, Ida	July 10	Aug. 1	0.002
Union Cons., Nev	June 26	July 17	0.05
Utah-United, Utah	July 6	July 27	0.01

Monthly Average Prices of Metals

SILVER

Month	New York 1912	New York 1913	New York 1914	London 1912	London 1913	London 1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.642	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26.788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	58.175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25.948
July	60.654	58.721	......	27.919	27.074	......
August	61.606	59.293	......	28.375	27.335	......
September	63.078	60.640	......	29.088	27.986	......
October	63.471	60.793	......	29.299	28.083	......
November	62.792	58.995	......	29.012	27.263	......
December	63.365	57.760	......	29.320	26.720	......
Year	60.835	59.791	......	28.042	27.576	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic 1913	New York Electrolytic 1914	London Standard 1913	London Standard 1914	London Best Selected 1913	London Best Selected 1914
January	16.488	14.223	71.741	64.304	77.750	69.488
February	14.971	14.491	65.519	65.259	71.575	70.188
March	14.713	14.131	65.329	64.276	70.658	69.170
April	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.996	68.807	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14.190	...	64.166	...	69.446	...
August	15.400	....	69.200	....	74.313	.....
September	16.328	.....	73.125	....	78.614	.....
October	16.337	......	73.383	.....	79.250	.....
November	15.182	......	68.275	.....	73.825	.....
December	14.224	......	65.223	...	69.583	.....
Year	15.269	......	68.335	..	73.740	.. ...

New York, cents per pound, London, pounds sterling per long ton.

TIN

Month	New York 1913	New York 1914	London 1913	London 1913
January	50.298	37.779	238.273	171.905
February	48.766	39.830	220.140	181.556
March	46.832	38.038	213.615	173.619
April	49.115	36.151	221.159	163.963
May	49.038	33.360	221.143	150.702
June	44.820	30.577	207.208	138.321
July	40.260	.....	183.511	....
August	41.582	.....	188.731	....
September	42.410	....	193.074	....
October	40.462	......	184.837	....
November	39.810	....	180.869	....
December	37.035	....	171.786	....
Av. year	44.252	.....	206.279	.....

New York in cents per pound: London in pounds sterling per long ton.

LEAD

Month	New York 1913	New York 1914	St. Louis 1913	St. Louis 1914	London 1913	London 1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4.048	4.175	3.937	16.550	19.606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3.688	17.597	18.225
May	4.342	3.900	4.226	3.808	18.923	18.503
June	4.325	3.900	4.190	3.810	20.226	19.411
July	4.353	...	4.223	....	20.038	......
August	4.624	....	4.550	....	20.406	......
September	4.698	.....	4.579	.....	20.648	......
October	4.402	.....	4.253	.....	20.302	......
November	4.293	......	4.146	.....	19.334	......
December	4.047	.....	3.929	....	17.798	......
Year	4.370	..	4.238	..	18.743	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1913	New York 1914	St. Louis 1913	St. Louis 1914	London 1913	London 1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5.228	25.338	21.413
March	6.078	5.250	5.926	5.100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5.074	5.256	4.924	24.583	21.393
June	5.124	5.000	4.974	4.850	22.143	21.345
July	5.278	....	5.128	.....	20.592	......
August	5.658	.....	5.508	.....	20.706	......
September	5.694	......	5.444	....	21.148	......
October	5.340	......	5.188	.....	20.614	......
November	5.229	......	5.083	.....	20.581	.....
December	5.156	......	5.004	.....	21.214	.....
Year	5.648	.. ...	5.504	......	22.746	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer 1913	Bessemer 1914	Basic 1913	Basic 1914	No. 2 Foundry 1913	No. 2 Foundry 1914
January	$18.15	$14.94	$17.35	$13.23	$18.59	$13.90
February	18.15	15.06	17.22	14.12	18.13	14.09
March	18.15	15.07	16.96	13.94	17.53	14.18
April	17.90	14.90	16.71	13.90	16.40	14.10
May	17.68	14.90	15.80	13.90	15.40	14.23
June	17.14	14.90	15.40	13.90	15.10	13.97
July	16.31	.....	15.13	......	14.74	.....
August	16.63	...	15.00	....	14.88	....
September	16.65	.....	15.04	.....	14.93	.....
October	16.60	.....	14.61	..	14.80	.....
November	16.03	....	13.91	...	14.40	.....
December	15.71	...	13.71	.	14.28	......
Year	$17.09	...	$15.57	.....	$15.77	.....

STOCK QUOTATIONS

COLO. SPRINGS July 7 Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con	.007
C. K. & N.	.06½
Doctor Jack Pot	.05½
Elkton Con.	47
El Paso	1.49
Findlay	.008
Gold Dollar	.03
Gold Sovereign	.01
Golden Cycle	1.00
Isabella	.11½
Jack Pot	.05
Jennie Sample	.03½
Jerry Johnson	.02½
Lexington	.004
Old Gold.	.01
Mary McKinney	.50
Pharmacist.	.009
Portland.	1.13
Vindicator	1.05½

SALT LAKE July 7 Name of Comp.	Bid.
Beck Tunnel	.03½
Black Jack	.05½
Cedar Talisman	.00½
Colorado Mining	.11½
Crown Point	.01½
Daly-Judge	5.00
Gold Chain	.07½
Grand Central	.56
Iron Blossom	1.42½
Little Bell	.15
Lower Mammoth	.00½
Mason Valley	2.00
May Day	.07
Opohongo	.01
Prince Con	.17½
Silver King Coal'n	2.85
Silver King Cons.	1.80
Sioux Con	02
Uncle Sam	.04
Yankee	.01

TORONTO July 7 Name of Comp.	Bid.
Bailey.	00½
Coniagas.	7.00
Peterson Lake	35
Right of Way.	02½
T. & Hudson Bay	65.00
Timiskaming	14
Wettlaufer-Lor	05½
Big Dome.	8.25
Crown Chartered	‡ 00½
Dome Exten.	07
Foley O'Brien	24
Hollinger	19.00
Imperial	.01½
Jupiter.	05
Pearl Lake	.03
Porcu. Gold	.01
Preston E. D	.01
Rea	.15
Swastika	.01
West Dome	.07

SAN FRANCISCO July 7 Name of Comp.	Bid.
Comstock Stocks.	
Alta	.07
Belcher	.28
Best & Belcher	.06
Caledonia	.45
Challenge Con.	‡.02
Chollar	.03
Confidence	‡.20
Con. Virginia.	.15
Crown Point (Nev.)	.30
Gould & Curry	.03
Hale & Norcross.	.05
Mexican	.50
Occidental	.70
Ophir	.18
Overman	.20
Potosi	.01
Savage	.07
Sierra Nevada	.12
Union Con	.15
Yellow Jacket	.36
Misc. Nev. & Cal.	
Belmont	6.60
Jim Butler	1.02½
MacNamara	.01
Midway	.21
Mont.-Tonopah	.60
North Star	.26
West End Con.	.65
Atlanta	.14
Booth.	.04
C.O.D. Con	.02
Comb. Frac.	.05
Jumbo Extension	.19
Pitts.-Silver Peak	.37
Round Mountain	36
Sandstorm Kendall.	.08
Silver Pick	07
Argonaut	‡3.00
Brunswick Con	1.50
Central Eureka	13
So. Eureka	2.40

N. Y. EXCH. July 7 Name of Comp.	Clg.
Amalgamated	71⅜
Am.Sm.&Ref.,com	64½
Am. Sm. & Ref., pf.	103
Am. Sm. Sec., pf. B.	82
Anaconda	31½
Batopilas Min.	⅝
Bethlehem Steel, pf.	84½
Chino	41
Colo. Fuel & Iron.	25½
Federal M. & S., pf.	34
Great Nor., ore., ctf.	32⅜
Guggen. Exp.	55¼
Homestake	113
Inspiration Con.	17½
Mex. Petroleum	62⅜
Miami Copper	22¼
Nat'l Lead, com.	45
National Lead, pf.	107½
Nev. Consol	13¾
Ontario Min	2¼
Phelps Dodge	175
Quicksilver, pf.	1
Ray Con	21½
Republic I&S, com.	22½
Republic I&S, pf.	85½
SlossSheffi'd, com	25
Sloss Sheffield, pf.	84½
Tennessee Copper	33¼
Utah Copper	58⅜
U. S. Steel, com	62¾
U. S. Steel, pf.	109½

N. Y. CURB July 7 Name of Comp.	Clg.
Beaver Con	.24½
Big Four	‡.05
Boston Montana	9⅜
Braden Copper	7⅜
B. C. Copper	1⅜
Buffalo Mines	13/16
Can. Cop. Corpn.	2¼
Can. G. & S.	.08
Caribou	.66
Chambers Ferland	.16
Con. Ariz. Sm	.50
Coppermines Cons	1⅜
Davis-Daly	.60
Diam'field-Daisy	05
Ely Con	.06
Florence	.40
Gold Hill Con	‡ 7/16
Goldfield Con	1 7/16
Greene Cananea	29
Greenwater	‡.06½
Kerr Lake	5¼
La Rose	15/16
McKinley-Dar-Sa.	.62
Mines of Am.	3
Mother Lode	‡.26
Nevada Hills	.33
New Utah Bingham	⅜
Nipissing Mines	6
Ohio Copper	.30
Oro	.09
Puebla S. & R.	2½
Stand'd Oil of N.J.	407
Stand'd Silver Lead	1⅜
Stewart	1⅜
Tonopah	6⅜
Tonopah Ex.	2 [illegible]/16
Tonopah Merger	.43
Tularosa	⅜
West End Ex	.03
Yukon Gold	2¼

LONDON June 26 Name of Comp.	Clg.
Camp Bird	£0 9s 6d
El Oro.	0 13 9
Esperanza	0 15 0
Mexico Mines.	4 18 9
Oroville	0 10 10½
Santa Gert'dis.	0 11 3
Stratton's	0 0 6
Tomboy	1 3 9

BOSTON EXCH July 7 Name of Comp.	Clg.
Adventure	1⅛
Ahmeek	275
Alaska Gold M.	27⅜
Algomah	.90
Allouez	40½
Am. Zinc	15¼
Ariz. Com., ctfs.	4⅜
Bonanza	.51
Butte & Balak	2½
Calumet & Ariz.	65½
Calumet & Hecla	415
Centennial	17½
Cliff	‡1
Copper Range	36
Daly West	1⅞
East Butte	9 15/16
Franklin	4
Granby	80½
Hancock	14
Helvetia	.33
Indiana	4
Island Cr'k, com.	49½
Island Cr'k, pfd.	87
Isle Royale	21¼
Keweenaw	3½
Lake	6½
La Salle	3⅜
Mass.	4½
Mayflower	4⅜
Michigan	.55
Mohawk	44½
New Arcadian	4¾
New Idria Quick	‡3½
North Butte	25
North Lake	1
Ojibway	95
Old Colony	3⅜
Old Dominion	49⅜
Osceola	76
Quincy	56
Santa Fe	1⅜
Shannon	5
Shattuck-Ariz	23
Superior	27½
Superior & Bost.	1⅛
Tamarack	35½
Trinity	3¼
Tuolumne.	.35
U. S. Smelting	33⅜
U. S. Smelt'g, pf.	46½
Utah Apex	1⅜
Utah Con	11
Victoria	2
Winona	2½
Wolverine	40
Wyandot	65

BOSTON CURB July 7 Name of Comp.	Bid.
Bingham Mines	04½
Boston & Corbin	.28
Boston Ely.	.25
Butte & Lon'n Dev.	.30
Calaveras	1¼
Calumet-Corbin	.10
Chief Cons.	.90
Corbin	.90
Cortez	.25
Crown Reserve	1[illegible]
Eagle & Blue Bell	.95
First Nat. Cop.	1⅜
Houghton Copper	2
Majestic	.20
Mexican Metals	.20
Nevada-Douglas	1½
New Baltic	1¼
Oneco	.55
Raven Copper	.10
Smokey Dev.	.20
So. Lake	3½
S. W. Miami	‡1
Tonopah Victor	.37
Tretheway	12½
United Verde Ext.	.82

‡Last Quotations.

The Engineering and Mining Journal

VOLUME 98 JULY 18, 1914 NUMBER 3

A Journey to Lassen Peak

By W. H. Wright.[*]

SYNOPSIS—W. H. Wright visited Lassen Peak during the recent disturbance and made a number of interesting photographs, some taken within close range of the fissure or crater. The opening formed by the eruptions was, on June 16, about 400 ft. long and 100 to 150 ft. wide. The material thrown out by the eruptions had the appearance of debris from the walls of the old crater. The elevation of Lassen Peak is 10,437 ft. It appears to be the only active volcano in the continental United States outside of Alaska.

⁂

An eruption on Lassen Peak, California, occurring at 10 a.m. Sunday, June 14, had just ceased when I arrived at Prattville, on the way to Drake's Springs, in company with J. M. Howell and W. H. Spaulding, of San Francisco. The dust-cloud still hung over the mountain. A resident of Prattville stated that this had been the largest of all outbreaks and earnestly sought to dissuade us from going on to what he seemed to consider certain death. His parting words were rather doleful, and he intimated that, while he wished us good luck, he had grave doubts of our returning.

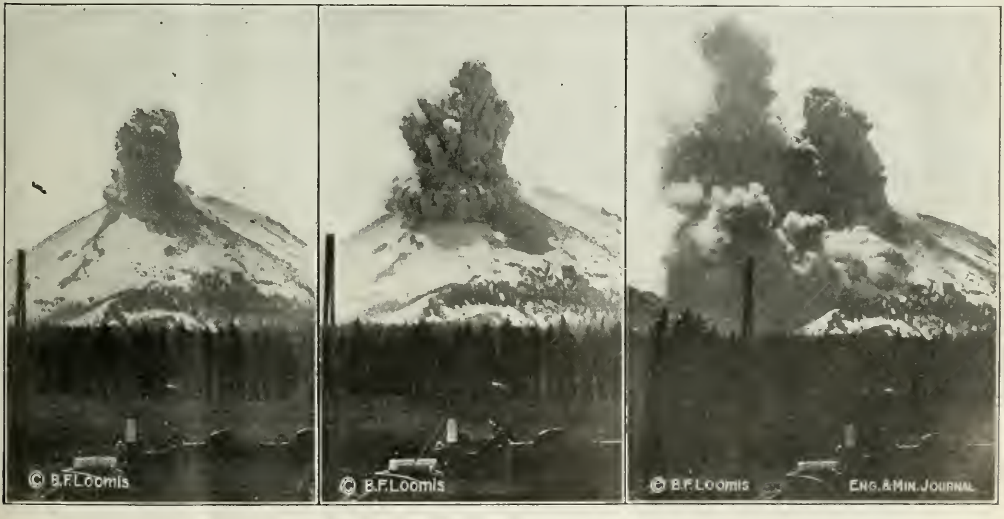

Fig. 1. The Eruption of Mt. Lassen

Showing successive stages of the smoke column, June 14, 1914.

We visited the peak on June 16, under guidance of Harry Kaul, who had spent the winter at Drake's Springs as caretaker. Kaul stated that on Thursday night, May 28, he heard a rumbling like that of thunder. Upon going out of doors he found the stars shining brightly. Also that on Friday afternoon, at 2:30, a slight earthquake caused the poorly fastened roof of the barn to slide to the ground. This shock was felt in Westwood, 29 miles, and Susanville, 51 miles, distant. At this time Kaul was probably the nearest to the mountain of any person in that region. On Saturday, May 30, the first eruption occurred, although a stage driver reports seeing a vapor rising from the mountain on Friday. Two days after the eruption, Kaul accompanied a party to the peak. The crater or fissure was then about half its present size, but general conditions were the same. There was not so much debris scattered about, and a small pool occupied a depression in the old crater. Since that time numerous eruptions have taken place, and have all been of the same character. Tin cans left by the party on Kaul's first visit to the peak were picked up by our party. They were badly mashed and dented by falling stones.

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Leaving the Western Pacific R.R. at Keddie, we traveled by automobile to Big Meadows, a distance of 26 miles, to secure saddle horses. Then a horseback ride of 35 miles brought us to Drake's Springs, where the night was spent. This point is 7 miles from the summit of the peak. O. L. Caddle, deputy sheriff of Plumas County, preceded the party with a light wagon, which carried a camp outfit and supplies.

Second Sunday Eruption Lighted by Sunset

About 15 miles from the mountain, in a direct line, the first sign of volcanic dust was seen. A slight film covered the ground. This seemed to lie in a narrow belt, as we soon passed through it when our course was changed. At various times during the ride glimpses of the mountain were caught, and a column of steam was always seen rising high above the summit. At Lee's ranch, in Warner Valley, 10 miles from the peak, we witnessed the second eruption of the day. This happened at 7 p.m. and was an impressive spectacle. The setting sun was level with the top of the peak and a little to the left. A column of steam and dust rose to a height of at least 1500 ft. above the mountain top In appearance it much resembled the dirty white exhaust of a coal-burning locomotive. Although witnesses to this eruption, situated on the west and northwest side of the mountain, reported that flames were visible, none could be seen from the southeast side. It is more than likely that the swift-rising column of steam reflected the red rays of the setting sun, giving an appearance of fire.

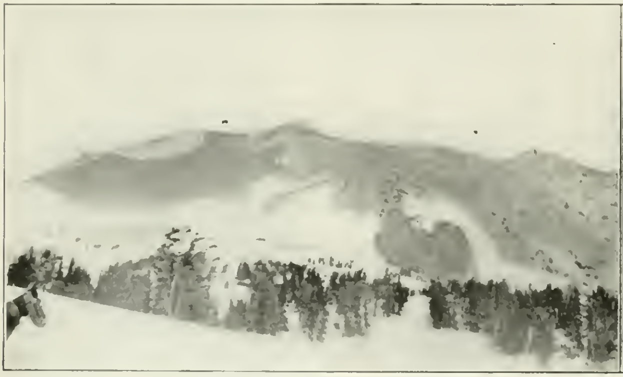

Fig. 2. Lassen Peak from 8600-Ft. Elevation
The dark shading shows where the ash fell on snow; the lighter, ash on shale.

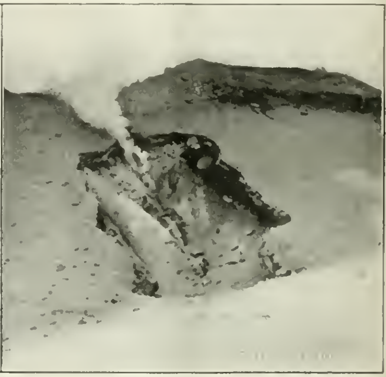

Fig. 3. The Crater
Track of guide who paced length of crater, at right.

Boiling Springs and Mud Pots in the Valley

That evening, after reaching Drake's Springs, it was decided that the next day could be well spent in recuperating and visiting the wonderful hot springs that occur at many points in this little valley. The next morning, Monday, June 15, the party visited Tartarus Lake. This is a pool occupying a crater-like depression, completely surrounded by boiling springs and mud pots. The steam from these has a decided odor of hydrogen sulphide. The area of this pool is approximately an acre. One large spring at the south end is almost a true geyser in its intense bubbling and spouting of steam. Two and one-half miles southeast of this lake is Geyser, a large boiling spring, which formerly spouted to a considerable height, but is now quite feeble in its action.

Two miles northwest of Tartarus Lake, and in the direction of Lassen Peak, is situated the Devil's Kitchen. This consists of a large number of solfataras and hot springs that are on both sides of a ravine, through which runs a good-sized mountain stream. Some of the springs actually bubble up through the water of the creek. The action of these springs varies from the sluggish mud-pots to the violently boiling springs that are, in fact, small geysers. The springs after a time apparently become choked with a deposit from the water and form other vents in new places. In the same general line, but a trifle more to the west, Bumpas Springs are situated. This is a group of springs similar to those of the Devil's Kitchen, but on a much larger scale. Many other hot springs, as well as mineral springs, exist in other localities in this region. The steam from all of these springs has the same characteristic odor of hydrogen sulphide, and possibly of the dioxide, although this could not be definitely ascertained by the sense of smell alone.

All day June 15 one of the party stood guard at a vantage point, looking across Tartarus Lake, with a camera ready to take a picture of an outburst from the mountain. The old saying that a watched pot never boils proved true in this case.

Traveling Over Dust-Covered Snow

Tuesday morning, June 16, guided by Harry Kaul, the party left Drake's Springs for the summit of Lassen Peak. Kaul had made two trips to the top of the peak since the first eruption on May 30. The trail leads through a magnificent growth of timber. Above 6000 ft. altitude the traveling was done over hard snow, which as we neared the top became very deep. It easily supported the horses and made the ascent much easier than at other seasons. Even close to the peak only a slight amount of dust covered the snow. Illustrations No. 1

and No. 2, taken at the elevations of 7250 ft. and 8600 ft., respectively, show this clearly. In picture No. 2 the shadowy area covering the top of the mountain is dust-covered snow and plainly marks the distance any great amount of dust fell.

The lighter-colored portions of this area are bare rock covered with cement-colored dust; the dust upon the snow, being wet, is dark colored. A short distance above the place shown in Fig. 2 the horses were tied. From there on it was a strenuous climb of a vertical distance of 1800 ft.

FISSURE ALONG MAIN AXIS OF OVAL PIT

At 12:30 the ridge at the top was gained and our first view of the crater obtained. The party then descended the slope into the cup-shaped depression that marks the site of the ancient crater. The new crater has broken out on the northwest side of this, and seemingly has been formed by steam escaping under high pressure from a fissure which lies along the main axis of the oval-shaped pit. Figs. 3, 4 and 5 all show this fissure distinctly. The steam forced its way through the fissure and formed a narrow crater, the sides of which had begun to cave, rapidly widening it. These pictures were taken at great risk. Aside from the danger of an outbreak of the crater, the danger from the caving sides was great. In order to get good views of the pit it was necessary to go close to the edge. Huge cracks extended back 25 and 30 ft. Every few minutes great masses would fall from the sides. A short time after one of the pictures was obtained, the place from which it was taken suddenly fell into the hole, sending up a cloud of dust and making a spectacular display, which, unfortunately, was over too soon to be photographed, as the party was busily engaged in eating lunch. The volume of escaping steam varies from moment to moment. Fig. 5 shows a large block of hard snow lying on the caved material covering the fissure at the bottom of the pit. In appearance and odor the steam resembles that escaping from the boiling springs previously mentioned; in fact, it was impossible to detect any difference. That the vapor is steam is evidenced by the fact that it condenses and disappears after rising into the air for a short distance. The hole is about 100 ft. in width and 500 ft. in length, and large quantities of huge rocks were thrown out. The one in the foreground weighed at least two tons. The deep snow, on the north slope of the south side of the old crater, which was covered with dust, sand and rocks, contained several hundred holes which had been caused by falling rocks. These must have been hot, as they were deep in the snow, which is as hard as ice; also, the sides of the holes are perfectly smooth, and there are many large stones lying on top of the snow beside these holes. Of course, it is possible that the unburied ones did not fall from as great a height as those that are buried. A stone lying 1000 ft. from the crater measured 30x54 in. As it was deeply buried, the thickness could not be measured.

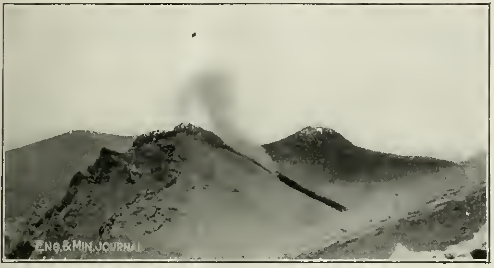

FIG. 4. FIRST VIEW OF CRATER LOOKING NORTH
Note large ejected rocks in left foreground.

DEBRIS THREE AND FOUR FEET DEEP ON THE SNOW

Small heaps of crumbled rock lying on the snow showed that some of the stones crumbled upon being suddenly cooled by it. The lookout station of the forest service, situated on the highest pinnacle of the mountain and about a thousand feet from the crater, resembled a large salt-shaker, the roof having been perforated in many places by falling rock. The largest hole was 12 in. in diameter and clean-cut. At the edge of the crater, débris from the different explosions lay on the snow to a depth of three or four feet. This gradually diminished to a depth of 6 in. at the top of the ridge surrounding the cup of the crater. The deposit has been classified as descending from a great height. Upon the snow were stones of various sizes. Next is a deposit of coarse sand, upon which is a layer of very fine dust that closely resembles portland cement. There was no lava or cinders. The only indications of heat were the hot stones and steam. The mountain is composed of dacite, which has the appearance of gray granite. If one could collect the débris from a blast in this rock, he would have exactly the same material that has been cast up by the present eruptions.

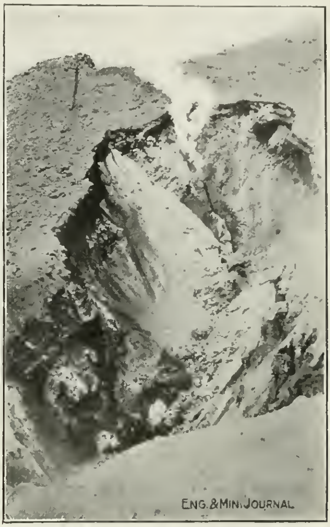

FIG. 5. CRATER SHOWING BLOCK OF SNOW IN FOREGROUND

The edges of the fissure are covered with a yellow deposit that appears to be sulphur. This could not be verified, as it was impossible to reach the fissure. The presence of sulphur is not unexpected, as deposits of sulphur are found at many of the hot springs. An odor of sulphur was noticed in the dust, but it was so faint that it could not be determined whether it was the hydride or dioxide.

DEBRIS FROM THE WALLS OF AN OLD CRATER

The evidences on the ground bear out the belief that the material thrown out by the outbursts consisted of débris from the walls of the ancient crater broken and forced from the fissure by steam under great pressure. Much of this material fell directly back into the new crater or caved from the side, closing the vent and making other explosions necessary to clear the outlet. Lassen Peak is 10,437 ft. high and is the southern terminus of the Cascade range. Like many other mountains in this range, it is an extinct crater. In the Lassen lava field, which lies to the northeast and north of Lassen Peak, is situated Cinder Cone, the latest active volcano in the United States. History does not record this last eruption, which appears to have occurred in the neighborhood of 200 years ago. This eruption was so quiet that it would not attract attention in a sparsely settled country.

Gypsum Production in 1913

Gypsum, of which plaster of paris is made, was mined in the United States in 1913 to the extent of 2,599,508 tons, an increase of 98,751 tons over 1912, according to the U. S. Geological Survey. Gypsum sold crude without calcining and used principally as an ingredient in portland cement and paint and as land plaster amounted to 463,136 short tons, which is a good increase over the business of 1912. About 85% of the gypsum sold crude in 1913 was used for portland cement at an average value of $1.49 a ton. The quantity sold for this purpose is steadily increasing.

There was an increase of 42,175 tons in the amount of calcined gypsum sold in 1913. A total of 1,680,157 short tons was calcined for wall plaster, Keenes cement, plaster of paris, etc. About 1,250,000 tons of this amount was used for mixed wall plaster, the so called cement plaster and hard wall plasters of the building trade. A marked advance in the quantity and value of gypsum imports was made in 1913, the total importation of unground gypsum in 1913 being 447,383 tons.

British Steel Production

The British Iron Trade Association has completed its report of steel production in Great Britain for 1913. According to its statement the total make of steel in that year—not including crucible and electric steel—was, in long tons:

	Acid		Basic		Total	
	Tons	Per Cent.	Tons	Per Cent.	Tons	Per Cent.
Converter steel.	1,048,772	13.7	551,929	7.2	1,600,701	20.9
Openhearth	3,811,382	49.7	2,251,793	29.4	6,063,175	79.1
Total	4,860,154	63.4	2,803,722	36.6	7,663,876	100.0

The total make of steel in 1913 was the largest ever reported, it was 867,732 tons, or 12.8%, more than in 1912. The gain last year was, as it has been for several years past, in openhearth steel, the advance in converter steel being comparatively small. Great Britain adheres to the acid process, however, and the increase in acid steel last year was much greater than in basic metal.

The production of wrought or puddled iron, on the other hand, showed a decrease of 119,272 tons from 1912, though it was greater than for several years previous. The make of steel and of wrought iron for five years past has been, in long tons:

	Steel			Wrought Iron
	Converter	Openhearth	Total	
1909..........	1,733,220	4,148,408	5,881,628	1,129,412
1910..........	1,779,115	4,595,366	6,374,481	1,118,893
1911..........	1,461,140	5,000,472	6,461,612	1,191,499
1912..........	1,522,487	5,273,657	6,796,144	1,326,017
1913..........	1,600,701	6,063,175	7,663,876	1,206,745

In the five years the proportion of bessemer, or converter, steel has dropped from 29.5 to 20.9%, while that of openhearth has increased from 70.5 to 79.1% of the total. The steel total has gained over 30% in the five years, while there have been no great changes in wrought iron.

The total production of finished iron in bars, shapes and other forms in 1913 was 1,121,132 tons. There is no complete report of the output of finished steel.

Argonaut Company Gets Decision

The Argonaut apex suit, an action brought by the Kennedy Extension Gold Mining Co. against the Argonaut Mining Co. for the recovery of the value of ores extracted and for other damages, aggregating about $1,000,000, was decided in favor of the defendant by Judge Fred V. Wood, in the Superior Court of Amador County, Calif., on June 29, 1914. The trial was begun in September, 1913; the arguments were submitted in January, 1914. Following is the decision rendered by the court, reprinted in part and condensed:

There are vexatious and embarrassing questions involved in this case, some of which seem to be impossible of an entire and satisfactory solution by the human mind, loking at them from an impartial standpoint; but this court is largely influenced in its decision by the preponderance of the testimony of practical mining men familiar with its history, and is disinclined upon the evidence produced to take from the possession of the Argonaut company the property which it has obtained by its discovery and labor upon what it had every reason to believe and was generally supposed to be the Argonaut vein.

This court is of the opinion and decides that the continuity and identity of the Argonaut vein is sufficiently shown to meet the requirements of the law; that the evidence does not satisfactorily establish the course of the apex of the Jackson vein; that the defendant Argonaut Mining Co. is entitled to retain the proceeds of the ores and minerals extracted from the segment of the vein in dispute and to a judgment for its costs.

All the work that plaintiff has ever done since its acquisition of the property has been to clean out the old workings and perform such other work as it deemed important to establish its claim in this action, and all of the property was idle for many years prior to plaintiff's ownership.

In the regular and customary course of mining the defendant extended its shaft, opening and developing various levels, and mining and milling the ore and minerals until at the time of the trial the shaft had been sunk to the 3900-ft. level on the incline. In developing the mine below the 1240-ft. level and in following what is claimed to be its vein or lode, the defendant company extended its levels, drifts and openings and extracted therefrom and removed ore and minerals of the value of many thousands of dollars, much of it underneath the placer lands owned by plaintiff and its predecessors in interest. The damage caused by the removal of these ores and minerals is the subject of this litigation.

On the part of the plaintiff it is claimed that the lode or vein from which these ores and minerals were taken formed no part of the so called Argonaut vein or lode, and that plaintiff is entitled to recover the value of all the ore and mineral mentioned upon either one of two grounds:

(1) Its common-law right to the ownership of all minerals lying underneath the surface of its property when not extracted from a vein having its apex within the exterior boundaries of land belonging to other persons.

(2) The plea that the ores were extracted from veins having their apices within the Muldoon quartz and Jackson quartz mines, extended downward within vertical planes of the end lines of such claims.

The defendant asserts in its defense that the orebodies mentioned were all obtained from and formed a part of the so-called Argonaut vein having its apex within the surface boundaries of the Pioneer quartz mining claim.

As to plaintiff's claim under the common-law right to ownership of the ores, the same may be eliminated from discussion, for it can be sustained only by disregarding practically all the oral testimony of the witnesses and the opinion of the experts. The real controversy in the action is waged over the location of the apex of the vein from which the minerals were extracted, that is, whether the ores were taken from veins having their apex within the surface of plaintiff's or of defendant's land.

Plaintiff's claim, under such apex right, to the ownership of the ores and minerals mentioned is based upon what it terms the Jackson vein by virtue of a union with the Muldoon gouge vein below the 950-ft. level of its mine. No continuous development of the vein has been made. It is not the discovery vein upon which the patent to the claim was issued, but developed exposures have been made upon which plaintiff has founded an interesting theory of geological movements causing the formation of the great Mother Lode, namely, that the Mother Lode fissure is a normal fault with a displacement of some 700 ft. and not an overthrust fault, as described by Ransome in the Mother Lode folio of the U. S. Geological Survey; that instead of there being one vein with branches, as claimed by defendant, and heretofore generally supposed to exist, there are a number of veins, formed at different periods of time, which by their faulting must have prevented any connection between the Pioneer vein and the vein from which the ores and minerals in controversy were extracted.

It can serve no useful purpose to enter into a discussion of the testimony of many hundred pages given by experts in support and refutation of this theory. Upon trial, the impression was strong in the mind of the court that there was great probability of the correctness of this theory. Before this court, however, will say that these men are all mistaken, upon a speculative theory as to the convulsions and workings of nature countless ages before the time of man, it will require something more than a strong opinion as to the plausibility of a theory.

The mining laws of the United States are framed upon the ideas of the practical miner as to what constitutes a lode or vein, rather than upon those of the geologist. In this case the testimony of practical miners, familiar with the conditions upon this part of the Mother Lode, is overwhelming that the Argonaut vein is continuous from the apex to the lowest level. Needless to state, all the expert witnesses for defendant concur in that testimony.

While the plaintiff in this case relies upon developed exposures only to substantiate its theory and its claim to extra-lateral rights by virtue of its apex location, it contends that continuous development by defendant in its workings has disclosed interruptions or breaks in the so called Argonaut vein which demonstrate that there is no continuity of the vein shown as required by law. This to my mind seems to be the most serious objection to the adoption by the court of the inference of these experienced and qualified mining men.

If a vein were always an ore-bearing filling of a single fissure, the difficulties encountered in this case and the wide divergence of experts' opinions would not exist. However, when it is tested by the opinions of the courts and of geologists, it does not seem that the inference drawn by the witnesses who are experienced in mining development in this district is unwarranted by the evidence, when they say that the so called Argonaut vein is continuous in its downward course through the placer lands of plaintiff, even though admittedly short interruptions in the vein are shown to exist.

It is claimed that the apex of the Jackson vein comes to the surface and is not what is known as a blind apex. A series of cuts or trenches was made, which it is claimed show the course of this apex. Every witness for defendant, practical miners and experts, is positive that nothing is disclosed in these cuts which can be called a vein. As to the witnesses for plaintiff, Mr. Perry stated that a fissure was shown in each one; that there were numerous stringers of quartz east of the fissure, irregular and running in different directions. Mr. Devereux, who has had more experience in mining upon the Mother Lode than any of the other witnesses for the plaintiff, in giving his testimony as a witness for plaintiff said that these stringers of quartz are a common occurrence in a slate country, whether near a large vein or not, and as to some he did not consider them a part of the Jackson vein.

All the witnesses for plaintiff, however, are positive that the Jackson apex is sufficiently disclosed. To me it seems difficult to understand how this vein, with its apex at the surface, should remain undiscovered until the commencement of this action, after so many years of mining activity in this county.

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The Output of Ontario Mines for the first three months of 1914 shows a total value of $9,484,299 as compared with $9,469,938 for the corresponding period of 1913. The reason for this small increase is the falling off of the silver production from Cobalt, which decreased 680,198 oz. valued at approximately $500,000. This decrease in silver was offset by the increased production of gold, copper and nickel. The following shows the value of the different minerals for the first three months of the year: Gold, $1,202,502, silver, $3,549,556; copper, $591,988; nickel, $1,446,012; iron ore, $12,928; pig iron, $2,503,450; cobalt, $8,898; oxides, $168,965; total, $9,484,299. During the period 112,826 tons of gold ore were crushed and of this amount 104,880 tons were treated in the mills at Porcupine.

Calumet and Arizona's New Smelting Works at Douglas, Ariz.

By Richard H. Vail

SYNOPSIS—Description of one of the new Arizona smelting works that replaces this company's old blast-furnace plant built in 1902. Four reverberatory furnaces now supplement two large blast furnaces. Some of the power equipment and the receiving bins of the old plant have been retained but a new bedding system, new roasting department, basic-lined converters and other modern equipment have been installed, thus making the smelting plant entirely new and uptodate.

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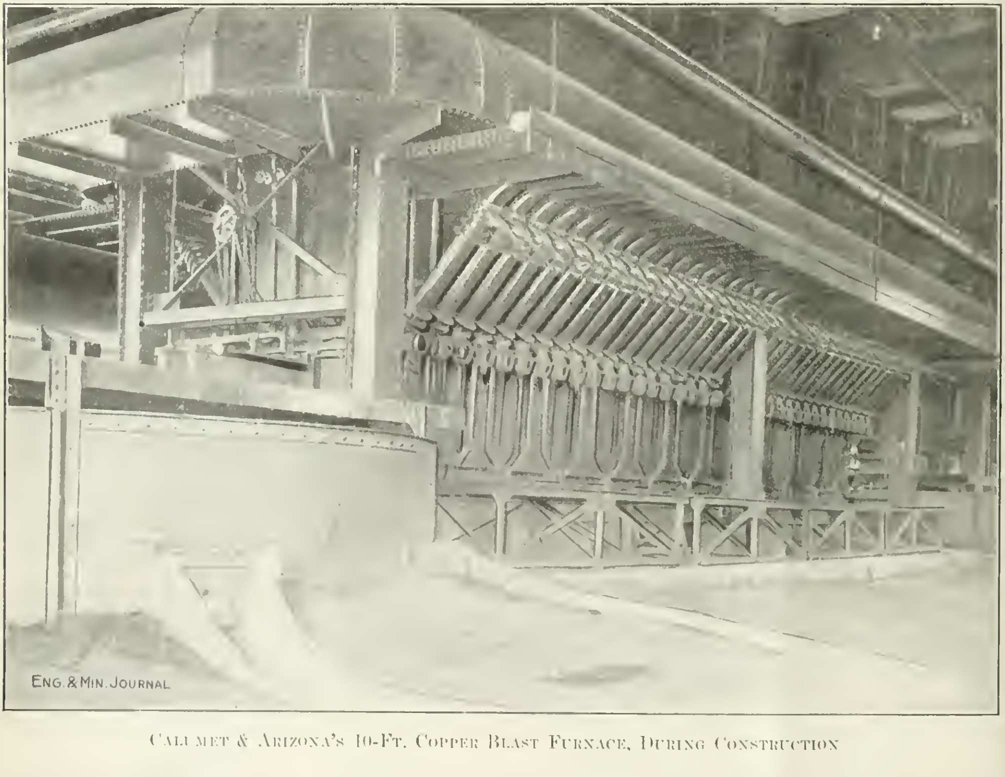
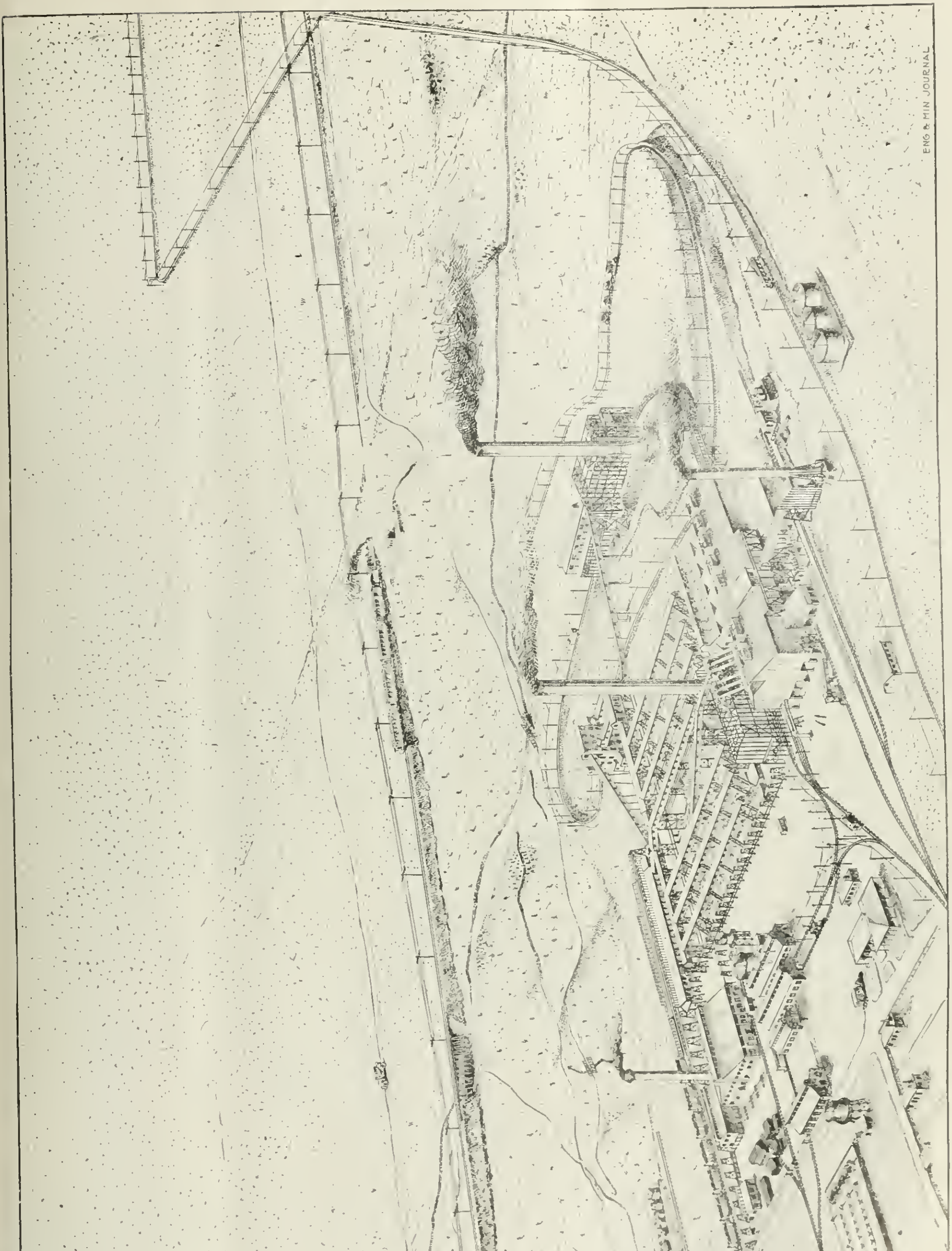
When the management of the Calumet & Arizona Mining Co. decided in 1910 that it would be necessary to build a new copper-smelting plant, a careful study was made of the several possible sites for the plant. It was finally decided to build near the site of the old plant at Douglas, Ariz., as the water development, shops, receiving bins, yard tracks and power plant were all well adapted for use in the new plant. The topography of the proposed site was not desirable, but it was made ideal in this respect by building up benches with molten slag, which was obtained from the old plant at the rate of approximately 1500 tons per day. In order to get desirable elevations for the various structures, approximately 500,000 tons of slag were used. By this method the roaster plant is on an elevation that permits the calcines to be hauled on a level track and charged into the reverberatory furnaces. The reverberatory furnaces are on an elevation that allows the matte to be tapped directly into large ladles resting upon the converter floor. The reverberatory-furnace floor is 14 ft. above the converter floor, and the calcine track 15 ft. above the reverberatory floor. The site for the bedding system, which has the same elevation as the converter-plant floor, is also a slag fill, the slag on portions of it being 16 ft. deep. The foundations for the chimneys were made of slag, the foundation bolts being held down by rails imbedded in the slag 12 ft. below the top of the foundation. Only a comparatively thin layer of concrete was used on the top of the foundation in order to make a proper surface for supporting the base rings of the stacks.



Calumet & Arizona's 10-Ft. Copper Blast Furnace, During Construction

The receiving bins belonging to the old plant were utilized in the new plant and were equipped with new chutes for feeding ore into the hoppers of the conveyor feeders. The bins have been equipped on both sides with

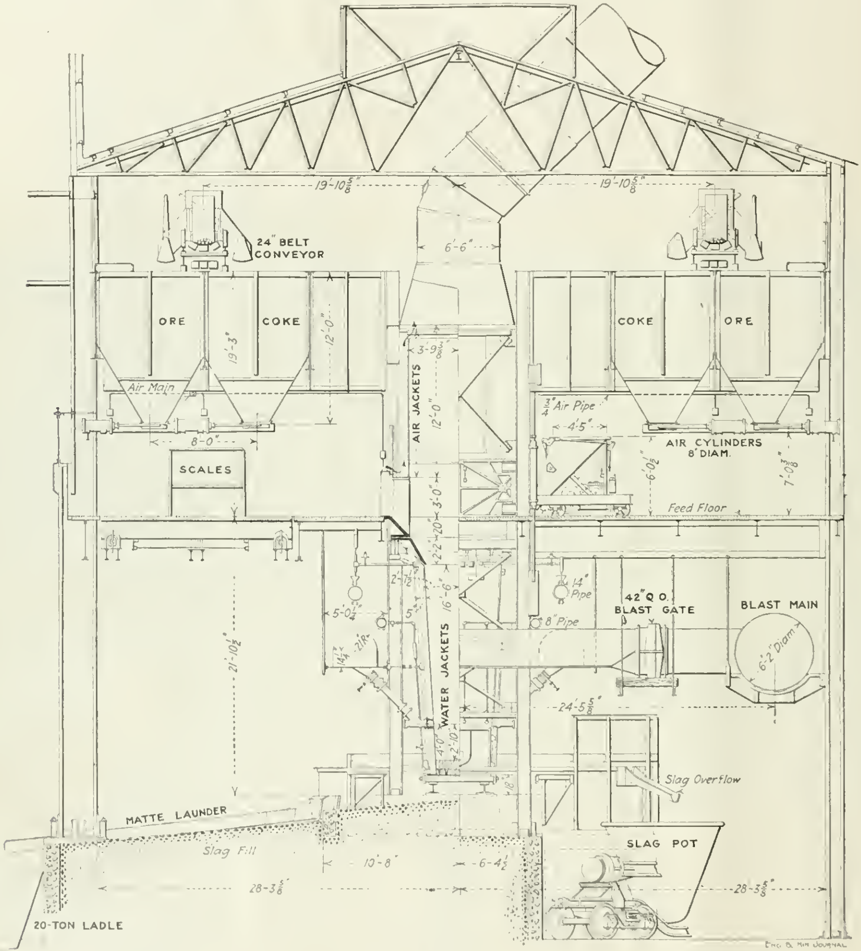


New Calumet & Arizona Smelting Works at Douglas, Ariz.

30-in. conveyors that deliver the ore into two 36x24-in. Blake-type crushers at the end of the bins. New coke-receiving bins have been installed.

Steel Sampling Mill

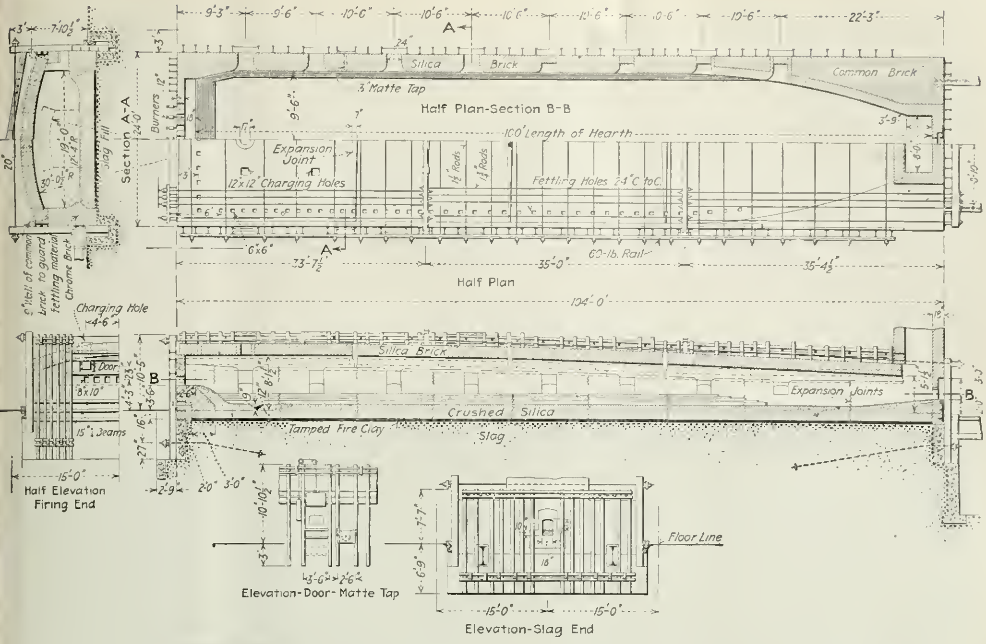
From the crushers at the end of the bins, the ore is conveyed up two inclined conveyors to the crushing and sampling plant, which has a capacity of 200 tons per hour when screening out the large sizes for the blast furnaces. The building is of steel and concrete throughout. It is 40x84 ft. in plan, and is five stories high. The mill is divided into two sections, which are run independently of each other. Each section has a crushing and sampling department. In the sampling department the ore is cut four times by Snyder automatic samplers, and a sample, weighing 1.6 or 3.2 lb., as desired, is obtained per ton of ore passing through. The plant is flexible, and ore may be crushed and screened and discharged at any desired size. Each section of the crushing plant has 54x24-in. Blake crusher, two 20x10-in. crushers, one 54x24-in. rolls, and two 14-ft. trommels. Each section of the sampling department has one 20x10-in. Blake crusher, one 36x12-in. roll, one 24x12-in. roll, one 60-in., one 42-in. and two 27-in. Snyder samplers.



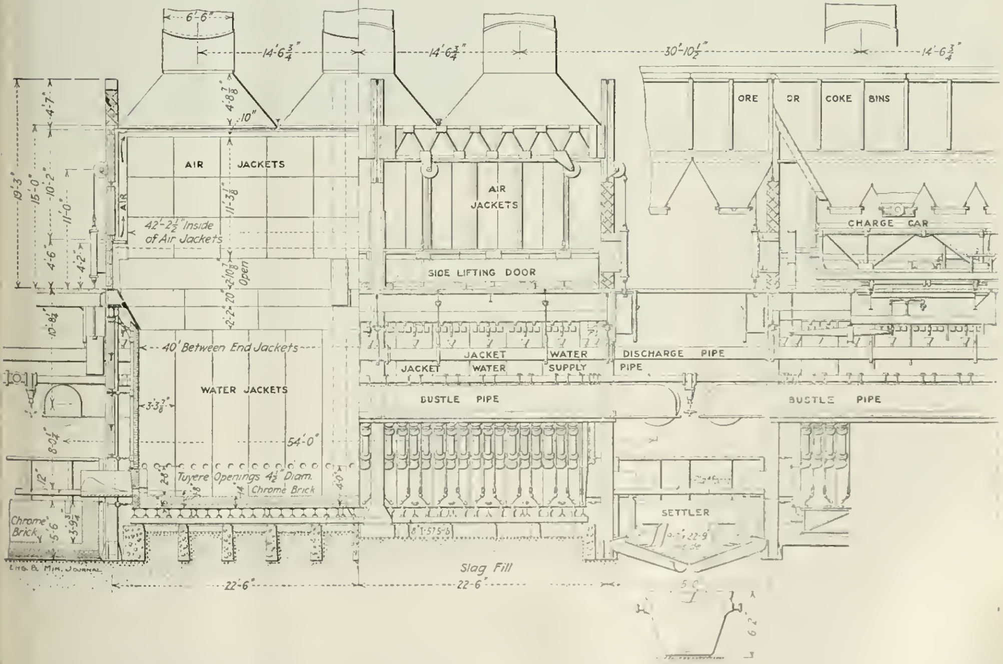
End Sectional Elevation of Calumet & Arizona 40-Ft. Copper Blast Furnace

Bedding and Conveying System

From the sampling and crushing plant the fine material passes to the fine beds and coarse material to the coarse beds. The bedding scheme is practically a duplicate of the Cananea system. Three beds for coarse and three beds for fine ore are provided, each having a capacity of 10,000 tons. A bed for coke, having a capacity of 5000 tons is also provided. Messiter reclaimers will transfer the material from the fine and coarse beds to Robins belt conveyors. The coarse ore and coke is conveyed up an incline to the ore-and-coke charge bins over the blast-furnace charge floor. The fine ore is conveyed up a similar incline to the roaster plant. The coke is



The 19x100-Ft. Reverberatory Furnace of the Calumet & Arizona Mining Co., Douglas, Ariz.



Side Elevation Section of 4x40-Ft. Copper Blast Furnace dumped from the cars into the coke-receiving bins, and from there it is conveyed to the blast-furnace charge bins or to the coke-storage bed by a belt conveyor.

The roaster plant contains twelve 21 ft. 6 in. Herreshoff air-cooled roasters, each having a capacity of approximately 80 tons of fine ore per day. The furnaces have six regular hearths, besides a top or drying hearth. A storage bin of 70 tons capacity is provided for each furnace. The roaster plant has a tile-and-steel dust chamber, 60x140x70 ft. high, equipped inside with baffles and wires. The gases from the dust chamber pass into a brick-lined steel chimney, 20 ft. inside diameter by 279 ft. high.

The main building of the new works is 222x460 ft. in plan, and it contains two blast furnaces, four reverberatory furnaces, six converters, copper-casting department, skullbreaker and other accessory equipment.

Two 40-Ft. Blast Furnaces

The blast-furnace department contains two 40-ft. furnaces, 48 in. at the tuyeres, giving a hearth area of 160 sq.ft. for each furnace. Among the features of the blast-furnace department are the method of feeding and of obtaining an accurate weight of the charge; also the design of the bustle pipe which has been combined with the girder that takes the horizontal thrust from the furnace jackets. The furnaces have an air-jacketed superstructure and three uptakes 6 ft. 6 in. in diameter; there are but two charge doors on each side operated by compressed air. Belt conveyors deliver the ore and coke to bins over the charge floor and air-operated gates discharge these materials into charge cars that rest upon platform scales. The charge cars always remain on the feed-floor level and are propelled the short distance from the scales to the furnace doors by electricity; no hand work is done in connection with the feeding, except occasional barring.

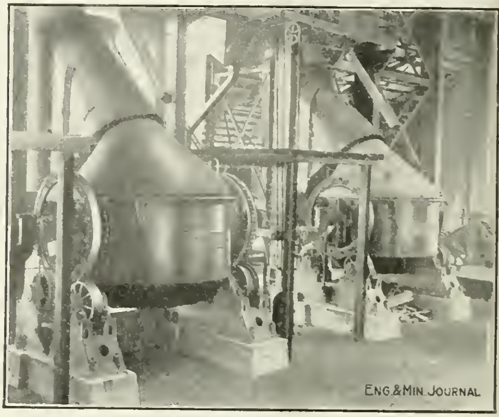
The blast furnaces have single-tier water jackets, of which there are 12 used on each side; each jacket has three 4½-in. tuyeres. The furnaces are tapped through a brick-lined trough spout, the blast being trapped by building up the front with clay. Chrome brick is used for lining the furnace bottoms and settlers. The furnace bottoms are made up on ½-in. bridge plates on which was spread a ⅝-in. layer of chrome sand; then two courses of chrome brick, one laid on the side and the other on end. A steel dust chamber, 60x100x70 ft. high, having suitable baffles and wires, receives the blast-furnace gases which then pass through an overhead flue into a brick-lined steel chimney, having a height of 305 ft. and an inside diameter of 25 ft. Gases from the reverberatory waste-heat boilers also pass into this stack.

Reverberatory Department

In the reverberatory department four reverberatory furnaces, 19x100 ft., are installed and the foundation and building for a fifth furnace is in place. Each furnace is equipped with two 712-hp. Stirling waste-heat boilers. Calcines are delivered to the reverberatory hoppers by cars running on overhead tracks. Matte is tapped into 20-ton pots and transferred by cranes to the converters. The slag is skimmed directly into 25-ton electrically tilted slag pots running on tracks underneath and just in front of the skimming end of the furnaces. The reverberatory furnaces are built on a slag block on which a 4-in. layer of fireclay was first put down, then 21 in. of silica. The details of the reverberatory-furnace construction are shown in an accompanying engraving. One of the newer features is the 9-in. wall of common brick along the top of the furnace side walls to prevent fettling material from dropping off the roof. At the skimming end of the furnaces, care has been taken to make the skimming operation as comfortable for the skimmer as possible by placing the header flue well above his head and setting the boilers back from the furnace. One of the features in the boiler settings of this department consists in reversing the usual baffling for Stirling boilers and allowing the gases to pass in at the top of the boiler instead of at the bottom as has been done heretofore.

Cranes Not Required for Feeding Converter Flux

The main converter aisle is 55 ft. wide and two 40-ton electric traveling cranes are installed. Stands for six 12-ft. Great Falls type converters, built by the Allis-Chalmers Manufacturing Co., are installed. An independent flue, dust chamber and chimney are provided for the converter department. The dust chamber is 40x60x50 ft. high, and the stack is 16 ft. in diameter by 200 ft. high. The balloon flue connecting the header flue just back of the converters with the dust chamber is 15 ft. in diameter. It serves to collect most of the dust. The molten converter slag is poured back into the reverberatory furnaces by the cranes. The slag skulls are broken in the McGregor skull-breaking equipment, described in the Journal of Apr. 11. The converter copper is poured into two straight-line copper-casting machines.



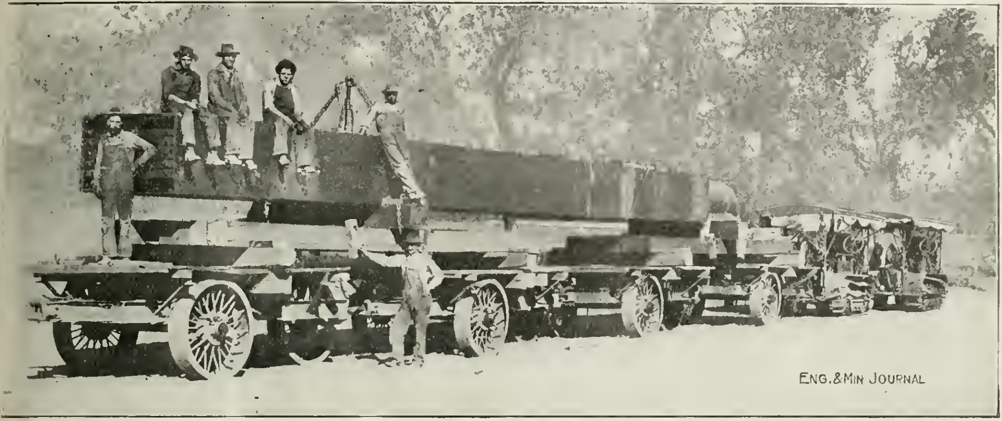
C. & A. Converters with Overhead Silica Bins and Feeding Arrangement

One of the features of the converter plant is the method of charging the siliceous material into the converters. Bins have been provided over the converter smoke boxes, which are equipped with weighing hoppers and chutes, permitting weighed or measured quantities of siliceous material to be charged directly into the converters. The bins are charged with the siliceous ore by means of conveyors leading from the blast-furnace inclined conveyor, across the converter aisle.

Water and Oil System

A new water tank having a capacity of 200,000 gal. as been installed for the blast-furnace water-jacket sup-ly. Approximately 2000 gal. of jacket water are cir-ulated per minute for the two blast furnaces. Two ray cooling systems are installed, one for the power-ouse condenser water and the other for the blast-fur-ace jacket water. Three 10,000-bbl. steel oil tanks and ight 111-bbl. auxiliary oil tanks with the necessary umps, heaters, etc., have been installed for furnishing e reverberatory oil supply.

The works is equipped with weighers and scales hroughout, so that accurate metallurgical records can be ade, and the results carefully watched. Dr. L. D. Rick-tts was consulting engineer for the new plant, which was esigned by Repath & McGregor, of Douglas. The melting works is under the general direction of John . Greenway, general manager of the Calumet & Arizona Mining Co.; J. Owen Ambler is metallurgist and H. A. Clark is smelter superintendent.



Tandem Caterpillar Engines Hauling Dredging Spud

Copper Roofing for Dust Chambers and Flues

For some years a number of men prominent in smelting work have held the opinion that copper would make a lasting covering for dust chambers, flues, converter buildings, etc. It will be of interest to many to know that in the Calumet & Arizona Mining Co.'s plant, copper was used for covering the roaster dust chamber, the blast-furnace dust chamber and the reverberatory flue. The copper covering, contrary to expectations, has been rapidly corroded on the underside, and is now being replaced in the dust chambers and flues at this plant. At this writing the cause is not definitely known. At one works where copper roofing was tried, the corroded copper upon examination showed the presence of soluble iron sulphates; these probably brought about the destruction of the copper sheets through well known reactions for which the necessary elements are contained in the flue dust and gases.

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A rich deposit of phosphate has been discovered in the valley of the Huasco River, about 300 miles from Valparaiso, Chile. Government engineers are preparing to report thereon.

Caterpillar Engines for Hauling Heavy Machinery

By Lewis H. Eddy*

The economy and efficiency of caterpillar-type engines for hauling heavy machinery was satisfactorily demonstrated during the construction of Yuba No. 14 dredge in 1913 at Hammonton, Calif. For the largest and heaviest pieces used in the construction of the dredge, two caterpillar-type engines of the Holt manufacture were employed, as shown by the accompanying illustration, which shows the hauling of a steel spud. These spuds weigh 80,000 lb. each, and are 62 ft. long. It required the use of four 3-wheel trucks, hitched tandem to carry each spud. The illustration gives an idea of the method of building up timber beds on the trucks carrying the spuds, so that the train of two caterpillars and four wagons loaded with one piece of great length, may be driven, when necessary, as in this case, around short turns of the road.

For the hauling of ordinary pieces the larger of the two caterpillars was used alone, and two wagons or trucks were commonly used. For hauling a number of small pieces, from four to eight wagons were used. The caterpillar engine is 65 hp. with a speed of 2¼ miles per hour loaded and 4¼ miles per hour empty. The general dimensions of this caterpillar are: Length over all, 18 ft.; width, 9 ft.; height, 11 ft. The machine is built with two caterpillar tracks and a single forward steering wheel. The tracks are made up each of 22 links, 10 in. long and 20 in. wide. These tracks measure 220 in. around the inside. They are provided with 22-in. sprockets, 10-in. rolls and manganese pins, 2 in. in diameter. In this machine an exact sprocket was not used; the projections were too far apart, which caused a flat wear on the pin rolls. The exact sprocket would act on the pins to a gradual contact that would greatly lessen the wear and increase the efficiency. The error in sprocket construction, which has been positively demonstrated by this character of haulage, may be easily remedied. This was one of the earlier engines of this type and much improvement has been made in many respects in the later manufacture.

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*Associate editor, "Engineering and Mining Journal," San Francisco, Calif.

The wagons or trucks are two lengths, 12 ft. and 14 ft., and each has 3 wheels, the two hind wheels carrying the greater part of the load, the forward wheel carrying a share of the load and being used for steering. The wheels are 50 in. high. The rim or tire of the wheel is made of bent-channel iron, 1-in. thick. The wheel spokes are of 7/8-in. steel rods countersunk through the rim and bolted to the hub. The wheels are held in place by a 2-in. pin through the axle at the hub. The hind axle is 4 in. in diameter; the front axle is 7 in. in diameter at the center, tapering to 4 in. at the outer ends; the center pin is 7 in. long, 2½ in. in diameter. There is a 12-in. bearing inside the hub of the forward wheel, this bearing acting as a turntable for the hub.

The body of the wagon is a wooden platform of eight planks, 1½x10 in. by 13 ft., laid on a frame supported by steel brackets. For the heavier pieces of machinery like those shown in the photographs, a bed consisting of timbers is constructed. Two pieces of 4x7-in. timbers are set lengthwise of the wagon on top of the platform, one on either side. Two pieces of 7x7-in. timber are laid close together across the center of the wagon and resting on the lengthwise timbers. When two wagons are coupled together a bed of six timbers 12x12-in. by 24-ft., and clamped together, is laid lengthwise on the two wagons. This timber bed rests on two bolsters made of 14x16-in. by 10-ft. timbers. One of these bolsters is placed across the center of each wagon. The king-bolt, 1½-in. diameter, passes through the timber bed and bolster and on through the joint of the two cross timbers. Thus two of the double wagons may be coupled together and a long heavy piece of steel material loaded so as to rest on two cross timbers, one under either end, as shown in the photographs of the loaded spuds.

The materials hauled were delivered by the Western Pacific Ry. on a spur track, two miles south of Marysville, and were transferred from the cars to the wagons by the use of two hand-derricks. In handling the spuds the use of the derricks was largely dispensed with. The spuds were turned over chiefly by hand and skidded on to the wagons. The unloading of the spuds at the construction camp was done with derricks operated by electric motors. Timber cribbing was built to nearly the height of the wagons and the wagons driven alongside. Then the spud was lifted with the derricks, one end at a time, from the wagons to the cribbing in such position as to be readily placed on the dredge.

This hauling was done under contract by R. N. Anderson, of Oroville, using his own caterpillar engine and eight wagons for most of the hauling and using an extra engine belonging to the Yuba Consolidated Gold Fields when necessary for handling the larger pieces. Since this hauling was done, the Yuba Construction Co. at Marysville, has established the manufacture of the caterpillar-type engine.

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Fluorspar in 1913

The fluorspar production of the United States in 1913 was the second largest in the history of the industry, the year 1912 having been a record-breaker. The quantity of domestic fluorspar reported to the U. S. Geological Survey as marketed in 1913, was 115,580 tons, compared with 116,545 short tons in 1912. Fluorspar was produced in 1913 in six states—Illinois, Kentucky, Nev Mexico, Colorado, New Hampshire, and Arizona—in th order named.

About 80% of the domestic output of fluorspar is consumed as a flux in basic open hearth steel furnaces. It i used also as a flux in blast furnaces, iron foundries, an silver, copper and lead smelters; in the manufacture o fluorides of iron and manganese for steel fluxing; i the manufacture of glass, enameled and sanitary war and of hydrofluoric acid; in the production of aluminum; and for many other purposes.

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The Old-Metal Association

By Sali B. Moers*

The enormous strides made in the old-metal trad parallel, if not surpass, those of many other large industries within the last 25 years, and that once despise pigmy has now become a giant. During these years of development the old-metal trade was left to take care of itself. There was no harmony, no union, no establishe system of practice, of rules and regulation. If the meta dealer had a grievance he had to fight it out by himsel and for himself. There was no association to appeal to to take it up and fight it out. With all this handicap the business thrived and prospered and enlarged by leap and bounds, until today it has become a recognized power It is, therefore, not to be wondered at, that an association should have been organized, for the systematizing of the business by adopting standards, and a classificatio of old metals that will have to become recognized all ove the country, also to uplift the business, with a view to mor correct methods of trade, to correct abuses and to conside grievances of any character relating to the metal trade and to organize in the near future an Old-Metal Exchange, where dealers from all over the country, on becoming members of the association, may do business and make acquaintances, both business and social. To carr out the foregoing there was organized an association, as a section of the National Association of Waste Material Dealers, relating exclusively to metals, and known as the Metal Section. This section was organized at the Hotel Astor several months ago, and has had since two successful meetings. Its officers are those of the paternal organization, most of whose members are more or less interested in the metal trade, but the specific business of the Section is in the hands of committees appointed from the membership of the Metal Section. The association is on lines now existent in Germany, where 86 of the largest metal dealers have joined the association, and it has become s influential that we understand their laws, rules, etc., after being in practice two years, became part of the law of the Empire, in matters of dispute pertaining to this business. The association was honored at its last meeting at the Hotel Astor by the presence of N. Levy, the president and organizer of the Old Metal Association of Berlin, Germany, who favored the association with an address. All signs bespeak a splendid progress for the organization.

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A Cement Factory with a Capacity of 150,000 bbl. Yearly is under construction at Binangonan, in the province of Laguna, in the Philippines. Limestone and other materials will be delivered by cableway into the bins at the plant The machinery will be driven by electricity furnished from a central power plant. The cement can be shipped to Manila by water. It is expected that the plant will be completed by December next.

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*Metal merchant, 183 South St., New York.

Retorting Cyanide Precipitate

By G. Howell Clevenger*

SYNOPSIS—To recover zinc from precipitate in a form suitable for further use as precipitant, the apparatus must be air tight, and products of combustion must not come into contact with precipitate. The scheme is feasible and economical when properly designed apparatus is properly used. To be profitable, only those precipitates containing much zinc can be so handled. Faber du Faur furnace with de Saulles-Convers condenser is recommended.

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Mr. Megraw's[1] proposal to remove zinc from cyanide precipitate by distillation and recover it in a form available for use again in precipitation, is of particular interest to me as I had occasion some time ago thoroughly to investigate this possibility.

It would not be feasible to use any furnace in which the products of combustion come in contact with the charge for this purpose, for the reason that it would be impossible to prevent oxidation of the zinc vapor. Under this condition the losses of gold and silver would be high, and this could not be ignored, for the zinc dust would be largely zinc oxide and could not be used as a precipitant.

This system of eliminating zinc has been proved feasible when the precipitate is contained in a closed graphite retort or crucible, connected with a suitable condenser. In this connection it is well to bear in mind that the zinc metallurgists have pretty thoroughly threshed out the problem of recovering zinc, and as a result, they still adhere to the retort furnace in which the ore undergoing reduction is heated in small, closed retorts out of contact with the products of combustion.

The removal of zinc by distillation from cyanide precipitate was first proposed by Sulman and Teed[2], and actually applied by them prior to 1897, in connection with their bromo-cyanide process as practiced at Deloro, Canada. In this connection Pickard determined that the loss of gold when heated in the presence of zinc is largely due to oxidation. He pointed out that when zinc and gold are heated together in a muffle furnace or a retort with air freely passing through, the loss of gold is serious. In retorting, he states that the loss of gold appears to be largely a function of the amount of oxygen which enters the retort. However, when the retort is closed and carbon is present, and there is a continuous flow of zinc vapor without the formation of zinc oxide, the loss of gold is small. In retorting precipitate, he found that even after this chemical cause for the loss of gold was eliminated, there was still a mechanical loss, due to the formation of miniature geysers and explosions throughout the finely divided precipitate by reason of the rapid evolution of zinc vapor, which projected particles of precipitate out of the retort. It was found that mechanical loss could be overcome by mixing the precipitate with a soluble carbonaceous substance as gum, flour, starch, sugar or molasses. In the work which is recorded, sugar with a small amount of borax was used as a binding agent and a source of carbon. The sugar and borax were added to and mixed with the wet precipitate and after drying, the bone-dry cake was broken into pieces about the size of a walnut and charged into a large graphite retort heated in a Faber du Faur furnace. Upon heating the mixture, there resulted an open, spongy mass, which served to hold the precipitate together, but was sufficiently porous to provide a free passage for the zinc vapor.

The following is an example of the charge retorted at Deloro: Precipitate, 55 lb. (containing 70 oz. of gold); sugar, 12½ lb., and borax, 1 lb. The coal required for retorting a charge was about 300 lb., and the total time of the operation about 10 hr. The ingot cast directly from the retort contained 64 oz. of the 70 oz. of gold originally present in the precipitate; the remaining 6 oz. of gold being in the slag produced. One melt in a No. 33 crucible recovered this remaining 6 oz. of gold. The condensed vapor from the retort contained constantly about 1 oz. of gold per ton, regardless of the grade of precipitate retorted. The fineness of the bullion in this case ranged from 750 to 820. No mention is made of the proportion of zinc remaining in the bullion at the end of the operation. Apparently no attempt was made to recover it in a form which could be used again in precipitation.

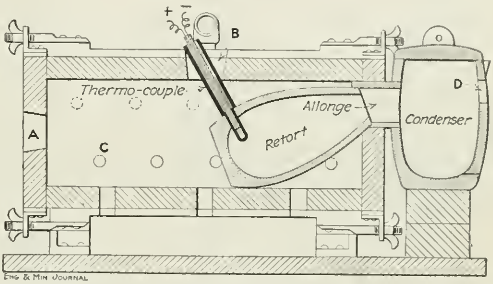

FIG. 1. TRANSVERSE SECTION OF FURNACE AND EQUIPMENT USED FOR DISTILLATION EXPERIMENT

Magenau[3] gives an account of an attempt which was made at Mercur, Utah, prior to 1900, to remove zinc by mixing the precipitate with charcoal and lead and retorting in a Faber du Faur furnace. It was proposed to recover the gold and silver from the lead by cupellation. The reasons given for the failure of this experiment were the impossibility of reducing the large proportion of zinc oxide present with the temperature it was possible to attain with the equipment used, and the persistent retention of combined water by the precipitate, which caused explosions in the retort. There were also said to be minor mechanical difficulties which arose.

In 1902 I carried on a series of experiments in the metallurgical laboratory of Columbia University with a view of ascertaining whether it was feasible to remove zinc from cyanide precipitate and condense it in a form available for reuse in precipitation by distillation. Careful consideration seemed to indicate that the difficulties encountered in the Mercur experiments were due to insufficient heat. The incomplete reduction of zinc oxide was doubtless largely due to the fact that there was not sufficient carbon present. The explosions attributed to combined water were most probably due to the formation of a crust on top of the charge, due to lack of heat, as it has been pointed out in connection with the retorting of the zinc crusts in the Parkes process that it is necessary to maintain the temperature well above the boiling point of zinc until distillation is completed, otherwise crusts form and explosions occur.[5]

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[1] "The Treatment of Cyanide Precipitates." Herbert A. Megraw. "Eng. and Min. Journ.," Vol. 97, p. 612.

[2] "The Sulman-Teed (Bromo-Cyanide) Process of Gold Extraction." H. Livingstone Sulman and Frank L. Teed. "Jour. Soc. of Chem. Ind.," Vol. 16, pp. 966, 967.

[3] "Some Observations on Practice of the Cyanide Process at Mercur, Utah." Wm. Magenau. "Min. and Sci. Press," Vol. 80, 192

[4] "The Refining of the Precipitates Obtained by Means of Zinc in the Cyanide Process of Gold and Silver Extraction." G. Howell Clevenger. "Trans." Amer. Inst. Min. Eng., Vol. **33**, pp. 908, 917.

The precipitate used in making these experiments was the result of zinc shaving precipitation and showed the following composition:

ANALYSIS OF PRECIPITATE

Element	Per Cent.	Remarks
Gold	16.639	
Silver	23.166	
Iron	0.170	
Aluminum	0.800	
Calcium	6.680	
Magnesium	0.070	
Zinc (as metal)	14.510	Determined by $Fe_2(SO_4)_3$ method; likely high
Zinc (as oxide	18.060	
Lead	0.730	
Arsenic	......	
Antimony	......	
Mercury	......	
Cadmium	Trace	
Copper	0.870	
Manganese	0.100	
Silica	1.760	
Sulphur	0.210	
Carbon dioxide	3.770	
Moisture	......	
By difference cyanide, oxygen alkalies and matter not determined	12.465	
Total	100.000	

The distillations were made in a small graphite retort, the counterpart upon a small scale of those used for retorting the zinc crusts in the Parkes process. The retort was heated in a cylindrical gas-fired furnace. A No. 100 graphite crucible connected to the retort by a section sawed from a small crucible, which acted as an allonge, served as a condenser. A section of the apparatus is shown in Fig. 1.

A mixture of 300 grams of precipitate with 500 grams of test lead and 50 grams of charcoal was placed in the graphite retort, and heated slowly in the gas furnace for 1 hr., until all moisture was expelled. The temperature was then raised and the heating continued for 5 hr. The weight of zinc recovered from the condenser was 74 grams, or 85% of the zinc present. The condensed zinc contained, by assay, 7.2 oz. of silver and 0.8 oz. of gold per ton. This experiment established the fact that zinc could be expelled by distillation without explosions, and in fact more completely than by acid treatment. It also established the fact that volatilization losses were small, and in view of the fact that it was proposed to condense the zinc in the form of a dust available for use again in precipitation, they would be of no moment.

Another mixture of 400 grams of precipitate, 100 grams of charcoal, and 100 grams of granulated lead was retorted as before. In this experiment a thermo-couple was introduced into the retort as shown in Fig. 1. Temperature measurements were taken at 15-min. intervals, as noted in Table I. In this experiment there was a smaller loss of gold and silver by volatilization th was noted in experiment I.

TABLE I. TEMPERATURE RECORD

Time	Temperature, Degrees C.	Remarks
10:30	22	Time of starting
10:45	159	
11:00	450	
11:15	671	First signs of zinc
11:30	874	
11:45	1011	
12:00	1100	
12:15	1125	
12:30	1206	
12:45	1269	
1:00	1287	
1:15	1310	
1:30	1310	
1:45	1362	
2:00	1382	
2:15	1400	
2:30	1414	
2:45	1420	
3:00	1382	
3:15	1400	
4:00	1414	
4:15	....	No temperature taken the last two points
4:30	....	

A third 200-gram sample of precipitate was mixed wit 200 grams of test lead, and 50 grams of charcoal and r torted. Temperature readings were taken as before 15-min. intervals. A sample of the contents of the r tort was removed every half-hour, and zinc determine The record of this test is given in Table II:

TABLE II. RECORD OF RETORTING

Time	Temp. Degrees C.	Per Cent. of Zinc in Charge	Per Cent. of Zinc Expelled	Remarks
11:15	20	11.58	0.0	First zinc appeare at 671° C.
11:30	498	.....	....	
11:45	866	10.51	9.2	
12:00	1055	.....	....	
12:15	1055	9.72	16.1	
12:30	1119	.....	....	
12:45	1166	6.95	40.0	
1:00	1185	.....	....	
1:15	1197	4.41	61.9	
1:30	1204	.....	....	
1:45	1206	1.48	87.2	
2:00	1210	.....	....	
2:15	1210	1.82	84.2	
2:30	1250	.....	....	
2:45	1225	0.53	95.4	
3:00	1265	.....	....	
3:15	1275	0.38	96.7	
3:30	1284	.....	....	
3:45	1284	0.19	98.3	
4:00	1281	.....	....	
4:15	1281	0.10	99.1	

Another 150-gram sample of precipitate was mixe with 40 grams of charcoal. No lead was added. In thi experiment temperature measurements were made and sample for the determination of zinc was removed at 15 min. intervals. The record of this test is given i Table III:

TABLE III. RETORTING RECORD

Time	Temp. Degrees C.	Per Cent. of Zinc in Charge	Per Cent. of Zinc Expelled	Remarks
1:00	22	24.50	0.0	
1:15	820	24.28	1.0	First zinc appeare at 750° C.
1:30	1015	23.90	2.4	
1:45	1134	28.67	3.1	
2:00	1168	17.77	27.4	
2:15	1194	5.41	77.9	
2:30	1194	4 98	79.6	
2:45	1209	4.50	81.6	
3:00	1214	2.40	90.2	
3:15	1209	1.72	92.9	
3:30	1204	1.92	92.2	
3:45	1221	2.10	90.2	
4.00	1229	1.00	95.9	
4:15	1239	0.68	97.2	
4:30	1264	0.68	97.2	
4.45	1274	0.62	97.1	
5:00	1261	0.43	98 2	
5:15	1290	0.38	98.4	
5:30	1274	0.38	98.4	
1:45	1280	0.19	99.2	
6:00	1296	0.10	99.6	

A fifth mixture was of 95 grams of precipitate with 9 grams of borax glass, 25 grams of soda, 30 grams of sil ica, and 400 grams of test lead. It was retorted unde the same conditions as obtained in the previous experi ments. Temperature measurements were not taken in this experiment on account of the difficulty of protecting the thermo-couple. The object of the experiment was to determine whether a fusible slag could be formed from which the lead would completely separate, but although there was a large excess of fluxes used, the material came out of the retort as a sintered mass. This was probably due to the large excess of charcoal in the charge. The residues after distillation showed 0.14% of zinc. The condensed zinc contained 3.86 oz. of gold, and 35.8 oz. of silver per ton. About the same temperature was maintained as in the fourth experiment. Apparently the presence of the fluxes caused a higher volatilization of gold and silver.

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[5] "Metallurgy of Lead." 6th Ed., p. 490. H. O. Hofman.

The retorting of cyanide precipitate, while resembling the practice of retorting the gold-silver-zinc alloys obtained in the Parkes process is different in that a larger proportion of charcoal is necessary by reason of the higher percentage of zinc oxide and carbon dioxide generally occurring in precipitate. In both cases the best results are obtained by raising the heat to the proper temperature at once and maintaining it at this point throughout the distillation. The time required for almost total expulsion of zinc upon a small scale was found to be four to five hours. About 90% of the zinc was removed in the first 2½ hours, and at a temperature not much exceeding 1200° C. To remove the remaining zinc required from 1½ to 2½ hours, and a somewhat higher temperature. It seems desirable to heat the material at the last to about 1300° C. in order to remove the last zinc. This operation seems to be somewhat analogous to the removal of mercury from amalgams by retorting; thus the most of the mercury is removed at a comparatively low temperature while the last requires a high temperature; in fact, so high that mercury is not entirely eliminated, even when the retort sponge is melted. It will be noted that the volatilization of gold and silver is not excessive, and in view of the fact that the zinc can be reused in precipitation it is of no moment. Indeed, it would appear that the presence of a small proportion of gold and silver in the zinc dust would tend to render it more active as a precipitant. In the course of these experiments it was not possible to determine the exact conditions required to cause the zinc vapor to condense as zinc dust free from oxide. It was, however, noted that when the condenser was cool and the zinc vapor was largely diluted with carbon monoxide, it readily condensed as dust fairly free from the oxide. A sample of this zinc dust showed 97.1% of metallic zinc. Later, as the zinc vapor became less diluted with carbon-monoxide, and the condenser became hotter, a portion of the zinc condensed as a liquid bath and the remainder as zinc dust, which in its highly heated condition rapidly oxidized to zinc oxide through the admission of air to the condenser. It might be mentioned that the condenser used was not air tight.

The proper conditions for the formation of zinc dust seem to be that the vapor be diluted with some inert gas, such as carbon monoxide, which, of course, is always present if the proper amount of carbon has been used, and that condensation take place below the melting point of zinc, without access of air.

Shortly after the publication of the account of this work, A. B. de Saulles,[6] of the New Jersey Zinc Co., called my attention to U. S. Patent No. 695,376, which had been granted to G. G. Convers and himself, Mar. 11, 1902, for a condenser to be used in connection with the ordinary zinc-distillation furnace which was designed to condense the whole of the zinc vapor as zinc dust.[7]

It is apparent that this type of condenser could be readily used in conjunction with the Faber du Faur retort furnace for retorting precipitate and practically the whole of the zinc vapor condensed in the form of zinc dust, which would be suitable for use as a precipitant. In Fig. 2, I have shown this form of condenser attached to an oil-fired Faber du Faur furnace, such as are used at Perth Amboy.[8]

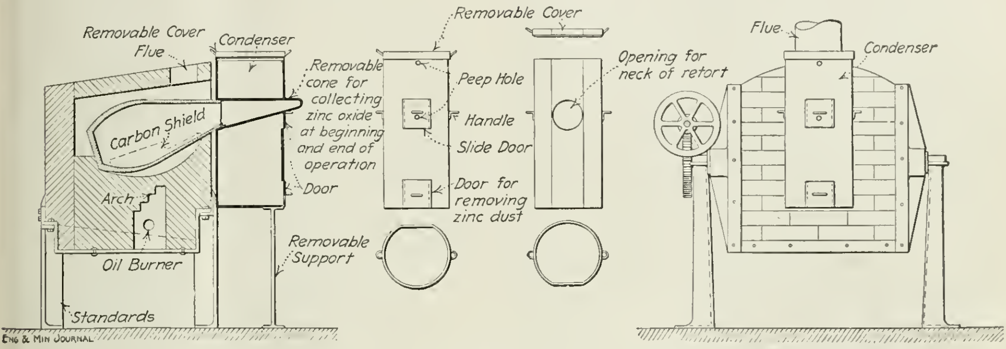

Fig. 2. Proposed Arrangement of Oil-Fired Faber du Faur Furnace and Condenser

Convers and de Saulles[9] give the following conditions as being necessary for the condensation of the whole of the zinc vapor as zinc dust: The zinc vapor should pass at once into a collecting chamber sufficiently large to receive it, and care should be taken that the pipe or connection through which the vapor is discharged into the condenser shall be always above the boiling point of zinc.

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[6] Personal communication in 1903.

[7] Generally, in retorting of zinc ores, the aim is to condense as high a percentage of the zinc as possible in the molten condition, which, when cast into slabs, is known on the market as spelter. Zinc dust, which is now largely used for precipitating cyanide solutions, is a byproduct, which results from the condensation of zinc vapor, which escapes from the spelter condensers, or is not in proper physical condition for condensation to spelter, in flue chambers beyond the spelter condensers. It appears that this source of supply has generally satisfied the market, although a more regular grade of zinc dust would result if more attention were paid to its special production.

[8] "Drawing of Oil-Fired Faber du Faur Furnace." "Eng and Min. Journ.," Vol. 83, p. 84. Drawing U. S. Patent 695,376.

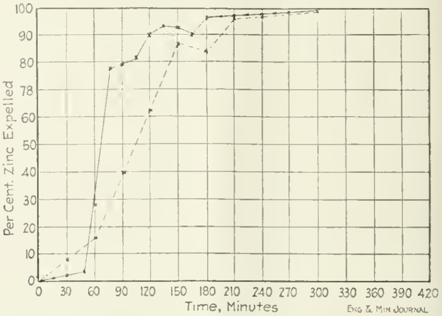
[9] Specification U. S. Patent 695,376.

At the beginning of the operation when the retort contains a quantity of air, and at the end of the operation when the charge contains a small proportion of zinc, more or less zinc oxide is produced. This is taken off separately by means of the removable cone indicated in the drawing of the condenser. When the zinc oxide ceases to deposit, this cone is removed through a door on the side of the condenser, and the zinc dust allowed to collect in the main body of the condenser. Toward the end of the operation, when the zinc oxide again begins to form, the cone is introduced a second time. In this way the zinc oxide is kept separate from the unoxidized zinc dust collected in the main body of the condenser. This condenser, due to simplicity, and apparent effectiveness, should leave little to be desired in this direction. Doubtless careful experimentation would be necessary in the beginning in order to determine the size of condenser and other minor details of equipment necessary for any particular case.

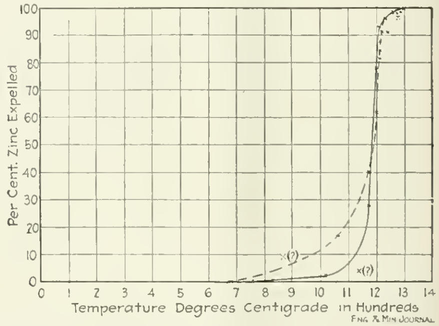
The particular sample of precipitate upon which my experiments were made presented the same general appearance at the end of retorting that the mixture did at the beginning, but upon close examination it was found that the gold and silver had taken the form of fine shot, with generally several large masses of bullion, especially if lead was used, as it considerably increased the bulk of the metal. When hot, this mass could be poured from the retort like so much sand, there being no tendency to stick. It was found that the retort could be easily washed or cleaned by adding metallic lead while it was still hot, and shaking. This lead was added to the main mass of precipitate before cupeling.

The practice at Deloro of retorting without lead and pouring the bullion direct from the retort would not appeal to be feasible in cases where it was necessary to add much charcoal. Regardless of the proportion of carbon or lead used, the residues after addition of copper fluxes could be readily melted in the blast furnace or cupeling furnace. Briquetting would doubtless be desirable, but on account of the change in the physical condition of the gold and silver, perhaps not so essential as where retorting was not practiced. Retorts would have a longer life if fluxes were not added at this stage.

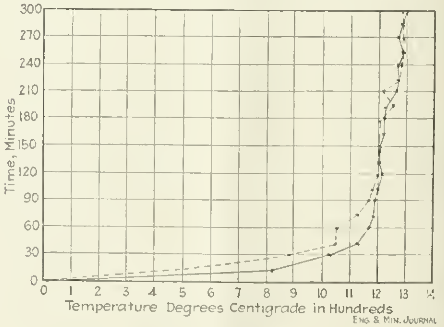
As a result of my investigation I was convinced that this method of eliminating zinc and converting it into a form available for precipitation was entirely feasible and could be readily applied by using the ordinary Faber du Faur furnace fitted with the Convers and de Saulles condenser. I have never had the opportunity of trying this method upon a large scale, and so far as I know, no one else has given it a trial with proper equipment. Retorting appears to be more attractive since the general introduction of crude oil as a fuel, as the intense heat necessary for successful operation can be more readily obtained with an oil burner than with coal. The amount of attention necessary with oil would be a minimum. In my opinion retorting would not be advantageous, in fact, unnecessary, except in cases where successful precipitation necessitates the use of a considerable excess of zinc, and as a consequence the formation of a precipitate containing a high percentage of zinc. In the case of precipitate resulting from the treatment of silver ores, or from silver-gold ores, in which silver predominates, it has been found possible with proper manipulation to obtain precipitate containing a surprisingly small proportion of zinc, and upon which the practice of any method for the removal of zinc would be superfluous. On the other hand, in precipitating low-grade gold solutions a considerable excess of zinc is essential, and as a result the precipitate contains much zinc which should be removed before melting. In present practice the zinc is dissolved by acid; at best a disagreeable operation, and one in which the zinc is lost. In such cases retorting seems to be a promising possibility. Retorting should not be attempted unless the proper equipment is provided. Makeshift experiments in crucibles, without provision for obtaining the high temperature necessary, are certain to be disappointing.



Effect of Time on Zinc Expulsion. With Lead, Dotted Line; without, Full Line



Effect of Temperature on Zinc Expulsion. With Lead, Dotted Line; without, Full Line



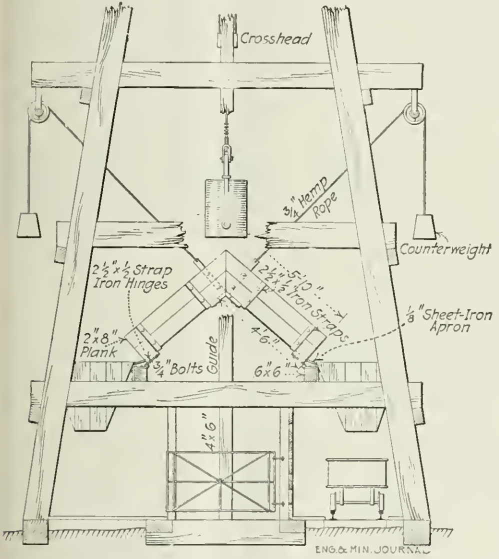
Rate of Heating

Details of Practical Mining

Shaft Cover and Chute for Sinking

By W. H. Jobe[*]

The arrangement here illustrated, taken from my annual report for 1912-13, is one devised for the Armenia mine, near Crystal Falls. A cover over the hoisting compartment consists of two chutes opening outward; it resembles a roof when in position. The bucket is hoisted above the cover, which is then closed by pulling the counterweight rope; the bucket is dumped to one side or the other and the contents slide down in the chute cover to a hopper over a waiting car. The covers are opened by pulling the counterweight rope in the opposite direction and the bucket is lowered. The details of construction are shown in the drawing. The cover is made of 2-in. plank and lined with $1/8$-in. sheet iron.



Combination Cover to Catch Contents of Bucket

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Reversal of Air Current in Mine Fires[†]

Reversal of air current during a mine fire will cause the smoke and gases to seek escape through the opening that was previously the downcast. If men are escaping through such an opening, they may be overcome by the gases. If we assume that there is a fire in one of two or more shafts, all connected underground, the shaft in which the fire exists will upcast. Water played upon the fire, or into the shaft, will likely cause the current to reverse. Obviously, then, it is not safe to throw water on the fire until it is certain that all of the men are out of the mine. If, however, tight ventilation doors or fire doors are provided, they may be closed as the men leave the fire zone and the men will then be in no danger from smoke or gas. The doors will serve the further purpose of shutting off the supply of air from the fire and thus aid in extinguishing it. The danger from this source is a fact; witness the Belmont and Giroux fires a few years ago.

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Gopher-Hole Blast at Chino[*]

At the Chino mine in New Mexico, the benches are usually blasted by a combination of vertical churn-drill holes and approximately horizontal machine-drill lifters or "toe holes." At one cut, because of trouble encountered in chambering the churn-drill holes and because of danger to the steam shovel, it was decided to try a mammoth blast using gopher holes, largely as an experiment. The bench was 300 to 400 ft. long with an abrupt rise of 75 to 100 ft.

Three adits were driven as shown in Fig. 1, 3 ft. wide by 5 ft. high, both machine and hand drilling being used. From the ends of these, crosscuts were run to each side and the ends chambered to receive the powder. The muck from the main adits was dumped around the entrances. That from the crosscuts was thrown back and leveled over the bottom so as to half fill the crosscuts to the adit, leaving only a 2x3-ft. space to permit the passage of a man. The amount of chambering was determined by the amount of powder necessary to break the calculated yardage. This yardage was estimated on the assumption that the blast would break to a line 10 ft. back of the breasts of the main adits, and run to the surface on a 1:1 slope.

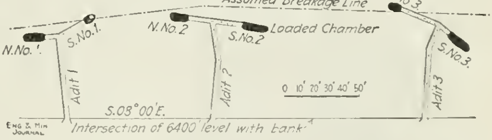

Fig. 1. Plan of Excavations

The total footage of the openings was 352; the work was carried on at first in two 9-hr. shifts and later in three 8-hr. shifts. With the latter system, two men were employed in each face, 18 men altogether per 24 hr. The laborers were Mexican, the miners being paid $2.75, the muckers, $2 per day. The work took 31 days to complete. Loading was begun at once after the excavation was completed and required three days, using four powdermen and 10 laborers in 10-hr. shifts only. A path was made on the bottom of the workings consisting of boards laid loose, end to end, in a single row without nails. The powder boxes were slid along the board path to the loading chambers. Pocket electric flash lamps were used for illumination, the batteries giving a fair light for about 24 hours.

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[*] Inspector of mines for Iron County, Crystal Falls, Mich.

[†] From U. S. Bureau of Mines Technical Paper 59, by Edwin Higgins.

[*] An abstract of an article by R. I. Kirchman in the "Colorado School of Mines Magazine," May, 1914.

GOPHER BLASTING

Chamber	Pounds of Powder Loaded Black	Pounds of Powder Loaded Judson	Gelatin 40%	Ratio of Explosive Charge to Ignition	Total Powder
N. No. 1.....	7725	2,400	800	12.65	10,925
S. No. 1.....	....	5,500	500	11.00	6,000
N. No. 2.....	....	5,250	600	8.75	5,850
S. No. 2.....	....	9,250	800	11.56	10,050
N. No. 3.....	....	7,050	500	14.10	7,550
S. No. 3.....	....	9,050	900	10.05	9,950
Total ...	7725	38,500	4,100	11.27	50 325

Gelatine, black powder and Judson powder were used for charging. Chamber No. 1 was loaded first. The ends of the gelatine boxes were broken open and the boxes placed end to end in the form of a pyramid down the center of the chamber. Three electric fuses were placed in each chamber in the middle boxes of three tiers. Extreme care was necessary not to injure the electric fuse wires and to avoid undue pressure on fuses or gelatin. The Gelatin was du Pont 40% Repauno; the fuses, Victor No. 7 in 10-ft. lengths with a resistance of 1.2 ohms each.

Around the gelatin was placed black powder in 25-lb. cans. About three-quarters of this black-powder charge was loaded from the breast to the front of the chamber and half-way up to the back. Judson powder in 12½-lb. paper bags was placed upon the powder cans, as compactly as possible and filled the pocket clear to the back. The opening to the chamber was sealed with the remaining one-quarter of the powder cans, to avoid any danger of damage to the gelatin and Judson powder when tamping.

The different chambers were connected in series with No. 14 lead wire. All electric fuses were carefully tested with a du Pont galvanometer. This instrument shows the presence of a circuit, as well as the resistance contained therein. All completed circuits in the different chambered pockets were tested before sealing with muck. The lead wires from each chamber were laid on top of the muck and in one corner of the passage and were protected by pieces of wood broken from the powder boxes and placed at an angle above them. These lead wires were uncoiled as fast as the tamping proceeded.

The tamping was a slow and laborious process. The muck had to be carried in powder boxes and slid along planks. These were then dumped into the receding filled faces. At intervals of about 3 ft., the circuits were tested in all the drifts to detect any wires broken by tamping.

During the loading, the men suffered from powder headaches which were sharp and annoying, but soon passed away in most cases. The tamping progressed more rapidly after the main adits were reached. The fill was carried to the entrances of all the adits. An unusual source of danger existed for a few days, namely, the presence of electrical storms; and the precaution of keeping all lead wires well within the adit entrances was observed.

The lead wires from the several entrances were connected in series. A pair of main lead wires was laid a distance of 1500 ft. north from the entrance of adit No. 1. These main leads were not connected to the adit leads until the time for blasting arrived. The blasting machine, a du Pont 1-75 fuse, was cleaned by holding a piece of paper between the armature and the brushes and rapidly rotating the former. The platinum contact point was also cleansed with paper. A du Pont rheostat was used to test the machine.

For blasting the adit, lead wires were connected to the main lead wires outside. A guard was stationed over the terminals, until the moment of blasting. The final circuit was tested with the galvanometer, a resistance of about 24 ohms being found, which was about right. The eighteen 10-ft. fuses used should have had a total resistance of 21.2 ohms; the remaining 2.8 ohms was due no doubt to imperfect connections. The resistance of the main leads was practically nothing.

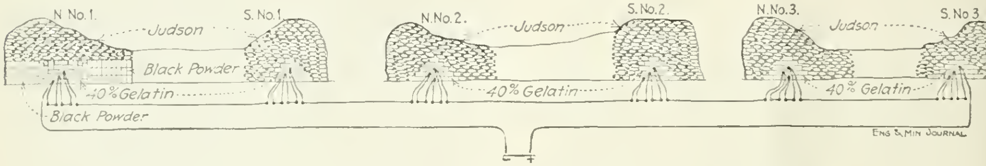


Fig. 2. Diagram of the Manner in Which the Chambers Were Loade

The warning signal for blasting, a series of short toots, was given by a steam shovel. After a lapse of three minutes, the battery was sprung. The blast threw some boulders a distance of from 400 to 600 ft. The main mass of the material was not thrown over 200 ft.

Broken material equal to 60,000 cu.yd. (solid) was removed and a rough estimate of the remaining material would be about 40,000 cu.yd. The load was a trifle too heavy for this class of overburden. A load of one pound of powder per 3 or 3½ solid cubic yards would have yielded better results. But as an experiment for future reference, this was a successfull blast. The engineers' figures of volume to be broken gave 118,660 cu.yd., representing a loading ratio of 0.425 lb. of powder per cu.yd. of material to be broken.

*

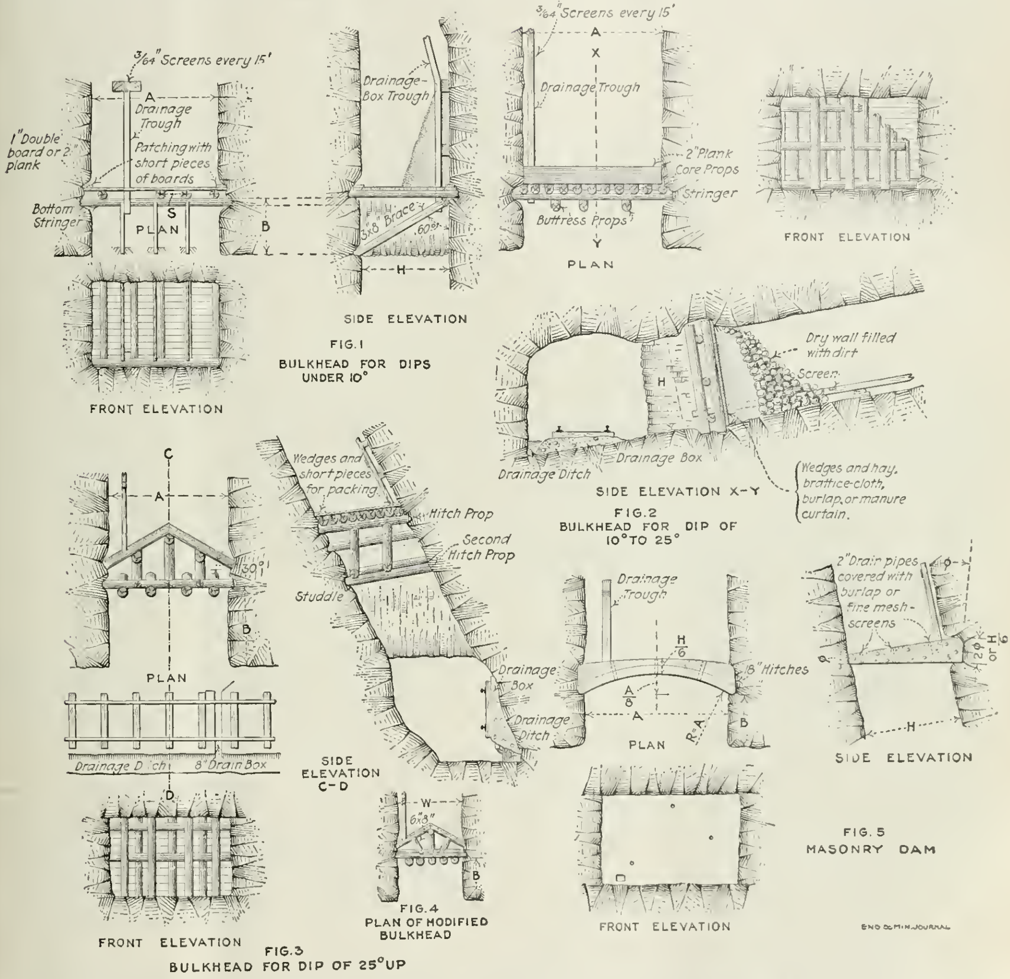
Injury to Miner in Drilling

Under the rule that although a miner is required by law to exercise a reasonable degree of care for his own safety, he does not assume the risk of a hidden danger over which he has no control; a miner engaged in drilling holes as a preliminary to blasting does not assume the risk of being injured by drilling into an unexploded charge left by another shift of miners, if he had no knowledge as to its presence. (Nevada Supreme Court, Peterson vs. Pittsburgh-Silver Peak Gold Mining Co., 140 *Pacific Reporter*, 519.)

✻

Bulkheads for Hydraulic Filling*

In the anthracite regions of Pennsylvania, where hydraulic filling for the underground workings is extensively practiced, certain types of bulkheads have become standard for confining the filling to its proper resting place. The design of these will vary chiefly with the steepness of the working; that is, the dip of the coal bed. The particular functions of such a bulkhead are to retain the solid material and permit the passage of water.



Timber and Masonry Dams Used in Anthracite Mine Workings of Various Dips to Catch Flushed Filling

Certain rules for proportioning the various dimensions are as follows:

The haunch distance B should be one-half the width of the opening for flat workings or workings dipping up to 10°; two-thirds the width of the opening for chute workings, those dipping between 10° and 25°; and the same for pitch workings, those dipping more than 25°. The width of opening is designated by A in the illustrations. The props should have a diameter in inches equal to their length in feet for flat workings, one-half greater for chute workings, and three-quarters greater for pitch workings. The spacing of the props across the opening is determined as follows: For flat workings, $S = \frac{A}{H}$; for chute workings, $S = \frac{2}{3}\frac{A}{H}$; for pitch workings, $S =$

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*Note—An abstract from Bull. 60, "Hydraulic Mine Filling," U. S. Bureau of Mines.

$\frac{4A}{7H}$, it being understood that A = the width of the opening in feet, H = the height of the opening in feet, S = the distance from center to center of props in feet.

For flat workings, the method of construction is shown in Fig. 1. The props are securely wedged at the top, and manure or dirt is firmly packed around the bottom after the bottom plank has been attached, to prevent leakage. The inside of the line of props is lined with 1½-in. planks or double 1-in. planks, the bottom, sides and tops being carefully joined or patched by short pieces of board nailed to the main boarding and the solid coal or pillar. For the steeper of the flat workings, a hay, straw, burlap or brattice-cloth packing is used, or a drainage trough is inserted, as shown, the object of either method being to avoid excessive hydraulic head.

The method of constructing a bulkhead for a chute working is shown in Fig. 2. In some cases buttress props are advantageous. Drainage should be effected by the use of a trough, as illustrated. The chief advantage of this trough method is the fact that the water is rendered available for use again in the shortest possible period of time. Where the inclination of the work is 18° or more, manure, straw or hay is placed between the two courses of boards as a screener, and in many places a dry wall is constructed to act somewhat as a filter.

A typical bulkhead for a pitch working is shown in Fig. 3. The spacing rule in such cases may call for more props than can be inserted in one row, and therefore a second row becomes necessary. The V-form shown in Fig. 3 is one intended to resist the highest pressures. The construction shown in Fig. 2 is also applicable, using horizontal timbers hitched into the side of the working for reinforcing purposes. Where the V-form is used, a layer of fine manure and dirt is placed as a bedding for the first layer of timbers in the bottom hitches. The planking is placed vertical, with as few nails as possible. Fig. 4 shows an alternative method of arranging the timbers. The use of a screener and a dry-wall filter is important with pitch workings.

Masonry is frequently desirable instead of timber, the most common form of bulkhead being that of a full-struck arch, with radius equal to the width of the opening, the thickness of the bulkhead at the haunches being equal to one-third of the height, and the crown equal to one-sixth of the height. These conditions are illustrated in Fig. 5. Dry walls are also used for bulkheads, and offer the advantage of being both a filter and a retaining wall at the same time. Concrete bulkheads have been tried and found advantageous where great pressures are encountered and timber is expensive.

⁂

Titanite--A New Explosive

A new explosive has been invented and patented by Norbert Ceipek, of Vienna (Brit. pat. 9743 and 13,519 of 1914). It is essentially an ammonium-nitrate explosive to which turmeric powder is added, for which many advantages are claimed. The turmeric or curcuma root is nitrated by boiling in water to extract coloring substances, drying, grinding, treating with a mixture of sulphuric and nitric acids, washing and drying the product of the reaction. Carbonized tumeric powder may be similarly nitrated. Ammonium-nitrate explosives usually contain carbonaceous material, and carbonized turmeric powder and carbonized sandalwood are recommended as excellent for this purpose, the sandalwood hastening the speed of combustion. As a formula for an explosive compounded along these lines, the following is suggested: Ammonium nitrate, 88%; carbonized turmeric powder, 1.05%; carbonized sandlewood, 0.95%; nitrated turmeric powder, 10%.

It has been found, however, that the carbonized material is unnecessary when the nitrated turmeric powder is used and a simpler formula offered is: 80 to 90 parts of ammonium nitrate and 20 to 10 parts of the nitrated turmeric powder, carefully dried, intimately mixed and finely ground.

The addition of trinitrotoluene and gelatin, the latter consisting of collodion cotton and dinitrotoluene, results in an explosive of greater strength. A formula for such a compound would be: Ammonium nitrate, 82 parts; nitrated turmeric powder, 4 parts; trinitrotoluene, 10 parts; gelatin, 4 parts; (the latter to consist of 0.17 part of collodion cotton and 3.83 parts of dinitrotoluene.)

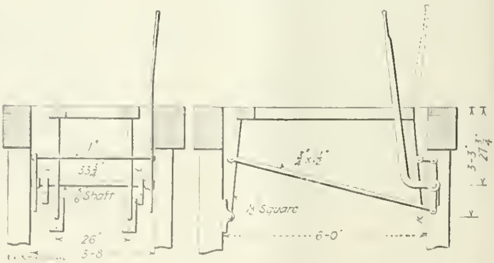
It is claimed that these explosives are stable when stored, the hygroscopic quality of the ammonium nitrate being overcome; that they are entirely safe, being insensitive to blows, shocks and fire, and exploding only from an initial explosion as by a powerful detonator; that they are powerful in their effect, and that they yield only a small amount of noxious gas. As a matter of fact, these claims have been pretty well borne out by trial at one of the largest mines in this country. The difficulty in the way of the general introduction of the explosive, which is called titanite, seems to be that ammonium nitrate cannot now be obtained quite cheap enough to enable the titanite to compete in price with the other high explosives in common use.

⁂

Simple Cage Chairs

By Percy E. Barbour*

A simple type of landing dog or cage chair is giving satisfactory service on various stations in the Uwarra shaft at Candor, N. C. The dogs were made in Charlotte, weighed, complete, 165 lb., and cost the mining company $60. This is nearly 13c. per lb. and is too high, although there is a good deal of forging in the set. The drawing shows the details of construction.



Arrangement of Cage Chairs in the Shaft

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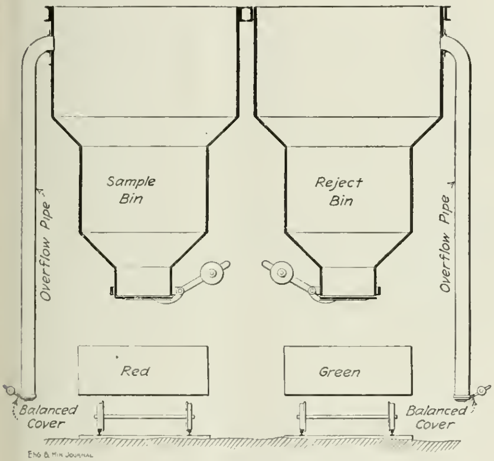
*Mining engineer, 887 Middle St., Bath, Maine.

Details of Milling and Smelting

Overflow Indicator for Sample Bin

In the Snyder sampling plant at the works of the Deloro Mining & Reduction Co., at Deloro, Ont., the sample and reject bins are steel receptacles placed alongside each other. Trouble was experienced in having the sample bin fill up and overflow into the reject bin, or *vice versa*. To avoid this, a slot was cut in each bin near the top, and a pipe fixed to it, leading down to the operating floor. The ends of these pipes were covered with automatically closing covers so balanced that a stream of material would open them, while at other times they remained closed. When the bins fill up to the danger point the material flows out of the slot before overflowing into the adjoining bin. Falling through the pipe to the operating floor, the attendant is at once notified that the bin is full and the contents must be removed.



OVERFLOW FOR FINE-ORE BINS

These sample bins are emptied into cars which run beneath them. In order to insure the same car being used for the sample at all times, the sample bin and car are painted red, while the reject bin and its car are painted green. The accompanying sketch shows the arrangement.

⁂

Lime Grinding at the Dome Mill

In order to secure a constant and uniform stream of lime water for mill use, the Dome mill has installed a two-stamp Hendy battery for the purpose. Lime will be fed through an automatic feeder into the mortar, where it will be ground and put into the pulp circuit where required. This installation is similar to the one at the Homestake plant, Lead, S. D., where a one-stamp mill has been grinding lime for a number of years.

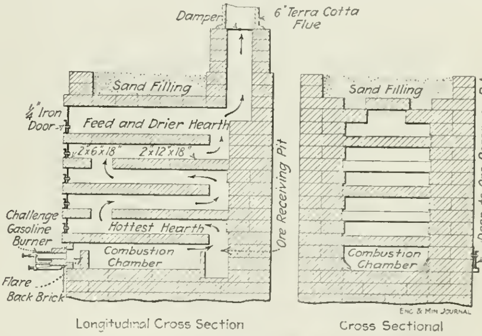
⁂

Zinc Extraction from Complex Ores

By S. E. Bretherton† and Frank L. Wilson*

The smelting of zinc-bearing ores, especially in the blast furnace, has been a problem of much importance. Ores containing up to 30% zinc have been successfully smelted in an ordinary blast furnace[1], although the zinc was lost under this form of treatment. Approximately 41% of this loss was in the slag, 11% into the matte, and 48% was volatilized.

Treating the ore to recover the zinc before smelting is now being tried at the Afterthought mines of Shasta County, Calif.[2] A 50-lb. testing plant has been installed and the results have so far been exceedingly encouraging, checking the smaller laboratory tests in a satisfactory manner.



ROASTER AT AFTERTHOUGHT MINE, INGOT, CALIF.

The ore of the Afterthought mines is peculiarly adapted to the process; it consists of a complex mixture of blende, chalcopyrite, a trace of galena and silver sulphide, pyrites, barytes, calcite, silica, and alumina. The average is from 20 to 25%, and some of the ore blocked out runs 30 to 40% zinc. It is not susceptible to ordinary separation, such as concentration, flotation, magnetic separation, etc., on account of its complexity.

The recovery of the zinc then lies between direct smelting, electric smelting, acid treatment or alkali treatment. The last named method has, up to this time, proved superior to any of the others, in respect of initia cost of plant, treatment cost and recovery of the zinc, copper, lead, gold and silver.

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†Consulting engineer, 220 Mills Bldg., San Francisco, Calif.

*Metallurgical chemist for the Afterthought Copper Co., Ingot, Shasta Co., Calif.

[1] "Matte Smelting at Ingot," W. B. Bretherton, "Eng. and Min. Journ.," Feb. 29, 1908.

[2] "Preparation of Ore Containing Zinc for the Recovery of the Other Metals," by S. E. Bretherton, "Trans." A. I. M. E., Vol. XLVI.

The alkali process, known more familiarly as the ammonium-carbon dioxide process, consists of grinding the ore to a maximum of 30 mesh, sulphatizing roasting, regrinding wet to —150 mesh, leaching, and recovering the metals. In leaching, the slimes are mixed with a solution (4 slimes: 1 solution) containing approximately 9% ammonia (NH_3) and 9% carbon dioxide (CO_2) in the ratio of 4 of solution to 1 of ore and hydraulically agitated under 30-lb. pressure. After sufficient agitation the charge is filtered, and the solution containing salts of zinc and some copper is sent to a tank where it comes in contact with scrap zinc or zinc dust. In this tank the copper is precipitated as a cement and the solution is again filtered to remove this cement. The clear solution containing the zinc is sent to a battery of stills where steam is used to boil out the ammonia and excess carbon dioxide. The zinc is precipitated as a white basic carbonate and recovered in a filter press. The pulp in the filter press is given first a wash with a strong solution to recover any undissolved zinc salts and finally with hot water to remove traces of ammonia. This residue is amenable to cyanidation or to direct smelting in the matting furnace. The cement copper can be either smelted with the residue or sold as a pigment. The zinc basic carbonate when calcined gives a pure white powder that is extremely light and different from the oxides produced by an acid process. It is of suitable quality for pigments.

The plant, with the exception of the stills, resembles a standard cyanide works, although the tanks are necessarily gas tight. All of the important features of the process and apparatus are covered by patents controlled by S. E. Bretherton.

As worked out at the Afterthought mine, the roasting was given particular study. It was found that with a prolonged sulphatizing roast the copper extraction averaged only about 55%, while the extraction of the zinc was 79.7% on an 18.6% zinc ore, 84.9 on a 20.72% ore, and from 87 to 95% on a 30% zinc ore. A different roast and longer leaching is necessary for proper copper extraction.

Copper dissolved was not ascertained, as this copper is later reprecipitated and remains with the residue. Silver extraction is negligible.

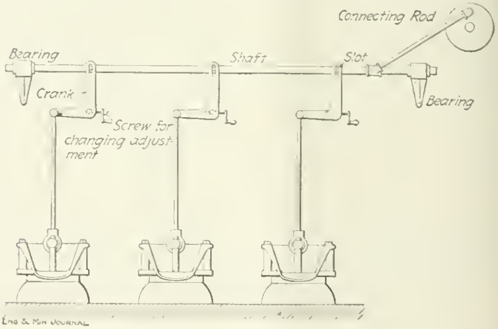
To obtain roasting results that would conform to those obtained in the use of a modern multiple-hearth roaster, a laboratory roaster was designed. The first one built by the writers had a capacity of 3 lb. per shelf For the experimental plant at Ingot a larger one of similar design was built. It is made entirely of fire brick and tile. Heat is generated by a "Challenge" gasoline burner. Distillate works well, but gasoline is more satisfactory and is apparently as cheap in the long run. The "flare back" brick is placed about 3 in. in front of the burner face and not only keeps the generator face of the burner hot, but spreads the flame and causes a more uniform heat on the under surface of the bottom hearth. An ordinary toothed rabbling iron is used to stir the ore on the different shelves. Frequent rabbling of the ore is necessary, especially on the three lower shelves. The ore is fed in at the top door and spread out on the upper hearth to dry. The charge is shoved back and falls through the opening to the second hearth and again spreads out. As it is worked down from shelf to shelf it finally falls into a pit in the rear of the furnace from which it is drawn through a side door. The ore commences to roast on the second shelf and on each succeeding shelf becomes hotter until the fifth shelf is reached. Here the last of the unnecessary sulphur is removed and the ore given the proper roasting temperature. The ore is allowed to remain on each shelf from one to two hours, each shelf having a capacity of 9 to 12 lb. of ore.

Ammonia losses were 4.44% during the run (not counting the first four tests). Of this amount 0.28% was unaccounted for numerically, but due to intermittent leaks in the system. 17% of the total ammonia was tied up as fixed ammonia. No lime was used to free this in the run. Compressed air was used to drive the charge through the filters and the air remaining in the agitator and copper precipitator was released through a scrubber. In like manner the absorbers and separator were connected with scrubbers. Washing the residue first by hot solution from the first still and then with steam brought the residual ammonia down to from 1.3 lb. to 3 lb. per ton of ore. The zinc precipitate held some as salt.

⁂

Gang Motion for Diaphragm Pumps

A convenient means of operating a gang of diaphragm pumps has been designed and installed at the Hollinger mill, Timmins, Ont. The accompanying drawing shows clearly the idea, which consists, of connecting the pump rods, by means of a bell crank, to a reciprocally moving shaft. A screw is placed so that the pump rod may be moved back or forward in the fork of the bell crank, thus changing the stroke of the pump. The adjustment may be made while the machine is in operation. The stroke of these pumps is short, and slight changes of position will cover all necessary adjustments.



Gang Motion for Diaphragm Pumps

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The Importation of Flint Pebbles into the United States is a subject of interest to cyanide operators and others using grinding mills requiring these pebbles. The value of the imports, but not the quantities, is reported by the U. S. Geological Survey, for 1913 as follows: Denmark, $134,625; France, $121,854; Belgium, $40,947; Newfoundland, $10,800; Canada, $8599; England, $2626; Sweden, $56; Germany, $2. The tonnage represented by this total, $319,509, is not given, but assuming an average value of $14 per long ton delivered at U. S. ports, would give a total of 22,822 tons as an approximation of the importations in 1913. It should be borne in mind, however, that many mills are using ore in conjunction with the imported pebbles.

Company Reports

British Columbia Copper Co.

According to the 1913 report of the British Columbia Copper Co., Greenwood, B. C., 612,907 tons of ore were smelted, of which 353,422 tons came from the company's mines and 259,485 tons from purchases of custom ores. The total production of metals was: 8,296,902 lb. of copper, 137,051 oz. of silver and 26,640.63 oz. of gold. Apparently the net balance of receipts above all expenditures was $58,325 and the company paid a dividend of $88,756, thereby decreasing its quick assets $30,431. These figures were obtained in the following manner:

Balance of quick assets at end of 1912		$152,836.99
Balance of quick assets at end of 1913		122,405.68
Decrease in quick assets during 1913		$30,431.31
Dividends paid in 1913		88,756.35
Apparent balance of receipts over expenditures		$58,325.04
Receipts and expenditures:		
Receipts from metal production		$1,881,171.89
Receipts from miscellaneous earnings		23,522.63
Total receipts		$1,904,694.52
Expended for operations, etc.	$1,424,298.09	
Custom ores purchased	368,499.94	
Total expenditure shown in report		1,792,798.03
Profit as shown in report		$111,896.49
Other expenditures apparent from decrease in quick assets but not given in report		53,571.45
Net balance of receipts over expenditures as indicated by decrease in quick assets		$58,325.04

Owing to shortage of ore, the smelting plant was unable to operate at more than 82% of capacity. The individual furnace efficiency was the highest ever attained at the plant. The slag showed lower metal losses than for any previous year. Costs were higher for several reasons; shortage of ore; extra labor on coke stockpile, occasioned by periods of coke shortage; many expensive renewals and repairs to plant and machinery, which were taken up in operating expenses; and same overhead expenses as when running full capacity. A summary of operating results for last five years as compiled from an analysis of annual reports follows:

PRODUCTION

	Tons of Ore Smelted		Metals Produced		
Year	Company Ore	Total Tons	Lb. Copper	Oz. Gold	Oz. Silver
1909	362,423	373,336	6,325,000	18,244	64,234
1910	399,353	441,672	7,143,456	24,962	84,180
1911	385,829	608,945	9,944,987	31,144	134,266
1912	443,022	740,589	11,146,811	25,862	142,025
1913	353,422	612,907	8,296,902	26,640	137,052

SUMMARY OF RESULTS

			Balance of Quick Assets	
Year	Net Balance Receipts Over All Expenditures	Dividends Paid	Increased	Decreased
1909	$92,172.69	....	$92,172.69	....
1910	56,324.07	....	56,324.07	....
1911	40,925.63	$147,930.83	....	$107,005.20
1912	81,441.94	177,512.70	....	96,070.76
1913	58,325.04	88,756.35	....	30,431.31

Considerable expenditures have been made for new property during the last few years. It is estimated that an additional $1,000,000 will be needed to provide for payment of properties now under option and installation of a concentrating plant. It was found desirable to provide for the organization of a new company for the purpose of financing these requirements and when all or nearly all of the company's shareholders have exchanged their stock the new company will for all practical purposes become identical or be merged with the British Columbia Copper Co.

*

U. S. Smelting, Refining & Mining Co.

The 1913 report of the United States Smelting, Refining & Mining Co., shows earnings from all companies to have been $4,555,122, and after charging off $969,536 depreciation, to have been $3,585,586. Of this amount, $1,702,144 was paid in dividends on the preferred stock and $1,053,322 on the common stock. The following table shows the production for 1913:

Metal	Amount	% in Value	Average Price Received
Copper	20.239,973 lb.	18.8	$0.15433
Lead	58,116,504 lb.	15.3	0.04396
Silver	13,089,708 oz.	47.3	0.60503
Gold	148,372 oz.	18.6	....

The charges to capital accounts for construction and other additions to property and investment were: $19,250 invested in stocks and bonds of coal and allied companies in Utah, $99,668 invested in stocks of other mining companies, $310,596 for additions to plants in the United States and Mexico and $218,217 for mine properties and other charges; total, $647,731, from which credits amounting to $296,665 are deducted, leaving a net charge of $351,066. Current assets amount to $10,507,118 over current liabilities. The total number of preferred stockholders in the company was 8702 and common stockholders 2674. The coal properties in Utah produced 869,522 tons of coal, an increase of 40% over 1912 production. The company has $4,000,000 5% gold coupon notes, maturing on Aug. 1, 1914, which are not included in current liabilities. [These have since been refunded by an equal amount, maturing June 1, 1918, which were placed with the public at 98¼.—EDITOR.]

*

Tri-Bullion

According to the report of the Tri-Bullion Smelting & Development Co., Kelly, N. M., for year ended Oct. 31, 1913, the company was apparently as unsuccessful as ever in its efforts to realize some profits from operations. Owing to the decline in the price of zinc in June, the company found itself in debt approximately $45,000. To relieve the financial strain, five directors signed notes to raise funds to pay off the debts. It was then decided to sell the Kelly group of claims and a sale was consumated at $87,500. This has relieved the financial troubles somewhat. Since the sale of this property the company now owns about 112 acres of copper-zinc claims at Kelly, and copper claims aggregating 150 acres in Arizona. Apparently all work was stopped at the time the report was issued, but the management contemplated operating the New Mexico properties as soon as conditions would permit. The Starlight mines in Arizona have been closed since about 1907, but a force of men is now cleaning out the old workings; after this is completed it will be decided just what steps to take to develop the property.

The production during the period covered by the report amounted to 2572 tons of zinc concentrates, 1467 tons of lead concentrates, 2096 tons of iron middlings, 1505 tons of copper ore, 417 tons of zinc carbonates, 137 tons of zinc sulphides, and 45 tons of lead carbonates. The value of this product by smelter settlements was $153,861, but after payment of operating charges, there was a net loss of $21,678. Development charges at Kelly, amounting to $28,208, increased the charges to $49,886 above income. The current assets, as shown in the balance sheet, amount to $95,290, and current liabilities, $55,800, leaving a balance of $39,490 in current assets. Of this balance $203 was in cash and $6302 in ores in transit, the remainder was made up of bills and accounts receivable.

*

Chino Copper

The 1913 report of the Chino Copper Co., Hurley, N. M., shows a production of 50,511,661 lb. of copper and dividend payments amounting to $1,919,070. An analysis of the financial statements shows the source of these dividends to have been as follows:

From balance of operating receipts over all expenditures	$1,849,926.68
By decreasing quick assets	60,963.32
From balance received through profit accrued from conversion of bonds and investments	8,180.00
Amount of dividends	$1,919,070.00

To check this statement and to make figures in the report clear, the following summary of statements is given:

Operating receipts:		
From 50,511,661 lb. of copper at 15.0884c.		$7,621,419.35
From dividends, rentals, royalties, etc.		137,533.40
Total operating receipts		$7,758,952.75
Expenditures for operations, plants, etc.:		
Charged to 1913 operations	$4,431,126.28	
Interest and income taxes	93,792.96	
Total		$4,524,919.24
Net profit for the year shown in report		$3,234,033.51
Expenditures for property, plants, and deferred charges to operations:		
Property purchase	$2,739.23	
Construction and equipment	786,667.18	
Development	146,628.73	
Deferred stripping	448,071.69	
Total expenditures not charged to operations		1,384,106.83
Net balance from operations above all expenditures		$1,849,926.68
Stock, bonds and investment transactions:		
Receipts from increase in capital stock		$415,600.00
Profits accrued, bond conversion		1,662,400.00
Profits accrued from investments		80,000.00
Total		$2,158,000.00
Less: Bonds redeemed	$2,078,000.00	
Increase in investments	71,820.00	
Total		2,149,820.00
Net balance from stock, bonds and investment transactions		$8,180.00
Add balance from operations		1,849,926.68
Balance of all receipts over all expenditures		$1,858,106.68
Dividends paid		1,919,070.00
Decrease in quick assets as shown in report		$60,963.32

The only increase in mining property was through the location of some fractional areas. The company now owns 147 mining claims, comprising 2615 acres; of this acreage, 2412 are patented. It also owns 160 acres of agricultural lands. Other lands for mill site and water rights comprise 16,700 acres, of which 10,660 are patented. The only drilling done during the year consiste of 19 holes aggregating 10,593 ft. This work was don more to prevent depositing waste over ore-bearing area than for development purposes. A general summary o operations and expenditures worked out per pound of re fined copper follows:

Tons of ore milled	1.942,700
Average contents of ore treated	2.033% Cu.
Production of concentrates	183,166.5 ton
Ratio of ore to concentrates	10.61 to 1
Copper contained in concentrates	53,170,145 lb.
Average assay of concentrates	14.518% Cu.
Copper in concentrates per ton ore treated	27.37 lb.
Percentage of mill extraction	67.31%
Refined copper produced	50,511,661 lb.
Net recovery in refined copper per ton ore	26 lb.

Expenditures:

		Per Lb. Copper, Cents
Mining and milling	$1,635,915.17	3.24
Treatment, refining, freight	2,135,453.68	4.23
Selling commissions	76,947.43	0.15
Stripping	582,810.00	1.15
Interest and Federal tax	93,792.96	0.19
Total charge to operations	$4,524,919.24	8.96
Less miscellaneous income	137,533.40	0.28
Net total charged to operating	$4,387,385.84	8.68
Additions to mining property	2,739.23	....
Construction and equipment	786,667.18	1.56
Development	146,628.73	0.29
Deferred stripping	448,071.69	0.89
Total net expenditure for 1913	$5,771,492.67	11.42

The total amount of ore and waste moved by steam shovels was 4,033,832 cu.yd. of material in place. Of this amount, 3,082,174 cu.yd. was stripping and the remainder, equivalent to 1,976,572 tons, was ore. Since the beginning of steam-shovel operations, there has been removed a total of 8,822,000 cu.yd. of material; 7,000,000 yd. of this was waste and the remainder, equivalent to 3,655,000 tons, was ore. Of this ore mined, 535,000 tons has been stored in stockpiles at the time. The average cost of steam shoveling and removing all classes of material during the year was 36.87c. per cu.yd. The cost of handling waste alone was 33.43c. per cu.yd. in place. The average cost of milling for the year was 61.08c. per ton.

Owing to the limited amount of development work done during the year no recalculation of ore reserves was made. It is stated, however, that the small amount of work done added more ore to the known reserve than was mined. The 1912 report estimated 90,000,000 tons of 1.8% copper ore in reserve. The company's equipment for shovel operations was increased by three shovels and four locomotives, making a total of 10 shovels and 19 locomotives. Tracks for steam-shovel work and the delivery of ore to the railroad increased 5.92 miles, making a total of 20.315 miles. Mining operations were hampered because of the limited areas in which ore shovels could work and at the same time avoid interference with stripping operations. On this account, to provide capacity for the mill, it was necessary to mine large quantities of partially oxidized ores upon which the mill could make only a partial saving. This condition was improving by the end of the year, and hereafter the mine is expected to produce ore of a more uniform grade.

The total issue of capital stock at the end of the year amounted to 860,510 shares. Bonds outstanding amounted to $236,500, all these bonds have been called for redemption on July 1, 1914, and the right to convert these bonds will expire on this date. With these bonds converted the total outstanding stock will amount to 870,000 shares. It is stated that an increase of 30% in copper output may be expected.

Kimberley Diamonds and De Beers

By Frank Conly*

YNOPSIS—First discovery of diamonds and early op-ations. Formation of De Beers Consolidated. Methods treatment, by weathering and by direct reduction. igid control of native labor and drastic laws to prevent ealing. Arbitrary rule of De Beers results in practical avery for Kafirs and hostile feeling in the community.

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Africa has a fascination all its own. The visitor is mediately conscious of it whether his first view be of airo in the north or of Cape Town in the south. Granted, ese cities have a distinct individuality of their own; ut they have both the mysterious charm common to the dark" continent.

The journey to Kimberley from Cape Town occupies bout 24 hr., and the train accommodation is not so uptoate as it might be. For instance, in the compartment leeping cars you have to pay extra for bedding. There s no charge, though, for the ministrations of battalions f fleas.

Kimberley is not exactly what one would describe as n inspiring town. It is very primitive, most of the houses being of corrugated iron, sheet iron—any old thing. A few of the better class residences, and also the business houses, are of sun-dried brick. The city boasts two hotels, which are almost unspeakable. There is one fine building, however, and that is the monument erected to commemorate the siege during the late war.

De Beers is the ruler of Kimberley, and to a large extent of the town's 25,000 inhabitants, directly or indirectly dependent upon the mines.

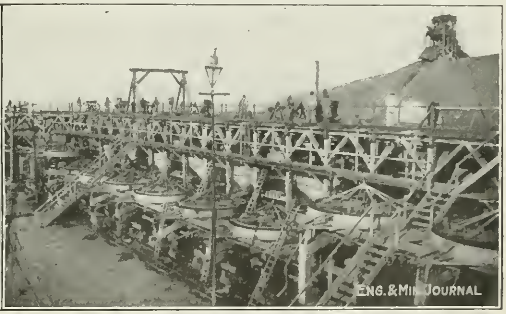
De Beers controls five "pipes" in the immediate vicinity of the town, and all within six miles of each other. These are the Dutoitspan with an area of 1440 claims, Wessleton with 1162, Bultfontein with 1067, De Beers with 622 and Kimberley with 470. The Premier mine at Pretoria, which produced the famous Cullinan diamond, has about 3570 claims. It takes 45.3 claims to make an acre.

Of all the histories of discoveries of vast mineral wealth, hardly can there be one more romantic than that of De Beers Consolidated. In 1867, the children of Daniel Jacobs, a Boer who had his farm near Hopetown, on the Vaal River, in Cape Colony, brought in a bright pebble, which they were subsequently allowed to play with as a marble. Eventually this came into the hands of an expert, and the next year was exhibited in Paris at the Universal Exhibition, as the "First African Diamond." It weighed $21\frac{3}{16}$ carats and was bought by Sir Phillip Woodhouse, then governor of Cape Colony, for $2500.

Some little excitement was caused by this incident, but as there were no other immediate finds, it soon died down. In 1869, however, a magnificent stone of 83.5 carats was found in the possession of a witch doctor. It was bought by Earl Dudley for $125,000, and this started the first rush.

As a curious instance of the mistakes even a specialist is liable to make, it is interesting to record that an expert sent out from England to go over the ground, reported that the formation of the country was such that no large deposits need be expected, and that any stones found had probably been carried a long distance by ostriches.

De Beers Floors, Pulsator and Mill



Washing Apparatus for Blueground

The finding of another fine diamond, "The Star of Africa," protruding from the mud wall of a farmer's house led to the discovery of the Dutoitspan pipe in 1870, and the following year a hunter resting under a tree on the farm of another Boer, named De Beers, absent-mindedly kicked up a valuable stone. Thus was found the De Beers pipe, and the Kimberley was opened the same year.

But before these later discoveries, there had been a rush to the Orange River, where a party of prospectors from Natal had found diamonds in the gravels of that stream, at Berkly West. The rush has been compared to the early days in the California gold diggings, and many of the stampeders actually came from the mines of California and Australia. They lined the river banks in their thousands, washing the gravel in rockers, with two or three sieves arranged so as to grade the material passed into the feed-box. As is the way with gold and diamond seekers, the very men who had been crazy to take up claims on the Orange River, now abandoned them and made for the new diggings.

Kimberley soon proved to be the richest pipe, and its 470 claims were so split up that at one time there were as many as 1500 owners, some holding no more than 5

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*352 West 122d St., New York.

sq.yd. The men broke up the yellow ground with their shovels and, by passing it through sieves, extracted the diamonds.

Meantime, Barney Barnato—whose real name, by the way, was Isaacs—had hurried from London. On the steamer he was known as a sleight-of-hand expert and mountebank entertainer; but, arrived at Kimberley, he shrewdly bought up as many options as he could lay hands on.

Impossible Methods of Working

While at first no digger was allowed more than two claims of 31x31 ft., this principle came ultimately to be abandoned. All the ground was taken up with these claims except the roads, which, by the regulations, were 15 ft. wide and 47 ft. apart. In about one year's time the workings had become so deep that already the roads were becoming unsafe.

Picture over 10,000 whites and natives in one mine, digging and wheeling and hauling up in tubs and buckets, or carrying on hand up inclined planes, the comparatively loose earth. The result was chaos. There were frequent cave-ins, despite roughly constructed wood-staging and other attempts at supporting the ground; and the deeper the diggings went, the more serious the situation became, until 25% of the claims were covered and 10 lots of waste had to be handled for every three of the famous "blue-ground" which was found about 50 ft. below the surface.

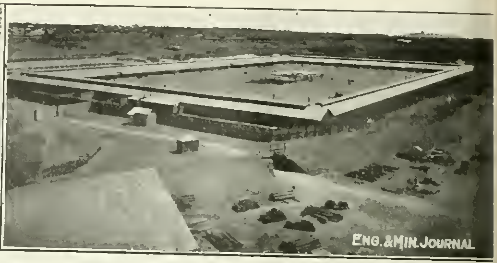
Formation of De Beers Consolidated

Under such conditions it was impossible to go on for long, and in 1883 Cecil Rhodes, having paved the way by getting legislation passed allowing the ownership of multiple claims by one man, got control, with I. Rudd, of the De Beers pipe and later backed by the Rothschilds and Alfred Beit, bought the Kimberley pipe from Barney Barnato. The De Beers Consolidated Mines Co. was formed in 1888; though the Wesselton mine was not discovered till 1890.

Americans have played important rôles in the history of Kimberley. It was largely due to the influence of Gardner F. Williams, of Los Angeles, that the consolidation was brought about; it was another American engineer that consummated the difficult feat of supplying the mines with water from the Vaal River, and much of the machinery now used is American.

With the exception of Wesselton, all the mines are now worked by underground methods with uptodate equipment.

Inside of the Kimberley Compound



The Dutoitspan Compound

Methods of Treatment

Some years ago it was discovered that the blue gro crumbled and decomposed if exposed to the air for a c siderable time. This led to the establishing of h floors, several miles in extent, where the rock is tal and spread out, guarded night and day for months, ral over from time to time by huge steam ploughs or harro drawn by cable haulage, and finally sent to the treatm works.

But at the newer mines, direct treatment has been troduced, to save time and cost. The rock is gradua reduced by crushers and rolls. Then centrifugal pa up to 18 ft. in diameter, are used to concentrate the n terial, the lighter substances and slime flowing away the center.

The diamond-bearing concentrates, about 1% of t mass treated, are further concentrated by pulsators, a eventually the residue is passed over a series of vaselin coated vanners to which the diamonds stick, while t other materials pass off.

The comparatively recent discovery that diamonds a here to vaseline meant a great deal to the industry. T concentrates are washed over the vanners by a flow o water strong enough to carry the waste matter awa while only the diamonds adhere. Perhaps 1% escape th plates, but these are caught in the little drains at th bottom, where a certain residue collects that has to b picked over later. The grease is scraped from the plates melted in a cauldron and run off, leaving the gems a the bottom.

Finally the diamonds are gone over by an expert wh knows the grade of a stone at a glance.

Treatment of the Natives

The bulk of the rough work of the mines is done b the Kafirs, some Zulus and convicts—these last distinguished by their white duck suits with a black arrow b way of adornment.

Of course, slavery is impossible under the British flag, but there are those who hold that a system not far short of slavery obtains in the diamond mines of Kimberley. It is said that for a certain sum, a chief will contract to supply so many men for labor in the mines. And once a native is inside the compound, he is a prisoner there for the six months of his contract.

True, he draws wages, from $0.75 to $1.20 per day; but, despite the rosy pictures drawn for the outside public of the happy Kafir who after six months' work, buys himself wives and oxen and settles down as a prosperous farmer, it is a fact that little of this money goes out of the compound with him. Within the walls of corrugated iron, the company maintains its stores, where all supplies have to be purchased.

The wives of natives are not allowed within the compound, but quarters are maintained for them outside, and on pay days, they may come to the gate and, through an official, obtain a portion of their husband's wages.

The compound is simply a large open space surrounded by a high wall and low sheds wherein the men sleep. Much of the life is lived outside.

Diamond Stealing

Where there is no building against the wall, it is roofed in such a way that nothing can be thrown over. Before this was done smuggled diamonds were at times thrown over, in tin cans, to be picked up by the watching wives without.

The laws aimed to check illicit diamond buying cause a great deal of feeling in and about Kimberley. The rigorous searching of natives leaving the mines for the compound does not worry the white people much; but the atmosphere of suspicion with which even the company's officers regard each other is trying to the least sensitive disposition. De Beers detectives are everywhere. An official of the company under suspicion may find that his best friend of a year's standing is a spy watching his every movement.

And if you, in walking along the street in Kimberley, should see a diamond lying in the roadway, you will be well advised to leave it alone, and at most, to report it to the authorities. If it is found in your possession, you will be lucky if you escape seven years or so of penal servitude. De Beers is supreme in Kimberley and rules with a rod of iron. Nevertheless, despite every precaution, illicit diamonds to the value of three quarters of a million of dollars or so are annually sold in Europe.

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Bureau of Mines Oil Department

San Francisco Correspondence

An oil department has been formed by the U. S. Bureau of Mines. The Secretary of the Interior has appointed W. A. Williams, of San Francisco, chief of this department, with headquarters at Washington, D. C. The work of the department will embrace all of the oil-producing states.

The government, it is expected, will control a large amount of oil lands through the proposed leasing system, in which case the new department in the Bureau of Mines will have a large amount of work to do, particularly in California and Oklahoma.

The importance of the position to which Williams has been appointed is great. The government has had no method of obtaining technical information such as will be necessary properly to conduct a leasing system. It has been compelled to depend upon chance and the departments of statistics. There has been some misconception regarding the attitude of the Bureau of Mines in recent litigation brought by the Government for the recovery of oil lands.

The Bureau of Mines is not engaged in gathering evidence for prosecuting these suits. Its purpose and duty are to aid these industries, rather than fight them. The establishment of the department of oils in the bureau will add to its efficiency. Williams has been geologist and engineer for some of the large California oil companies for several years. He graduated from the Stanford University department of geology in 1903. For several years he was chief geologist of the Associated Oil Co. and was recently with the General Petroleum Co. and has appraised their property, as well as that of the Union Oil Co., which was under option to the General Petroleum. Williams will probably proceed to organize his department immediately, and will have the coöperation of the State Mining Bureau, whose work respecting the oil industry will be in harmony with the Bureau of Mines.

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Calumet & Hecla Efficiency Work*

About the time the Calumet & Hecla began to experiment with the "one-man" drill, it also undertook some "efficiency work," that is, investigations to determine how the time was used in machine drilling. For this work the services of a large number of mining-school students and young graduates were engaged. It was desired to ascertain the amount of time occupied in setting up and tearing down machines, in changing steel and in extracting stuck steel, etc., which is regarded as unproductive time. In order to get fair averages, the tests were made to extend over a long period of time under different conditions and with different men.

As a consequence, unproductive work in drilling was largely reduced, with resulting profit to both men and company. The compilation of the valuable data obtained was the means of introducing improvements and economies in many ways.

As a concrete instance, it was found that a large amount of time was lost in changing steel, this for the reason that the miner got his drills mixed. When sharp steel was brought to him in the morning, it was thrown down behind his machine, and when he took out his dull steel he threw it down with the rest, and then had to paw over all the dull and sharp steel when he wanted the next size. This consumed both time and energy, and it was soon demonstrated to be better to set the steel up in order at the side of the drift near the machine, where it was easily visible and accessible.

As might be expected, the work of these "efficiency men" was resented by the union and was the subject of complaint before the Congressional Committee. The miners called the men "school boys." Apparently, the "school boys" were somewhat to blame for this attitude, inasmuch as on their own initiative and without authority by the company they sometimes undertook to stimulate rivalry among the men. They would, for instance, hold stop-watches on two men and tell the slower one how much better the other was. The men considered this an attempt to speed them up and resented it, whereas the company desired only to obtain data that would eliminate useless work and result in benefit to both parties.

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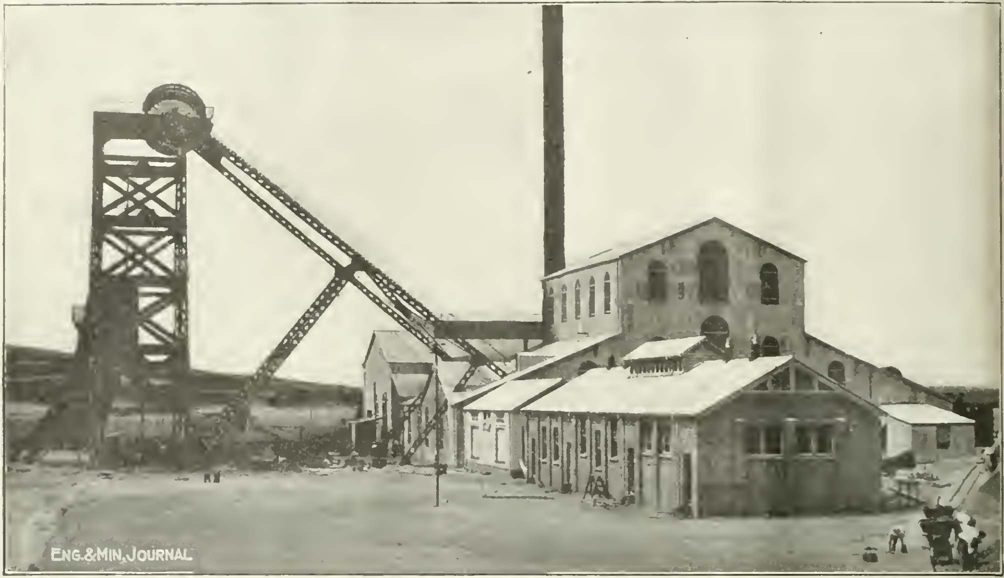
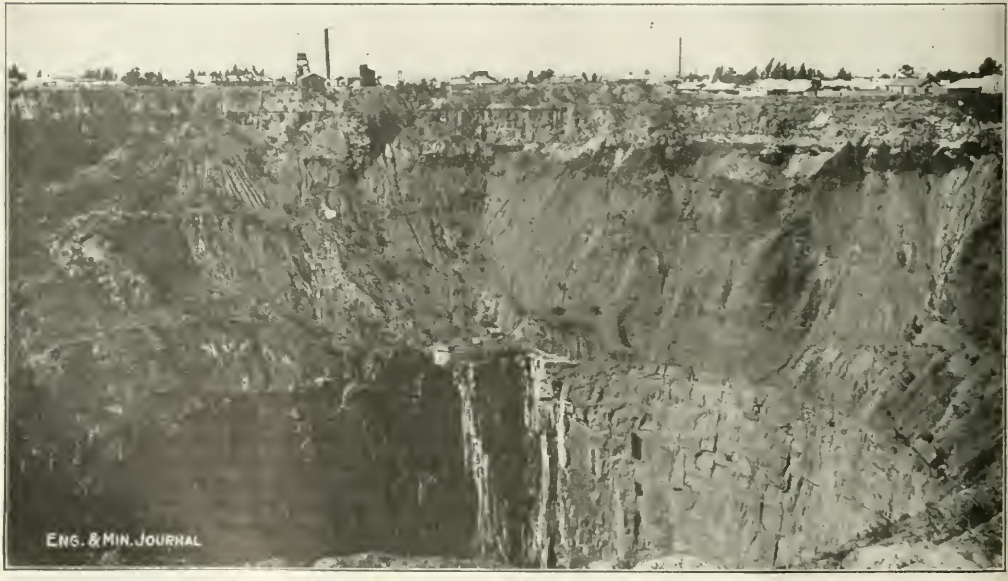
*From testimony given by James MacNaughton, manager of the Calumet & Hecla, before the Congressional Committee investigating the recent strike in the copper country.

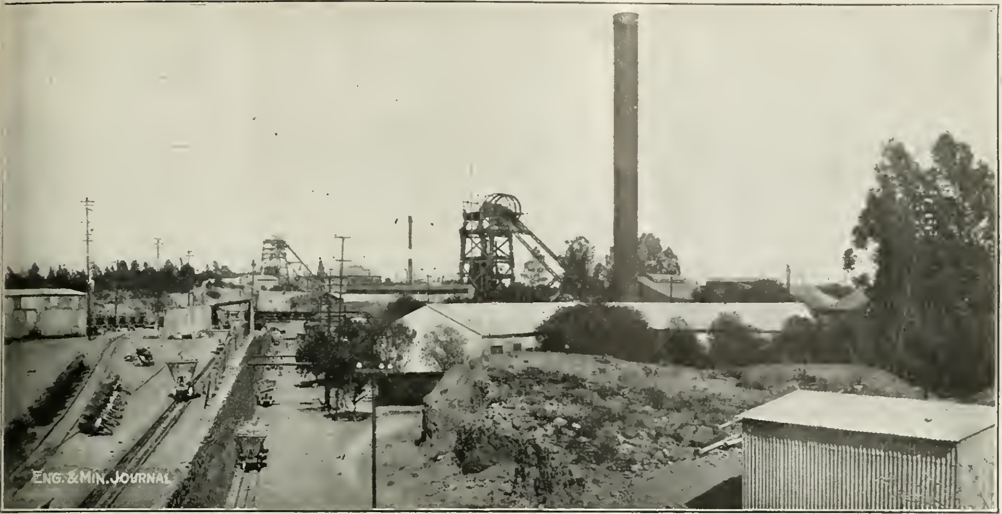
The De Beers Diamond Mines



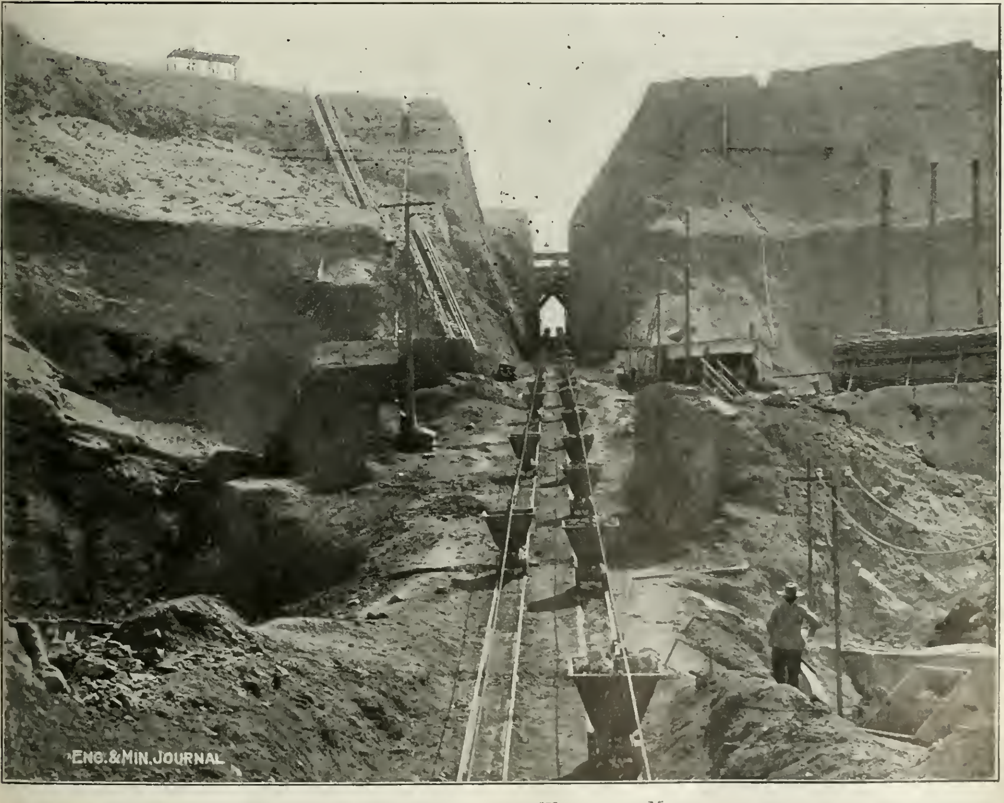
HEADFRAME AT THE DUTOITSPAN MINE
One of the properties of the De Beers Consolidated Mines, at Kimberley, South Africa.



THE GREAT PIT AT THE KIMBERLEY MINE
The total depth from the surface is 840 ft.



HEADFRAMES AND HAULAGE AT THE DE BEERS MINE
Cable haulage has been highly developed in the diamond mines.



HAULAGE SYSTEM AT THE WESSELTON MINE
The company owns five diamond "pipe" deposits, the Kimberley, De Beers, Bultfontein, Dutoitspan and Wesselton.

Correspondence and Discussion

Present Mining Conditions in Mexico

To form an idea of what the mining industry in revolutionary Mexico at present urgently requires, it is necessary to look at the matter from different points of view. The situation is much involved, and the various interests concerned in the industry are often antagonistic.

In many, in fact in most, districts work has been stopped or has been much curtailed. Large numbers of miners and those who live by the miners are without employment. To this are added the facts that in the mountain regions of the western Sierra crops were poor last year, that prices are high now, and that in many places there is actual distress and want.

Many of the mining districts are in isolated places and in desolate country. No other work is to be had; the working people have no reserve funds, and the distances by trail are generally so far that it would be impossible for them to shift their families to some other place, even if work could be obtained there.

The local authorities therefore have on their hands a lot of people clamoring for work, who, if they cannot find occupation, have either to steal or to starve. Among these are many of the best and most useful workmen, who have not allowed themselves to be carried away by promising prospects opened up by the revolution, but have remained to take care of their families. These workmen are to be pitied greatly, as they and their families have often suffered great hardships. These people also include the scamps of the neighborhood, who have been down to the mining camps during the last years of lawlessness and loot; the small merchants from whom the miners borrow their daily or weekly food supply; the parasites, the agitators, those who have been lately converted and have surrendered to the revolutionary cause, and all those who expect to derive benefit through being friendly to the revolution.

The local military government has to satisfy these people as well as the rabble. All, of course, expect to receive impossible benefits from the revolution. It also has to see that funds are provided for current municipal and military expenses. To bring this about, a number of profit-paying mines, especially those belonging to native refugees, are being worked by the government, and promises of protection are being made to foreign companies to re-establish confidence.

If, as a general rule, mines in Mexico could be worked offhand at a profit, either by day's wages or on a royalty basis, the local government, under present conditions of war, could probably oblige all owners to work their mines for an indefinite time. In most districts, however, especially in the bonanza mines, this, unfortunately, is not the case. Rich ores and profits do not occur constantly. Generally it takes much capital and years of exploration and development to put mines in a producing condition, and profitable production will not continue if such investment of funds is not carefully and systematically kept up. This is not likely to be done by a military authority, working temporarily in a mine belonging to other people. His first object is to keep a large number of people profitably occupied, and if, at the same time, an "honest penny" can be made, the chance is not often neglected. The result of such work is that sooner or later the good ores are gouged out, that the working of the mine no longer leaves a profit, that the systematic work of years is destroyed, and that operations to produce future results stop indefinitely.

Most of the principal mining companies have lost considerable amounts of money, during the revolutions of the last three years, in assessments, forced loans and contributions collected by various factions or by looting bands. The mines of native silver and gold have moreover lost large amounts by direct robbery. For instance, in the mines of Batopilas, Chihuahua, hundreds of thousands of pesos have been stolen from the mines by thieves. Against these thefts, there was no protection, and there has been no redress. Only in April last, looting bands were carrying off the products from the mills.

No company, and especially no company working bonanza mines, can invest capital unless there is a certainty of permanent protection, not only now, but for years to come. This protection necessarily includes: The guarantee that the mines can be worked exclusively according to the companies' systems and plans, without outside interference; full assurance that only such workmen and people shall enter the mines as the companies may chose to employ or permit; proper protection against thieves and their operations, and proper punishment of culpable parties.

No company can invest money, start new work or develop new property when other people are allowed to take the benefit of their years of labor. It would be ridiculous to do work under such conditions. It is, of course, necessary that these and other local conditions be thoroughly explained to the new general and local governments. The true inwardness of mining conditions is different in each locality and therefore not generally understood. Even with the best intentions, a business which it has taken years to build up can be broken up in a short time through want of practical knowledge.

To explain matters in a clear and effective manner, plain talk is absolutely necessary, and, under present conditions in Mexico, plain talk is not always appreciated. People are sensitive and complaints are apt to be locally resented and to be laid to antagonism to "the cause," or to personal enmity. Still, present conditions and requirements will have to be thoroughly understood by the Constitutional Government before protection, such as foreign companies need, can be expected to be granted. It is, however, hardly possible at this present moment for every single mine operator to explain to the new government, and for the forever-changing officials to study out all the difficulties that have arisen or are oming up from day to day. A single mine often may ot be important enough to influence administration hanges, even if it were inclined to weigh all suggestions resented and to favor all requests of foreign operators.

The best and most effective way would be to present uggestions and complaints through an association or ureau of foreign operators. This would eliminate the ersonal equation and local resentment, and would give very suggestion, indication or complaint far more eight. It would also, in any future operations, avoid he personality of separate agreements which might bind he operator without insuring him the fulfillment of romises locally made. There is no doubt but that the eneral and state governments of the Constitutionalists ould welcome any suggestions made through such a hannel. It would give a more general view of conditions than could be obtained in any other way; conditions which have to receive due consideration if mining s to be resumed with the aid of foreign capital on the cale of former years.

I present this suggestion to foreign operators as an id toward a better and fuller understanding between oreign mining companies and the Constitutionalist Government, believing that it may help to bring about a mutual understanding, without which, in Northern Mexico, mining is not likely to flourish for some time o come.

WALTER M. BRODIE.

Brielle, N. J., June 24, 1914.

What Becomes of All the Mining Engineers?

Any misguided notion of wholesale competition with libraries and bibliographers has long since vanished from my mind. I am perfectly willing to contribute my mite toward the demand which enables their livelihood, confining direct attention to one periodical, and imposing on it the obligation of keeping me informed as to significant events in mining. All unwittingly the JOURNAL has borne this responsibility for years, and done so most admirably.

Nor do I wish in the present allusion to imply any essential shortcomings. I wish simply to ask a question and to import true significance to it in the importance of its setting. Why publish such piffle as that appearing in a recent issue under caption of "What Becomes of All the Mining Engineers?" If the writer had prefaced his remarks with an accurate, comprehensive definition of the species for purposes of identification when encountered, some enlightening observations might have been recorded from time to time. Possibly an answer might have occurred even to the writer himself before the completion of his preface.

It is most gravely unfortunate for the best interests of educational institutions that their limitations are not fully appreciated popularly. Fertilizing and tilling the soil will not produce peaches on a pumpkin vine. In fact the pumpkinny element will only be increasingly emphasized thereby. Naturally this is no argument against cultivation, however strongly the disgusted experimenter with cultivated pumpkins may have been led to feel. Experience as instructor in a mining school will shortly convince anyone, if conviction be necessary, that the laws of nature are common to farm and college alike—namely, that the best to be hoped for from cultivation is a better crop of peaches on a *peach* tree. Moreover, it matters not by what terms you designate the cultivated product of farm or college; the consumer will recognize the true quality shortly, once it comes into his hands.

What becomes of all the mining engineers? Glancing over an alumni list, a round hundred familiar names of one-time seedlings appear. Of these, some 15% the cut worms got after shortly, among them a certain name which stands out conspicuously in the present connection. Another 25% early developed runners and other unmistakable signs. Despite unmistakable signs, however, after a four-year period of cultivation and grafting, an "E.M." label was attached to the 25 as a matter of formality along with the 60 more or less well formed saplings, and all were shipped off variously for planting and development as fruit bearers. With about a third of the 60, it appears from subsequent events, the grafting did not take, and they went entirely to wood. Some eight or 10 others seem to have been totally unable to withstand the rigors of the climate, and another 10 or 12 have apparently been incapable of marked headway against it. Of the 100 about 20 have become active producers.

"By their fruits ye shall know them," applies to mining engineers quite as well as in its original context, and furnishes the sole truly selective identification for the species. By their fruits you may go further also and keep track of what becomes of them. Out of the 100 entries then there are 20 actual mining engineers, all of whom may be accounted for pretty much any time. Of the rest, some have doubtless been recognized in their misnomer characteristics and cleared out, leaving no record save a lasting one of discredit to their Alma Mater and to the profession at large; and others have been left neglected where first planted out to accumulate dead wood, and finally die off completely. But the fate of such is not properly involved in the question since they were never mining engineers despite shipping labels. And as to the demand for mining engineers, there is and always will be demand for the real stuff. If the aspirant will concentrate not on external conditions of demand, but on internal ones of fitness, and if institutions of learning will exercise a full measure of discrimination in choice of materials, eventualities may safely be left to care for themselves. Among candidates I have seen men who have afterward become mining engineers in fact, and who at the time gave every assurance, cut off because they could not meet some inconsequential arbitrary requirement. Meanwhile, others whose real qualifications for the future were utterly hopeless were held simply because they managed to fulfill or dodge those same arbitrary requirements, and at length were foisted on the no longer unsuspecting public. The roll call shows up as well for the mining profession as for any other, but there is food for contemplation in other directions.

C. G. GILBERT.

Washington, D. C., July 5, 1914.

Cultivating the Safety-First Idea

Few movements in recent years have attracted so widely the attention of the people or have been so enthusiastically carried forward as has the propaganda for

"Safety First." Nevertheless, the adoption of safety precautions runs against difficulties. No desultory, spasmodic efforts, for instance, succeed. Your independent working man (and Heaven knows how independent he can be!) regards such as little less than periodic aberrations on the part of the management, and resents them as personal interferences. Nothing excites more contempt among his kind than a half-hearted attempt at carrying out a policy so important as the regulation or correction of his methods of working.

The way to lead the workman to think of safety first and to act accordingly, is to compel him to obey sensible and practical rules, and to penalize disobedience. It is an axiom that behind laws shall stand force. In no other way can a wholesome respect for the laws of safety be inculcated. Without such enforcement, the most beautifully printed set of rules becomes a toothless futility, and the mild expostulation of his foreman, an insufferable impertinence.

J. Fred Older.

Angels, Calaveras County, California, May 28, 1914.

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The Flotation Decision

Few of your readers will agree with the sentiments editorially expressed in the Journal of May 23, on "The Flotation Process."

It may be true that, "The whole spirit of the American mining industry is one of freedom in the application of processes, the exchange of information for the benefit of everybody, and an abhorrence of royalties and objection to monopolies," but why should the metallurgist, or patentee of a process or apparatus, be the special object of comment, when he, above all others, has less of governmental protection for his efforts and expenditures than any other class of citizen?

Both the patentee of a metallurgical process and the patentee of mining property get their monopoly from the government, and probably of the two, the patentee of a metallurgical process has the better claim. It would seem eminently fair that the mine owner should be given the same monopolistic privileges enjoyed by the patentee of a metallurgical process, and have his patented lands revert to the government at the end of 17 years.

Why should it be any more abhorrent for the mine owner to pay a royalty for the use of a patented process, than for the patentee of the process to be deprived of that part of the public domain patented by the mine owner? If an average legal decision might benefit the patentee of a metallurgical process, as the article suggests, might it not also benefit the mine owner if his patented lands were to be thrown open to the public by court proceedings or legislative action? Is it not just as abhorrent for a lessee to pay a royalty on the ore extracted from a patented mine as for the mine owner to pay a royalty on a patented process to extract the metal from the ore? If one might be benefited by the loss of his monopolistic privileges, should not the other be benefited also?

It would be extremely interesting to many of your readers if the writer of the editorial would show just why patented lands should not be given the same monopolistic privileges as is now possessed by the patentees of metallurgical processes and apparatus, and at the end of 17 years become public property. When the essay has been finished, he will no doubt conclude that the patentee of a process or apparatus is not fairly dealt with as co pared with the beneficiaries of other governmental pri leges. It usually takes as much time, patience and mon to develop a metallurgical process as it does to develop mining property. There is no argument in favor one that is not just as applicable to the other. Monopo it is true, is distasteful, but let us at least be consiste for consistency, as someone has said, is a fair jewel.

W. E. Greenawalt.

Denver, Colo., May 28, 1914.

[Respecting the number of our readers who agree disagree with the sentiments of our editorial we shall n argue. The patentee was the special object of comme in view of patentees' proneness to claim (often in go faith) that to which they are not entitled, the U. Patent Office conniving, innocently, we will admit. M Greenawalt's analogy of the patented lands is so impe fect as not to be an analogy at all. In our remarks r garding royalties on processes, we may have failed convey our meaning. We did not mean that a real inve tor is not entitled to a royalty on his invention, but w did mean that persons engaged in the mining and meta lurgical industry are averse to paying a royalty per to of ore. We merely stated a fact. Why it should be w shall not attempt to pronounce. It may be that th patentees are considered to be exorbitant; it may be tha there is an aversion to the exhibition of private book The Thomas-Gilchrist basic bessemer patent is the onl major metallurgical patent successfully exploited in th United States on a royalty-per-ton basis. The Huntin ton-Heberlein patents were sold outright. Patented ma chines are usually sold at a price which includes royalt

We have been speaking of things that are real inve tions. These are rare. What often concerns the publi are the alleged inventions, the quasi-inventor and actua patentee being only a developer of some old idea, althoug he may be quite sincere in his belief of his originality In its attitude toward these the public is favorable rathe than adverse. There are important processes in use toda and recognized financially by the users, which probabl would be rejected by the courts if the users were induce by unreasonableness to contest them. In paying for thes the users really recognize engineering services, not patent rights. The particular patent plague that is annoying, however, is the combination of some well know steps that would naturally occur to almost anybody verse in the art and the attempt to hold up somebody becaus an ignoramus in the Patent Office has allowed a patent

We often marvel why people spend so much money in taking out patents on anticipated or inconsequentia things. Some reasons are known to us. Many persons who think they have made an invention lose all sense of perspective. Some like to put their ideas officially on record and consider a Patent-Office fee to be well spent for that purpose. Some think there may be enough in their ideas to induce someone else to buy their patent to get it out of the way. Some may be contemplating the organization of a company and need papers to turn in, whether or not they really be worth anything. Another reckons on getting his profits while the going is good and figures that a worthless patent may be a certain protection in the meanwhile. After all, it is only the great patents, like the cyanide patents, the roasting-furnace patents, the filter patents and the flotation patents that are fully tested in the courts.—Editor.]

Editorials

The American Mining Congress

A committee, comprising Hennen Jennings, James Douglas, D. W. Brunton, Samuel A. Taylor, M. S. Kemmerer, Harry L. Day and Carl Scholz, the list of which comprises some distinguished names, lately issued a report respecting the affairs of the American Mining Congress, and for the first time there is published, so far as we are aware, a financial statement of this organization for a long series of years. From this it appears that during the period 1905-13, both years inclusive, this organization has run behind to the amount of $11,100, which deficit is owed to the secretary, James F. Callbreath, for arrears of salary. The committee says: "The original agreement with the secretary in 1905, was that for three-fifths of his time, he was to receive $300 per month. In 1912, the directors, in consideration of his devoting his whole time to the Congress' affairs, considered he was thoroughly entitled to $500 per month. Since starting the work he has conducted the financial end of it on the principle that the Congress' indebtedness should be limited to himself."

Means for improving the financial situation of the organization are now being considered. It has been proposed to create a corporation class of membership and a canvass among the corporations is to be inaugurated. The committee says: "Should no encouragement be given to the project by these representative men, it would then be well to face the fact and drop our political program and office at Washington at once."

The accounts submitted with the report of this committee are carelessly compiled and will be distressing to the expert accountant. However, it is not worth while to enter upon minor or technical criticisms. The most important thing is an examination of the income. This rose to $14,949 in 1908, fell to $8666 in 1910, rose again to $12,916 in 1912 and fell to $8465 in 1913. This shows an absence of steady interest in the organization. The direct income from memberships and dues reflects a similar condition. Life memberships, at $100, yielded $1500 in 1907, in 1911 but $100, and in 1912 and 1913 nothing at all. Memberships ($15 initiation) yielded $3315 in 1908 and only $405 in 1913. The income from these sources is hardly to be expected to increase from year to year. Indeed, such compounded, anticipatory payments ought not to be treated as income at all, but only the amortization of them during the life-expectancy of the payer should be so regarded. Most important is the membership dues of $10 per annum. These rose to $4743 in 1908, dropped to $2843 in 1909, rose to $5859 in 1912 and declined to $4763 in 1913. The membership fee being $10 per annum, we may assume that the American Mining Congress had a membership of 525 to 550 in 1913, this after 15 years of existence and after nine years of rejuvenescence, which began in 1905-6, progressed well up to 1908 and then halted. Even in the more prosperous days the largest item of revenue was the contributions from towns where the annual convention was to be held. In several years there have been "contributions for special work," these amounting to $2124 in 1912.

The American Mining Congress previous to about 1905 was not an altogether reputable organization. About that time a sincere effort was made by Hon. J. W. Richards, of Boise, Idaho, for many years its president, and J. F. Callbreath, of Denver, Colo., long its secretary, to elevate the organization to a healthy and useful plane. They had high ideals and as we conceive them, those ideals were meritorious. They were nothing less than the creation of an organization which might speak for the mining industry. The conception was bold and theoretically it was appealing. What could be more useful than an annual convention of representative mining men assembled to discuss the problems affecting them and exerting pressure upon legislators to secure what the industry needed? In fact this kind of work did secure the creation of the U. S. Bureau of Mines, the one great accomplishment of the A. M. C.

However, as an exponent of the mining industry, the American Mining Congress signally failed, as is manifest from its membership record. An organization which cannot maintain the interest of a considerable membership to the extent of payment of dues lacks the elements of success, and, of course, the 500 or 600 dues-paying members that the American Mining Congress has numbered out of the whole mining industry of the United States is ridiculously few. Yet the officers of the Congress have been earnest and sincere, while Mr. Callbreath, the secretary, has been almost quixotic in his self-sacrificing devotion.

With its establishment of a Washington headquarters a few years ago, the Congress began to tread the dangerous path of lobbying. When any organization of this kind begins to express its opinion as an organization and urge that opinion, there is likely to be scattered the seeds of dissension. Such may be done by a small and homogeneous organizations like the Mining & Metallurgical Society and the American Institute of Consulting Engineers, wherein the procedure is very formal and deliberate, with an opportunity for every member to vote and a stern avoidance of political controversies, but not in a large, loose and heterogeneous association. For this reason the American Institute of Mining Engineers has heretofore refrained wisely from expressing any opinion, and so certain is our conviction of the wisdom of its traditional policy that it is with alarm that we have lately observed some yielding of its management to temptation. A trouble of the American Mining Congress in this respect has been that it has not been representative. Even if it had been, it could seldom have hoped to be unanimous. There is no question about the unanimity of the brewers and distillers in lobbying against the prohibition movement, but upon what question will the miners, with their diverse and far greater interests, stand alike? Suppose we were back in the days of the silver question, would the iron miners of the north have stood with the silver miners of the West? Probably there was never a resolution adopted by the American Mining Congress that represented undivided opinion. If there is going to be lobbying, what are the members of the other view going to do? Quit the organization, of course. Nobody is going to pay dues to an organization that is opposing his own interests. Upon the next question there will be a new division and subtraction. The history of such an organization would be like that of the ten little injuns. Indeed, the American Mining Congress appears to have abandoned this course.

Its latest prospectus is to constitute itself a Washington bureau of information, undertaking to keep its members informed respecting pending legislation, to bring to the attention of the respective bureaus in Washington and the congressional committees matters that interest persons engaged in the mining industry, the conception being that a communication from the organization will have more weight than from an individual. For example, a group of Cunningham claimants might become involved in the red tape of the Land Office, which a miners' agency in Washington, versed in red-tape tangles, might aid in solving. In other words, the American Mining Congress might become an intermediary between official Washington and the mining people. The committee mentioned at the beginning of this article sees something in this program, but announces bluntly that it must be dropped if sufficient financial support be not offered.

There is one thing certain, namely, that Mr. Callbreath should be paid the $11,100 that was owed him on Oct. 1, 1913. As the committee says, "The sanguine, self-sacrificing work of the secretary has kept the organization in existence." Whatever be its future, the organization ought promptly to square its debt to him.

Feeding Blast Furnaces

The method of feeding blast furnaces is a subject of almost perennial discussion, because the conditions prevailing at different works usually impose a solution having special reference to local requirements. The feeding of lead blast furnaces, however, has become more standardized than is the case in copper smelting, although mechanical charging was earlier introduced into copper-smelting practice.

At most lead works the present practice is to drop the charges from large cars that are run directly over the furnace; these cars, which approximate the length of the furnace, are usually charged with the furnace stock from small barrows, and then proceed under their own power to the furnace-feed floor; when the latter is on a higher level, the charge car is raised on an incline by an electric hoist, or vertically, by a platform elevator, after which it proceeds under its own power to a position directly over the furnaces, the gases of which are drawn off below the feed-floor level. This general scheme is followed even in lead plants that are using mainly a sintered charge.

At copper plants, on the other hand, the charging arrangements are more varied, although nearly all copper works employ mechanical charging in some form. The method of charging the new 40-ft. furnaces at the Calumet & Arizona smelting plant, illustrated on page 104, is interesting. The change cars in this instance operate in connection with a bedding and belt-conveyor system that delivers the furnace stock into bins at the sides of the furnaces. The charge cars operate under their own power, but merely run a few feet from the charge bins to the furnace doors. As the cars do not leave the feed floor, the system eliminates the danger and confusion caused by charge trains running through a furnace building at high speed.

The Diamond Trade

Slack times, both in Europe and America, have seriously affected the diamond market, and sales in the past year have fallen off materially, as those of luxuries are apt to do when money is scarce. The control of the diamond trade for years has rested between the London Syndicate and Amsterdam, but recently a third interest has come in in the shape of the Antwerp dealers, who have built up an important trade in precious stones. This has been large enough to make their influence felt in the trade, and has put the Belgians almost on a par with the Amsterdam dealers. The control of the London syndicate is with the DeBeers company, which is the foremost producer and likely to remain so. The threat that the Premier Diamond Co. as an independent seller of diamonds would flood the market and break the established control has never been carried out. That and other outside companies seem to have realized that any break would be more disastrous to them than to their competitors, and they have been content to let the old syndicate regulate prices.

The Antwerp dealers have handled most of the diamonds from German East Africa, the quantity of which has come to be of some importance. They are generally possessed of large capital and may be able to tide over the present period of decreased demand and increased production, which does not look altogether propitious for the trade.

Diamonds, as we all know, have only a very limited use in the arts, which would be satisfied with a very small production. Nevertheless they have retained their hold on men's imaginations for centuries and this has been enough to give them a value in trade which has made the mining of them one of the most profitable of mineral industries.

Southern Iron Rates

The recent decisions of the Interstate Commerce Commission on pig-iron rates from Alabama and Virginia furnaces should be of much importance to those producers. In both cases the Commission holds that the old rates have been unreasonable and have tended to discrimination, and orders that they be reduced. The difference in the new rates in apparently not large—from 10 to 15%—but it is sufficient to put the Southern iron makers on a much better competitive basis with the Pittsburgh district and the Mahoning Valley in the West, and with the Buffalo and Lehigh Valley stacks in the East.

As is well known, the Alabama furnaces, outside of the Tennessee Coal & Iron group, are chiefly merchant furnaces, supplying foundry iron to the East and also to the Northwest, while the Virginia makers are also merchant furnaces sending foundry and basic iron into the seaboard territory. The quality of their product is not questioned, and their sales at seasons when trade is inclined to be slack depend almost entirely on the rates they can make to purchasers. The new rates will enable them to meet Northern competition on equal terms, and still maintain a fair price at furnace, which has not always been possible. Whatever the railroads may think, the furnacemen should certainly be satisfied with this decision.

⁂

Oil booms seem to be in fashion now all over the world. The latest is in Japan, where the Japan Petroleum Co. recently completed a well at Kurokawa, Akita district, which proved to be a gusher, yielding 400,000 gal. a day. The news caused extraordinary excitement on the Tokyo Stock Exchange, and the company's shares rose from 86 to 200 yen in a very short time; and would have gone further, but the Exchange officials ordered dealings suspended. Prospecting and drilling in Akita have been greatly stimulated.

⁂

The index to Vol. XCVII of the ENGINEERING AND MINING JOURNAL is mailed with this issue. Any subscriber not receiving same should notify the subscription department at once.

BY THE WAY

A London dispatch to the *New York Times* says that the final valuation of the estate of Sir Julius Wernher, which is now being concluded, will occasion great surprise. It was provisionally valued at $25,000,000, but it is understood that the revised estimate will set the value at more than $57,500,000. As the estate of Alfred Beit was finally proved at about $42,500,000, the two chief partners of Wernher, Beit & Co. made during their lifetime $100,000,000 between them. The Wernher fortune is easily the record for a South African magnate. It is unlikely that its total will ever be equaled by any other fortune taken from the Transvaal mines.

⁂

American industry is threatened in a new quarter. It appears that out in Bingham the canny Italians are getting tips for their acetylene mine lamps direct from Sunny Italy, and the local stores cannot obtain them at a competing price. The explanation is probably that thrifty cousins in Italy of the thrifty Italians here send over tips in letters, thus escaping the payment of duty; and it is also possible that some Italian mines may distribute tips to their men without charge and that a proportion of these find their way to America. Against such competition, the American acetylene-mine-lamp-tip industry would seem to stand small chance.

⁂

Entomology and metallurgy appear to be as unrelated as two branches of science can be, yet such is not the case. Heretofore, the bee industry has been a profitable one in Mason and Smith Valleys, Nevada. This spring, for some unaccountable reason, the bees died in such numbers as to entirely destroy whole stands. Of course, the farmers immediately blamed the "smoke" from the Thompson, Nev., smelting plant, but bees died at such a distance from the smelting works that its fumes could not possibly have been the cause. An investigation of probable causes of the bee trouble, writes an engineer, has led to the discovery that the blossoms of all the wild flowers, sage brush and alfalfa, were filled with small insects known as thrips. The thrips have also been found on the bees, hence a clue. Entomologists from the University of Nevada are making an investigation, and their report is awaited with interest.

⁂

In the Senate's hearing of the Gold Hill case, the following letter from W. G. Newman to the Comptroller of the Currency was produced:

> Jan. 14, 1914.
>
> My Dear Mr. Williams: You will see by the enclosed that I have made my trade that I was so anxious to make with you, but not without you, because I admire you and with a man like you, with the properties I control with Mr. Phillips, we can make millions upon millions, because I am in nothing but what is beyond question. Our holdings in Nevada to-day are enormous and just becoming dividend payers.
>
> The property Mr. Phillips and myself control in Alaska is greater than that controlled by the Guggenheims and Morgan and the Standard Oil Co. all combined. My Gold Hill mine is a wonder, truly.
>
> When the clouds roll by and you have a quiet moment I will show you where we can make the City Bank crowd look green with envy. Tennessee Copper will pay $4 in 1914 and $1 extra, $5 sure. This is private. At 50 the stock is a 10 per cent. dividend payer. So get a few of your friends to buy some and let you vote their stock.
>
> I am in a position to promise you everything you want in the company in the way of officers, excepting the presidency. This must be strictly private. You know I don't know what failure means, never having made one at anything I ever undertook.
>
> Please name your time and place and I will be at your service with the facts.
>
> I congratulate you now on your new office, as it's yours, I know.
>
> Yours very respectfully,
>
> W. G. NEWMAN.

Now we wonder what those holdings in Nevada are? Also, is the tip on Tennessee Copper still good?

⁂

In the investigation of the recent miners' strike in Michigan, the question of socialism came up. Congressman Casey asked Mr. MacNaughton whether the companies were going to make it a condition of reemployment that the men give up their membership in the Socialist party. Mr. MacNaughton said they were not. The chairman wanted to know about "red socialism," asking why, if the miners were going to have to give up their Western Federation cards, they should not have to give up their affiliations with red socialism. Mr. MacNaughton said the companies might like to make them, if they could distinguish between the different shades of socialism. He said he prided himself on being something of a socialist, but did not think he was a red one. He assumed that red socialism was militant socialism, the enforcing of its doctrine by violent means. He didn't think he would fight for the socialism he believed in, although he might consider that.

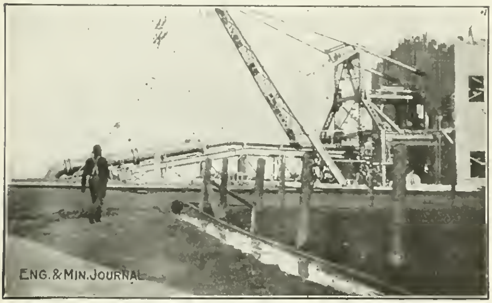
Later on an attorney for the strikers crossexamined Mr. MacNaughton on his socialism. He asked him whether the adjective "red" might not be taken to signify the red blood of brotherhood, rather than that of war. Mr. MacNaughton said he hadn't heard that meaning attributed to the word, and very much doubted whether that was the sense in which it was used.

We are inclined to agree with Mr. MacNaughton that it is beyond the power of ordinary intelligence to distinguish the different colors of socialist doctrines. It is enough to keep an ordinary brain busy distinguishing between the I. W. W., socialists, the Western Federation of Miners, and the Butte Mine Workers' Union.

Calumet & Hecla to Leach Tailings

HOUGHTON CORRESPONDENCE

By far the most interesting and perhaps the most important development that has occurred in the Lake Superior copper district in several years, at least, is the leaching process of the Calumet & Hecla company. Full details are not available now and will not be for some time, but enough is known to foreshadow its importance. A short résumé of its growth may be of interest. In the early days of mining at the Lake, mill methods were decidedly crude as compared to present day practice. The mill tailings of those and even later days carried what would now be considered very low-grade rock—from 6 to 8 lb. of copper per ton, and upward. Simply for comparison, it has been stated that if the Franklin mine last year had averaged 12½ lb. copper per ton of rock, the results would have made both ends meet. To go back—the Calumet & Hecla was one of the mines whose lode was rich—and also the tailings—and these tailings have lain for years at the doors of the mills on Torch Lake. The first step in the recovery of their contents was the original regrinding plant built by this company, adjacent to the mills. This plant was designed to handle the tailings as they came from the mills, every day, and has proved entirely successful. The second regrinding plant was designed to handle the tailings which had lain in the lake all these years. The problem of getting these sands from the lake to the plant on shore is expected to be solved by the use of a large suction dredge which has been furnished by the Bucyrus company and is now being erected at Lake Linden. The accompanying photograph shows the outrigger end of this, containing the suction pipe which leads to the large Morris centrifugal pump on the dredge. The steelwork is exceptionally heavy—in fact, looks more like very heavy bridge work than dredge construction. This is possibly accounted for in the fact that the dredge is expected to do duty for 30 years.



BUCYRUS SUCTION DREDGE AT LAKE LINDEN

But even with the regrinding plants, the tailings would still contain enough copper to make its recovery worth working for and the leaching process is intended to accomplish this. About all that can be said of it at present, is, that it has proved successful on a small scale, and is now being installed on a large scale. The process itself is said to be extremely simple. A number of sheet-steel tanks, 54 ft. diameter and 20 ft. deep, with removable covers are to form a portion of the equipment and it is said that the chemical employed is an ammonia solution which has no effect on anything except the copper; also that it can treat profitably any sands containing 6 lb. or more of copper per ton, at a treatment cost of about 35c. per ton.

If the final results of this process, working on a large scale, are what are expected, the effects are bound to extend beyond the Calumet & Hecla. For instance, the Franklin mine, it is conservatively estimated, has about 4,000,000 tons of such sands, running from 6 to 8 lb. of copper per ton. Of course, this process may not be the last word in Lake Superior mill practice, but a final tailings content of two pounds of copper per ton would seem to be about as fine as the process of recovering copper from these low-grade ores could be carried.

*

Geological Survey Appropriation

WASHINGTON CORRESPONDENCE

The Government appropriation for the Geological Survey, covering the coming fiscal year, has been enacted into law. The total is $1,355,520.

The salaries for the director's office are: Director, $6000; chief clerk, $2500; chief disbursing clerk, $2500; librarian, $2000; photographer, $2000; increased by salaries of assistant photographers, clerks, copyists, watchmen, janitor and messenger boys to a total of $35,340. The salaries of scientific assistants are: $4000 each for two geologists, $3000 for one, $2700 for one; $2000 each for two paleontologists; $3000 for a chemist; $2700 for one geographer, $2500 for one; and $2000 each for two topographers.

The purchase of not more than four motor vehicles at a total cost not exceeding $2800 is authorized and the purchase of 16 horse-drawn vehicles at a total cost not exceeding $2400.

The appropriation for skilled laborers and temporary employees is $20,000; for topographic surveys, $350,000; for geologic surveys, $400,000; for chemical and physical researches, including investigation of conditions favoring deposition of potash salts, $40,000; for preparation of illustrations, $18,280; for preparation of mineral-resources report, $75,000; for water-supply investigations, $300,000, $100,000 of this to be used for well-boring tests in arid regions; for the library, $2000; for engraving and printing geologic maps, $110,000; and $75,000 for topographic survey of forest lands.

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Rio Tinto Labor Troubles

According to a Spanish correspondent of the London *Mining Journal*, the "labor conflict at Rio Tinto is getting dangerous again. The relationship between the company and the workmen, which for so long has not been a hearty one, has reached a difficult point. He says: "It is not so much a question now of wages or of the precise claims made by the workmen as of the general atmosphere, and that will continue until the politico-economic system, maintained by the company, suffers a complete transformation."

"The strike committee recently took a very grave step.

They called on the workmen to employ *sabotage*, in order to reduce production from 6000 to 1000 tons a day. The company answered by announcing a lockout. The Government has sent to Rio Tinto a member of the Institute de Reformas Sociales, who, after studying on the spot all the circumstances, claims and rights, will propose a final solution. I may say that this commissioner has a modern spirit and training, and is familiarized with the Socialist movement and carries great authority on the subject. The lockout of the company is no doubt an efficacious solution, as the workmen have suffered badly; but it is at the same time a dangerous system of a doubtful social morality, and as the causes are not removed, trouble may arise again at any moment. The present time is precarious, and the solution adopted will decide the future of these wealthy fields which an erroneous management is threatening to make barren."

Salt Lake Meeting of the A. I. M. E.

The annual summer meeting of the American Institute of Mining Engineers is to be held in Salt Lake City, Aug. 10 to 14, inclusive. The Hotel Utah will be headquarters and reservations may be made through Duncan MacVichie, Newhouse Building, Salt Lake City.

In addition to the technical sessions and sight-seeing trips around the city, trips are planned to the mines at Bingham, the Magna and Arthur concentrators, the Garfield smelting plant, the A. S. & R. smelting plant at Murray, the United States Smelting plant at Midvale, the plant of the International at Tooele, the mines at Park City and the Tintic mining district. Other pleasure trips are outlined, particularly for the visiting ladies, and there will be a banquet on Friday evening, Aug. 14. The papers to be read at the various technical sessions are as follows:

Monday, Aug. 10, 8:30 p.m.: F. W. Bacorn, "An Amendment to Sales' Theory of Ore Deposition;" C. W. Goodale, "Drumlummon Mine, Marysville, Mont.;" I. B. Joralemon, "The Ajo Copper-Mining District;" Stuart Croasdale, "Leaching Experiments on the Ajo Ore;" Frank R. Van Horn, "The Occurrence of Bournonite, Jamesonite and Calamine at Park City;" Howland Bancroft, "Dip Chart;" M. N. Alling, "Ancient Auriferous Gravel Channels of Sierra County, California;" B. S. Butler and H. D. McCaskey, "Copper Ores of the New London Mine;" George A. Packard, "Rope Idlers for an Incline Shaft;" Arthur Crowfoot, "Development of the Round Table at Great Falls;" Frederick Laist and A. E. Wiggin, "The Slime Concentrating Plant at Anaconda;" H. A. Wentworth, "Electrostatic Separation at Midvale.

Tuesday, Aug. 11, 8:30 p.m.: R. D. Divine, "Separation of Lead, Zinc and Antimony Oxides;" W. H. Howard, "Electrical Fume Precipitation at Garfield;" H. H. Alexander, "The Bag House in Lead Smelting;" L. D. Anderson, 'Effects of the Bag House on the Metallurgy of Lead;" Lawrence Addicks, "Nodulizing Blast-Furnace Flue Dust;" E. L. Newhouse, "Lead Smelting at East Helena, Mont;" W. W. Norton, "A Comparison of the Huntington-Heberlein and Dwight-Lloyd Processes;" G. P. Hulst, "The International Lead Refining Plant;" Irving A. Palmer, "Smelting Lead Ores in the Blast Furnace;" Dorsey A. Lyon and S. S. Arentz, "Losses of Zinc in Mining, Milling and Smelting;" S. E. Bretherton, "Treatment of Complex Ores."

Wednesday, Aug. 12, 8:30 p.m.: Earl S. Bardwell, "The Effect of Annealing upon Refined Copper;" C. D. Demond, "Economy and Efficiency in Reverberatory Smelting;" E. Horton Jones, "Unit Construction Costs for the New Arizona Copper Co. Smelting Plant;" Frederick Laist and Harold W. Aldrich, "Experimental Leaching at Anaconda;" Frederick Laist and F. F. Frick, "Precipitation of Copper from Solutions at Anaconda;" Dorsey A. Lyon and Robert M. Keeney, "Melting of Cathode Copper in the Electric Furnace;" C. R. Kuzell and I. H. Wigton, "Curves for the Sensible Heat Capacity of Furnace Gases;" L. O. Howard, "Basic-Lined Converter Practice at Old Dominion Plant;" O. Kuchs, "Lead Matte Converting at Tooele."

Thursday, Aug. 13, 9:30 a.m.: T. P. Holt, "Chloridizing-Leaching at Park City;" A. W. Allen, "Descriptive Technology of Gold and Silver Metallurgy;" W. F. Ward, "Playa Panning on the Cauca River;" J. V. N. Dorr, "The Dorr Hydrometallurgical Apparatus;" G. H. Clevenger, "Discussion of James Johnston's Paper, "Mill and Metallurgical Practice of Nipissing Mining Company, Ltd., Cobalt, Ont., Canada;" Robert S. Lewis, "The Book Cliffs Coal Field, Utah;" J. P. Hodgson, "Mining Methods at the Copper Queen Mines;" R. H. Bedford and William Hague, "Tests of Rock Drills at North Star Mine;" Robert Livermore, "Draining Kerr Lake;" Sidney L. Wise and Walter Strache, "The Design, Construction and Cost of Two Mine Bulkheads;" Carl Allen, "Methods and Economics in Mining;" H. M. Chance, "The Appraisal of Coal Land for Taxation;" E. D. Gardner, "Mining Claims Within the National Forests;" R. W. Raymond, "Biographical Notice of Louis Janin.

The chairmen of the various committees at Salt Lake City are as follows: General, R. C. Gemmell; transportation and accommodation, Duncan MacVichie; program, Alfred Frank; entertainment, C. W. Whitley; press, Ernest Gayford; ladies' entertainment, G. B. Wilson. The chairman of the Bingham committee is J. D. Shilling; of the Garfield, W. H. Howard; of the Park City, James Humes; of the Tintic, Walter Fitch.

Bituminous Shales in Utah

The oil shales of northwestern Colorado and northeastern Utah, whose existence have been known for some time, have been examined by the U. S. Geological Survey and are described in Bulletin 581-A. It seems not unlikely that these shales may before long be of economic importance. They occur in the Uinta Basin, the outcrop having a total length of something more than 125 miles. The actual amount of shales is not estimated. In field distillation tests, the amount of oil obtained per ton of rock was found to vary from 10½ to 61 gal., the average being about 30½ gal.

It is stated that in one place along the outcrop of the shales the cliffs are strewn with slag, produced by the burning of the bituminous matter in the rock; this burning seems not to have penetrated more than about 300 ft. in depth. Where the rock was not actually fused to a slag its color was changed to pink, red or yellow, whereas the normal color of the unaltered shales is brown.

Copper Consumption in North America

In their "Statistical Compilations on Copper," Messrs. Aron Hirsch & Sohn estimate the consumption of copper in North America for three years past as below, in pounds:

	1911		1912		1913	
	Lb.	%	Lb.	%	Lb.	%
Electrical industry	350,000,000	49.4	400,000,000	48.8	400,000,000	52.1
Brass mills	225,000,000	31.7	265,000,000	32.4	220,000,000	28.7
Copper sheets	100,000,000	14.1	115,000,000	14.1	105,000,000	13.7
Miscellaneous	34,000,000	4.8	39,000,000	4.7	42,000,000	5.5
Total	709,000,000	100.0	819,000,000	100.0	767,000,000	100.0

Copper wire is included under the electrical industry. The miscellaneous is made up chiefly of castings and alloys.

Close Work in Estimating

By Dwight E. Woodbridge*

In the years that have passed since the first development of the Mesabi iron district, methods of operation have been subjected to great changes and have become increasingly scientific. Doubtless there is room for much and continued improvement in many details of work, but it seems as though in one department, at least, theoretic scientific accuracy was already approximated. I refer to that most difficult operation, the calculation of ore in the ground before its actual development by shafts, crosscuts, drifts and raises. At the outset one must admit that the calculation of Mesabi range orebodies is a more simple affair than that of smaller deposits in lenses or in irregular veins, but even the estimation of Mesabi flat-lying bodies is beset with difficulties. The estimator must study ore channels, shore-line areas, completeness of drill information, the relation that depths bear to areas; he must take into consideration the method of drilling, whether it be churn or diamond, in connection with the relative silica analyses, so as to know if he is including rock or ore; he must study the rock inclusions in the ore deposits of that particular part of the range which he is considering, in order to make fair estimates of rock inclusions or deductions; and he must have a general understanding of all practical mining conditions, so that he may know what and how much nonmerchantable ore will naturally be mined with the good, while still not reducing the latter to a grade where it becomes unsalable.

To show to what close approximation engineers have come in their calculations of Mesabi range tonnages, the various results reached by several engineers who worked independently and for opposing clients in connection with a recent lawsuit at Duluth, are tabulated herewith.

TABLE OF COMPARATIVE CALCULATIONS OF MESABI ORE

Estimator	No. 1 Ore	Low-Grade Ore	Total
Area No. 1			
No. 1	4,752,361	1,041,376	5,793,737
No. 2	4,725,530	855,357	5,580,887
No. 3	4,773,465	544,602	5,318,067
No. 4	....	....	5,305,000
		Average..........	5,499,423
Area No. 2			
No. 1	171,207	1,122,473	1,293,680
No. 2	170,790	1,076,600	1,267,390
No. 3	126,639	1,187,903	1,314,542
No. 4	....	....	907,000
		Average..........	1,195,653
Area No. 3			
No. 1	2,699,000	699,931	3,398,931
No. 2	2,671,387	775,152	3,446,539
No. 3	2,480,601	573,974	3,054,575
No. 4	....	....	3,791,000
		Average..........	3,422,761
Area No. 4			
No. 1	452,682	279,792	732,474
No. 2	464,122	309,152	773,274
No. 3	365,534	212,242	577,776
No. 4	....	....	1,114,000
		Average..........	799,373
Area No. 5			
No. 1	12,467,176	415,755	12,882,931
No. 2	12,420,748	551,700	12,972,448
No. 3	12,484,736	1,098,795	13,583,531
No. 4	....	....	13,020,000
		Average..........	13,114,730

These figures make account of the rock deductions from No. 1 ore, and the additions to low grade thereupon, which in the case of No. 1 engineer were 1,141,998 tons and in that of No. 2, 607,906 tons.

In this table are the estimates of four engineers; No. 1 is a man who has estimated almost every ore deposit on the range to a total of perhaps 1,500,000,000 tons; I myself am No. 2; No. 3 is the engineer of a purchasing company whose purchase price was fixed at a certain figure per ton shown; No. 4 is the manager of a company whose annual shipments exceed 1,500,000 tons. Nos. 1 and 2 worked for the defendant in the suit referred to, and No. 4 for the plaintiff. The figures of No. 1 were checked almost precisely by a fifth engineer who accepted the areas and depths calculated by No. 1; a fifth set of figures was prepared by another engineer, but is not included, as I do not possess the figures in detail; however, they were in gross, only about 2% greater than the average of those given.

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*Mining engineer, Duluth, Minn.

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Some Anthracite Statistics

The report for 1913 of Edward W. Parker, statistician of the United States Geological Survey, gives some interesting particulars of the anthracite trade. The total mined in 1913 was the largest ever reported in one year, and its disposition was as follows:

ANTHRACITE MINED IN 1913

	Tons	%
Shipped from mines to market	71,343,172	87.3
Sold to employees and local trade	1,793,814	2.2
Consumed at mines	8,581,694	10.5
Total	81,718,680	100.0

The average number of men employed in 1913 was 175,145 and the average number of days worked was 257. Both the number of men and the number of days were the highest ever reported. The average output per man for the year was 466 tons, or 32 tons more than in 1912; but the average per man per day decreased from 1.88 tons in 1912 to 1.81 last year.

The coal marketed was as follows in 1913, by sizes:

Grade	Collieries	Washeries	Total	%
Lump	362,084	630	362,714	0.5
Broken	3,501,211	2,284	3,503,495	4.9
Egg	8,957,166	20,941	8,978,107	12.6
Stove	13,900,576	21,210	13,921,786	19.5
Chestnut	17,060,899	107,918	17,168,817	24.1
Total prepared sizes	43,781,936	152,983	43,934,919	61.6
Pea	8,056,919	151,762	8,208,681	11.5
Buckwheat	9,135,587	368,574	9,504,161	13.3
Buckwheat No. 2, or rice	5,081,314	552,723	5,634,037	7.9
Barley	2,836,147	852,410	3,688,557	5.2
Culm (screenings)	313,643	11,718	325,361	0.5
Total steam sizes	25,423,610	1,937,187	27,360,797	38.4
Total	69,205,546	2,090,170	71,295,716	100.00

Pea coal is coming to be more used for domestic purposes each year, and it is probable that before long it will be included in the prepared or domestic sizes. Washery coal is decreasing each year as the old culm banks are worked out. The maximum shipments of washery coal were 4,301,082 tons in 1907; since then they have decreased steadily, and last year were less than half those of six years ago.

The records of anthracite shipment have been kept with some approach to closeness ever since the first shipment in 1807. While there are gaps in the earlier years, there is no doubt that for at least 60 years they are very nearly correct. According to the tables published in the report the total shipments to market up to the close of 1913 were 1,952,030,891 long tons. Allowing for sales at mines and coal consumed in operating, this means that practically 2,250,000,000 tons have been mined in the anthracite region in the last century.

PERSONALS

Henry H. Armstead sailed, July 10, from New York for Mexico.

L. Vogelstein, of New York, sails July 18 for Europe, to be gone about two months.

A. L. Frank, consulting engineer of the Ohio Copper Co., has resigned his position.

William S. Mann is making an examination of the Trinidad Mine in Placer County, California.

Col. J. A. Wood, general manager of the Santa Fé Dredging Co., operating at Golden, N. M., has gone East on a short business trip.

H. J. Stewart, assistant manager of Crown Reserve Mining Company, Ltd., Cobalt, Ont., is on a two months trip of inspection to the principal mining camps in the West.

Bernard MacDonald has changed his office from 1005 Fair Oaks Ave., South Pasadena, Calif., to 533-A, I. W. Hellman Building, Los Angeles, where he continues designing the Parral tank system.

H. M. Kingsbury has left the Conrey Placer Mining Co. to accept a position with the Kyshtim Corporation at its copper mines in Russia. He sailed from New York for London July 7, on his way to his new post.

K. A. Strand, engineer of the Empire Zinc Co., has been made superintendent of mines at Hanover, N. M., taking charge July 1. William Swancoat, former superintendent, will remain with the company at Hanover in a consulting position.

Robert Sticht, general manager of the Mt. Lyell Mining & Ry. Co., Tasmania, was in Denver last week. He was entertained by the Colorado Scientific Society on July 8, and made an interesting address on mining methods and pyritic smelting in Tasmania.

OBITUARY

James McChristian, the last of the pioneers who raised the Bear Flag in California in 1846, died at Sonoma, near the place of the original flag raising, on June 15. He was 87 years old. His illness was caused by overtaxing himself at the celebration of the 68th anniversary of the flag raising, June 13 last.

William Bleecker Potter died at his home in St. Louis, July 13, aged 68 years. He was born in Schenectady, N. Y., being a son of the late Bishop Potter of New York. He graduated from the Columbia School of Mines in 1869 and for two years was assistant in the department of geology there, at the same time serving as assistant on the Ohio Geological Survey. In 1871 he was appointed professor of geology at Washington University, St. Louis and retained his connection with the university for 22 years, until 1893. While holding his professorship he also served for two years as assistant on the Geological Survey of Missouri; as mining engineer of the Pilot Knob Iron Co.; as metallurgist of Vulcan Iron & Steel Works, St. Louis; as mining engineer of the Iron Mountain Co.; and as a member of the board of Managers of the Missouri Geological Survey. In 1893 he resigned from his professorship and since then has been consulting engineer and metallurgist. He founded the St. Louis Sampling & Testing Works, and was manager of those works up to the time of his death. Dr. Potter served as president of the St. Louis Engineers' Club in 1887 and as president of the American Institute of Mining Engineers in 1888; he was also a member of the Mining & Metallurgical Society of America. He was one of the best known mining engineers and metallurgists in the country, and his service as consulting engineer were often in request. In 1888 Dr. Potter married Agnes Kennett Farrar, of St. Louis, who survives him. He leaves also two daughters and two sons.

SOCIETIES

Northwestern University—In the Department of Geology of this University, at Evanston, Ill., the following appointments have been made, to take effect on Sept. 1, next: Joseph E. Pogue, U. S. Geological Survey, associate professor of Geology and Mineralogy. William H. Haas, University of Chicago, instructor in Geology and Geography. Henry R. Aldrich, Massachusetts Institute of Technology, to be instructor in Mining and Metallurgy. John R. Ball, Northwestern University, assistant in Geology.

University of Utah—Work continues at the metallurgical research department of the School of Mines, supported in part by state and in part by Federal appropriation and operated under the joint direction of the Bureau of Mines and of the University of Utah. The names of the holders of fellowships—five in number, granted to graduates in metallurgy and chemistry—during the coming collegiate year have been announced. They are as follows: Robert M. Isham, Nebraska Wesleyan and Columbia University; Clarence L. Larson, University of Minnesota; Harry T. Morgan, Stanford; Orville H. Pierce, University of Nebraska; Wallace G. Woolf, University of Utah. In all there were 41 applicants, from 25 American colleges. Dorsey A. Lyon, metallurgist of the Bureau, is at Salt Lake, personally supervising the work. The object of the department is to aid in the advancement of metallurgical practice by the improvement of old processes and the invention of new, so that more low-grade ores may be made commercially available.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALLOY of Platinum, Gold, Silver and Copper. Robert R. Graf, Highlandtown, Md., assignor of one-half to Frank E. Welsh, Jr., Baltimore, Md. (U. S. No. 1,101,534; June 30, 1914.)

AMALGAMATOR. Erastus B. Bennett, Denver, Colo. (U. S. No. 1,101,244; June 23, 1914.)

BLAST FURNACES—Stack Cooler for Blast Furnaces. Luther L. Knox, Niles, Ohio, assignor to Keystone Bronze Co., Pittsburgh, Penn. (U. S. No. 1,101,701; June 30, 1914.)

CONCENTRATION—Improvements in or Relating to Ore-Concentrating Tables. J. M. and J. H. Holman, Camborne, Cornwall. (Brit. No. 11,775 of 1913.)

CONCENTRATOR—Ore Concentrator. Paul H. Darrah, Goodyears Bar, Calif. (U. S. No. 1,101,415; June 23, 1914.)

CRUSHER—Gyratory Crusher. Josiah E. Symons, Chicago, Ill. (U. S. No. 1,101,668; June 30, 1914.)

CYANIDING—Apparatus for Filtering Slimes. William Armor Stedman, Wonder, Nev., assignor to Butters Patent Vacuum Filter Co., Inc. (U. S. No. 1,100,267; June 16, 1914.)

CYANIDING—Apparatus for Thickening Pulps. John Edward Rothwell, Butte, Mont., assignor to Colorado Iron Works Co., Denver, Colo. (U. S. No. 1,099,396; June 9, 1914.)

CYANIDING—Method of Cleaning Filter Leaves. Paul Foster Leach, Wollaston, Mass., assignor to Moore Filter Co., New York, N. Y. (U. S. No. 1,101,639; June 30, 1914.)

CYANIDING—Pulp-Distributing Machine. Vyvyan C. Bennett and Grey Drummond, El Oro, Mex. (U. S. No. 1,100,649; June 16, 1914.)

DRILL—Rock Drill. James H. Baldwin, New York, N. Y., and Frederic P. Darte, Ridgefield Park, N. J., assignors to Dulles-Baldwin Electric Drill Co., New York, N. Y. (U. S. No. 1,101,387; June 23, 1914.)

DRILL—Rock Drill. John Thomas Curnow, Palatka, Mich., assignor of one-half to Arnold Giesen, Palatka, Mich. (U. S. No. 1,102,012; June 30, 1914.)

ELECTRIC FURNACE. Frederick T. Snyder, Oak Park, Ill. (U. S. No. 1,100,995; June 23, 1914.)

ELECTRIC FURNACES, Door for. Frederick T. Snyder, Oak Park, Ill. (U. S. No. 1,100,994; June 23, 1914.)

FERROMANGANESE—Melting Ferromanganese. Ernest Humbert, Chicago, Ill. (U. S. No. 1,101,551; June 30, 1914.)

GRADING—Method of and Apparatus for Grading Finely Divided Materials. Halbert K. Hitchcock, Tarentum, Penn. (U. S. No. 1,100,302; June 16, 1914.)

MINE-DOOR CLOSER. Thomas Ramsay, Roslyn, Wash. (U. S. No. 1,100,690; June 16, 1914.)

MINER'S LAMP. Frederic E. Baldwin, New York, N. Y. (U. S. No. 1,101,982; June 30, 1914.)

MINING SHAFT. Charlie B. Rowley, Brainerd, Minn. (U. S. No. 1,100,622; June 16, 1914.)

WIRE ROPE. Thomas Gore, New York, N. Y. (U. S. No. 1,099,644; June 9, 1914.)

ZINC—Improvements in and Relating to Apparatus for the Manufacture of Zinc. P. Ferrere, Paris, France. (Brit. No. 3965 of 1913.)

ZINC—Process for the Recovery of Zinc from Its Ores. Alex Roitzheim, Düren, Germany. (U. S. No. 1,100,390; June 16, 1914.)

ZINC—Process of and Apparatus for Producing Zinc and Other Similar Metals. Heinrich Specketer, Griesheim-on-the-Main, Germany. (U. S. No. 1,099,211; June 9, 1914.)

ZINC OXIDE—Improvements in and Relating to Apparatus for the Manufacture of Zinc Oxide. P. Ferrere, Paris, France. (Brit. No. 9368 of 1914.)

Editorial Correspondence

SAN FRANCISCO—July 8

Comstock Mining Situation, since the settlement of the differences in the north end companies and the renewal of pumping arrangements with the Mexican, is more encouraging than it has been for a number of years past. It is reported that there is a marked change in sentiment in Virginia City regarding the situation there, and improvements in general conditions along the lode are expected. There is a stronger spirit of confidence that mining will be carried on steadily and without friction in the future. The physical condition of the mines is such as to give good basis for the belief that opportunities for discovering new ore, which have not been taken advantage of lately, will now be improved. The mines are in good shape and the water under control.

Old Drift Mines in Magalia District in Butte County, which in the early days of California mining were rated among the largest producers, are proving attractive for reopening and development. Recently two companies have undertaken the reopening of the old Indian Springs channel mines. One of these is the Union Construction Co., of San Francisco, engaged in dredge mining in Trinity County and in Alaska, of which W. W. Johnson is president and manager. The other company, recently organized, is the Nugget Gravel Mining Co., of which John D. Hubbard is president and James Spiers secretary. The head office of the company is in San Francisco. Hubbard is also mine manager and personally directs operations. Indian Springs channel has a record which probably approximates $4,000,000 production from drift mining in the early days. The Union Construction Co. has taken over the old mine and 560 acres of the Hupp ranch. The Nugget Gravel Mining Co. has taken over adjoining land and is driving a tunnel toward the old Indian Springs mine. Each operator believes he is on the old Indian Springs channel. Which may be right, is not so much a matter of interest as the fact that both companies are developing pay gravel. The Nugget mine is fully equipped with electric power for all purposes, including hoist, pumps, cars and lighting underground. The mine is also provided with telephones. The gravel is washed in sluices and the company is prepared to handle 100 cars per day. The floor of the tunnel is 120 ft. below the surface and the gravel is hoisted through an incline of 30°. The Union Construction Co. is preparing for development on a similar scale. There are other drift enterprises in operation or preparing to operate in the Magalia district, pointing to a renewal of old time mining activity.

Reports from Guadalajara, sent here by the British vice-consul at Guadalajara, Mexico, state that all the mines in the State of Jalisco, without exception, are closed. The mine managers have no thought of resuming operations until peace is assured and there is absolute security for the lives of foreigners engaged in mine and mill direction. It will be remembered that El Favor camp, in the Hostotipaquillo district of Jalisco, was the scene of the only killing of foreign mining men that resulted in Mexico during the anti-American rioting following the American occupation of Vera Cruz, C. B. Hoadley and G. E. Williams losing their lives at the hands of a Mexican mob. Hoadley, an American, was assistant mill superintendent, and Williams, an Englishman, was accountant. The mob included many of the miners employed at El Favor. Hoadley and Williams were stabbed to death, and later Hoadley's head and face were horribly mutilated to secure several gold-filled teeth. Walter Neal, manager at El Favor, who was stabbed in the back, has entirely recovered from his injuries since reaching the States, and he is now acting as consulting engineer for the Makeever interests, owners of El Favor, who also have properties in Montana and Arizona. The last of the Jalisco properties to shut down was that of the Espada Mines Co., owned by San Antonio, Texas, men. At the time work was stopped several bars of bullion were stolen by Mexicans. It is understood here that R. H. Ramsdell, the American owner of the Mirador mine in the Mascota district of Jalisco, and three Americans with him there have remained at Mirador, but have made no attempt to continue operations. Late advices from Guadalajara are to the effect that Ramsdell and his companions have not been molested. Private advices from Guadalajara tell of the temporary confiscation by Mexicans of the Casados mine in the Hostotipaquillo district. They operated it as long as the dynamite and other supplies found at the mine held out, and it is stated that high-grade ore to the value of 20,000 pesos was taken out and sold to Mexican ore buyers. Many former employees were concerned in the confiscation. The federal troops in the district either were powerless to drive the mob away from the mine or made no effort to do so. The Casados mine is the property of the Consolidated Mining Co., an American concern. A. F. Flynt, owner of the Purisima mine in Tepic, has just arrived here from Mexico, and reports that all mining operations are at a standstill in that territory. Flynt remained concealed at his mine after the American occupation of Vera Cruz, and did not venture into the Tepic capital until its capture by the Constitutionalists under Gen. Obregon. He had just completed a 20-ton cyanide plant at the Purisima. He also had the Zopilote mine, the property of a German company, under lease, and was milling there. Flynt states that after the Vera Cruz occupation the federal forces confiscated the property of the Grant Bros. Construction Co., the American concern that built the Southern Pacific railroad through Sonora and Sinaloa and into the Tepic capital. This property included over 500 horses and mules and 100 carts. All the supplies of the Waters-Pierce Oil Co. also were confiscated by the federals.

BUTTE—July 9

Minerals Separation, Ltd., has been denied a motion for a rehearing on the injunction suit against Hyde, involving the Butte & Superior oil flotation process, by the U. S. Circuit Court of Appeals at San Francisco.

Electrification of the Milwaukee Ry. from Three Forks to Deer Lodge, Mont., was but fairly started when the company and its contractors ran into trouble from the Butte labor unions. The electrical workers extended their jurisdiction to embrace all the work on the Chicago, Milwaukee & St. Paul Ry. and called out the electrical workers because they were not getting the prevailing rate of wages of Butte, $5 for an 8-hr. day. The railroad company declined to treat with the Butte labor union and suspended work.

Construction of the Southern Montana R.R., from Butte to Jackson, which will open the Big Hole Basin and the Elkhorn and French Gulch mining districts, has been delayed because the English syndicate which is to build the road, a subsidiary of the Boston & Montana Development Co., has asked that the railroad bonds be made convertible into Boston & Montana stock. This proposition has been agreed to by the latter company, and it is said that as soon as the formality of the change in the papers is made work will begin. The financiers and contractors for the road are Sir Robert W. Perks and the MacArthur Bros., of London, comprising the firm of MacArthur, Perks & Co.

Union Troubles at Butte are practically unchanged and it appears that there may be no change until the mining companies are drawn into the controversy, which to date has been confined to opposing factions of the Western Federation of Miners, with the I. W. W. in control of one faction and Charles H. Moyer and his associates in control of the other. Moyer says that as soon as the international unions are lined up in support of the Federation, the mining companies will be asked to live up to the contract with the Federation, which provides for the employment only of Western Federation miners. It is possible that the mining companies will agree to do that, as they have always been inclined to fulfill their contracts, and the rebels may then be told that they must show Federation cards. If they refuse to go back and get Moyer's permission to work, they will be locked out. Moyer says he will then bring other Federation men into Butte to take the places of the seceders. It is doubtful that he will be able to do that, and, failing, the Federation contract with the mining companies will be vitiated. Whether he fails or is successful, it looks as if serious trouble with the seceders cannot be avoided. The seceders, through their president, have served notice that they will not return to the Federation and that they will soon make a demand of their own that none but white-button men, their own members, be permitted to work in the Butte mines. Officers of the seceding union have also stated that their organization will not be controlled by the . W. W. and that sections of the constitution and by-laws, eported by a committee which is controlled by the I. W. W., will not be approved by the majority of the members of the new Butte Mine Workers Union.

SALT LAKE CITY—July 9

Experiments with the New Christensen Process at the Knight mill at Silver City are being kept up and the mill s operating the greater part of the time. By working three shifts it has been treating 60 tons daily of Dragon Consolidated ore worth $5 per ton. A recovery of 85 to 95%, t is stated, has been made. Tests have been made on ore from the Iron Blossom, Black Jack, Colorado, Beck Tunnel and other properties.

HOUGHTON—July 16

Calumet & Hecla Conglomerate Production is usually ooked upon as a thing of the past. This view is taken for the reason that each year the Calumet & Hecla shows a further decrease in the amount of copper in the conglomerate and a constantly increasing cost for the copper produced. Compared with the days of 60 and 70 lb. of copper per ton of rock, when the Calumet & Hecla conglomerate ode was opened, the explanation is reasonable. The conglomerate lode has, of course, seen its best days, but the fact remains that Calumet & Hecla will still be mining from the conglomerate 10 years from date, and will be taking out practically as much copper rock as it is getting out at present. The pillars and arches and stope cleanups alone would keep up the conglomerate tonnage for 10 years Calumet & Hecla continues to have 10 operating shafts on the conglomerate lode, all sending up rock of average grade, and above average tonnage is being mined. Five of these producing shafts are at the Calumet and five at the Hecla. All of them are getting close to the boundary lines, all but the slope shaft. Rock around this is hoisted through the vertical Red Jacket shaft. It is the largest producer of the entire Calumet & Hecla plant at present. The shaft has attained a depth of 1600 ft. below the 57th level. Shafts Nos. 5 and 6 of the Calumet are double. They are down over 6200 ft. to the 60th level. No. 4 is the deepest shaft on the Calumet. It is now down over 8000 ft. No. 2 shaft continues to be one of the main producers and will be for some time to come, although sinking will be permanently discontinued when the 63d level is reached. The South Hecla or Blackhills end of the conglomerate lode has practically stopped producing except from the removal of pillars. This was, without question, the richest part of the conglomerate lode. When the Calumet mine first was opened by the late Alexander Agassiz the best rock was found in the upper levels. Compared with the Calumet in those days the Hecla and South Hecla property did not show up so well. In fact, when the deal first was proposed to get the Agassiz interests to invest in these two adjoining properties there was some hesitancy because of the apparent leanness of the formation. When the shafts reached a depth of 1000 ft. the Blackhills end of the property developed unusually high-grade rock. In fact, at no period in the mine's unusual history was there such uniformly rich rock as at this depth. During the last year the old No. 11 South Hecla shaft had its pillars taken down on the fifth, fourth and third levels, and in No. 8 the work of taking down pillars is well under way, practically up to the 54th level from the bottom of the mine. As yet no pillar removal is under way in the Calumet, although in two of the Hecla shafts, Nos. 2 and 3, three or four levels are cleaned up each year. The Hecla's deepest shaft is now No. 6, which is rapidly approaching 8000 ft. South Hecla Nos. 9 and 10 is a double shaft, similar in operation to Nos. 5 and 6 at the Calumet; it is under the 80th level. At No. 8, South Hecla, sinking has been discontinued, the boundary line being reached. Rock tonnage from the conglomerate lode during this year likely will exceed that of last year by a substantial amount. In fact, it would not be surprising if the conglomerate tonnage for this year ran considerably over 2,000,000 tons, and the mine costs will not be much over $2.25 per ton, if operating conditions remain the same during the remainder of the year as they have the first six months. These figures are by no means authoritative. In fact, it is quite impossible to get company officials to commit themselves to any figures on the costs at present, but they are based on conservative estimates from persons reasonably well acquainted with the conditions at the property. In the past four years the conglomerate tonnage gradually has declined each year. In 1910 it totaled 1,950,040, and there was a pronounced slump in 1912 and 1913, in the latter year due to the strike and the year before to the shortage of labor due to the fear of the strike rather than to any difficulty in finding opening operations for the drills. In this connection it would, of course, be unreasonable to expect to see the conglomerate rock again produce an average of 30 lb. of copper per ton of rock. Under existing circumstances and with the present efficiency in mining, and more particularly in milling, for the milling of the conglomerate rock always has been a difficult and serious problem for the Calumet & Hecla to solve satisfactorily in comparison with the milling of amygdaloidal rock. More of the foot wall is being treated satisfactorily now. The single-man drill working in the conglomerate is doing fairly good work, some 20 drills of this type operating in pillar removal.

NEGAUNEE—July 11

Townsite of Alpha on the Western Menominee range, is being improved. A park has been created in the center of the plat, with streets radiating from it like the spokes of a wheel. These streets are being graded and parked. Flowers and shrubbery will be planted. Eventually the streets will be paved with asphalt. Surface water pipes are being laid for use until the permanent system is installed. Electric lights are already available. The town will be given a village organization shortly. It is the prediction in the vicinity that within a few years Alpha will have a population of close to 10,000.

Work at the Athens Property is being done by the Cleveland-Cliffs company. A shaft is being sunk that will go down 2000 ft. before a deposit located by diamond drilling will be encountered. The Athens is within the corporate limits of Negaunee. It will be a model mine. The shaft will be lined with concrete from top to bottom, and its equipment, compartments and all, will be of steel. There will be two skipways, a ladder and a pipe-way and a counterbalance compartment for the cage. A steel headframe has been erected, also an engine house and other buildings. As far as possible, machinery will be operated by electricity. An air compressor and a hoisting engine are already installed and in operation. The mine will be fully equipped with electric motors and electric lamps, both above and below ground. The feed wires will extend below the surface through a 12-in. pipe line. It is considered unlikely that the Athens will be ready for permanent operation much before four years. The shaft is down but 80 ft. Fifteen men are employed under Capt. John Phillips. The shifts are of eight hours each and work is done every day except Sundays.

Contract for Two Additional Blast Furnaces has been awarded by Corrigan, McKinney & Co., of Cleveland. These furnaces will be built at the steel plant the company has under construction. This has been cheery news to the Crystal Falls district on the Menominee range. The Corrigan-McKinney interests are large holders of mining property in that field, and of late years only a minimum amount of ore has been produced and shipped. Most of the shafts are, in fact, inactive at present. It is believed that with the company using its ores in its own manufacturing operations the Crystal Falls country will be greatly benefited. The Corrigan-McKinney company holds in this field the Great Western, Tobin, Genesee, Columbia, Fairbanks and Lamont mines, all idle now, and the Dunn and other properties. A large amount of ore is in stock, much of such character that it is hard to sell in times like the present. The furnaces of the company will enable the utilization of all the raw material. Before the Great Western is again placed in commission, some improvement work will have been done. For a distance of 80 ft. the upper part of the shaft extends through quicksand. It has been necessary to keep a hydraulic pump in operation all during the time the mine has been idle. The timbering will be removed and the shaft concreted from the surface to the ore. The present shafthouse will be replaced with a modern and more substantial structure. In addition the ore-crushing plant will be removed from the shafthouse and installed in a separate structure. Work on these improvements will be commenced at once.

TORONTO—July 11

Calgary Oil Fields has been connected with Calgary by a wireless service, there being field stations at 12 of the leading properties, in charge of government licensed operators. It is hoped by this means to secure reliable news and prevent the dissemination of false reports as to sensational strikes. More oil is being produced at the Dingman well than can be saved, the 12,000-gal, tank being full to overflowing. A second tank will be installed as rapidly as possible. The Dingman well No. 2 is down to 700 ft. and is giving off 1,000,000 cu.ft. of wet gas daily A strike of crude oil in the well of the Southern Alberta is reported. A sample brought to Calgary shows 45° Baumé

The Mining News

ALABAMA

Blount County

TENNESSEE COAL, IRON & R.R. CO. (Birmingham)—Prospecting for brown ore near Chepultepec is in progress.

PIG IRON FREIGHT RATES from Birmingham, according to Interstate Commerce Commission, are unreasonable, and it has ordered following rates: To Louisville, $2.65; to St. Louis, $3.40; to Chicago, $4; to Boston, $4.25.

ALASKA

KOYUKUK DISTRICT—This is one of the oldest placer mining regions in Alaska, and it will produce more gold during 1914 than has ever yet been taken out in a single year, according to reports. Production should therefore be $300,000. Second largest nugget ever found in Alaska was picked up on No. 4 Above, Hammond River, by J. C. Kinney and partners last winter. It was worth $2600; Alaska's largest nugget came from Nome and was worth $3200.

NATIONAL RAILWAYS COMMISSION—Thomas Riggs, member of commission, arrived at Dawson, June 12, with a party of 40 men, including three assistant locating engineers. Party left at once by steamer for Tanana district. Some members of party will land in Nenana River district and others will proceed farther up the Tanana to Fairbanks with Riggs. Both parties will begin surveying immediately upon landing. Riggs will cover the field from Fairbanks 400 miles westward through Susitna Valley, where connections will be made with present road, extending 72 miles from Seward. Lieut. Mears will leave Seward for interior to make surveys from Susitna River to Broad Pass. After making a trip of inspection over Alaska Northern Ry. line, Mears stated that engineering difficulties in way of constructing a railroad from Seward to Knik Arm have been overestimated.

ALASKA MEXICAN (Douglas)—In May, 20,811 tons of ore crushed yielded $29,927, or $1.94 per ton; net profit, $16,363.

ALASKA TREADWELL (Douglas)—In May, 83,706 tons of ore crushed yielded $189,265, or $2.28 per ton; net profit, $100,866.

READY BULLION (Ketchikan)—Webber & McKenzie, owners, are contemplating installation of new machinery and building of a cyanide plant.

ALASKA UNITED (Douglas)—In May, Ready Bullion mill crushed 20,888 tons of ore, yielding $51,740, or $2.50 per ton; net profit, $21,227. In same month 700 Claim mill crushed 19,908 tons of ore that yielded $32,351, or $1.64 per ton; net profit, $7428.

READY BULLION (Fairbanks)—Isaacson & Hendrickson, lessees on old Hess claim at mouth of Ready Bullion Creek, report discovery of pay running $1.25 per sq.ft. of bedrock. Many holes sunk by former workers missed pay by a narrow margin. Ground is 86 ft. deep.

ERCEG (Fairbanks)—M. Erceg has taken a contract to sink Keystone drill holes on Allen Creek, a tributary of Goldstream. A large amount of prospecting has been done on creek in past, both by drilling and by shaft-sinking, but no workable ground has yet been found.

TOKIO CREEK (Fairbanks)—With opening of navigation, many stampeders are returning from Chisana and other parts of upper Tanana country, most of them drifting down river to Fairbanks in poling-boats or on rafts. In vicinity of Tokio Creek, which is near Tanana Crossing, where old Eagle telegraph line crosses the Tanana, over 100 holes were sunk to bedrock without result, although Van Bibber found some good prospects at one place.

ARIZONA

Cochise County

CALUMET & ARIZONA (Warren)—A large shoot of sulphide ore has been found in Cole shaft. So far drifting has gone for 40 ft. and has not run out of the ore. This ore came as a surprise. While some work had been done in limestone, shoot as a whole is in unexplored territory. It may have a bearing of considerable importance upon future of Warren district.

SHATTUCK (Bisbee)—Superintendent states that during last two weeks good ore has been encountered on 400 level in crosscuts 35 and 20, which gives evidence of bringing in some important ore-bearing territory. New finds in intermediate A87 raise on 600 level have been made, about which more will be known in next 30 days. New ore zone developed in crosscut 22 on 700 level is one of the most encouraging finds made in last five months, ore carrying 15% copper. No. 9 crosscut on 700 level also has shown good ore streaks from 32 crosscut to present face. Stoping ground in older orebodies is looking well. New ore is being found there daily. Shipments continue at rate of 50 eight-ton cars daily. Development of high-grade ore on 700 level is especially important, taken in connection with encouraging conditions on 800 and 900 levels.

Gila County

INTERNATIONAL SMELTING CO. (Miami)—Slag foundations for two reverberatories are being poured. The third will be erected after first two are in operation, making it possible to use slag from those furnaces for pouring foundation of third. Concrete base for blowing engines, containing 400 cu.yds., is now being poured. Erection of bedding bins is nearly completed, riveting being well under way.

INSPIRATION CONSOLIDATED (Miami)—The most important construction work now in progress at mine is lining of main shafts, as buildings have been completed so far a actual construction is concerned. Floors must yet be laid an not much machinery is yet in place, but contract work, larges item of the undertaking, has been finished. All machinery fo crushing plant is on the ground, as well as that for compressor and hoist house. Feeder and conveyor machinery fo storage bins and crushing plant is ready for installation, an if it were necessary whole upper plant could be made ready to go into commission in a short time. There is, however considerable work yet to be done such as building underground bins and completing shaft lining. Main east shaf will be finished to collar by another week and main west shaf a few days later. Because of large amount of excavation necessary for 3000-ton underground bins on 600 level concreting of shafts could not be started at bottom, so that 20 ft. in bottom of each shaft is yet to be lined. Work on bin will begin soon. Work on concentrator building continues carpenters and corrugators being well started on inclosing structure. Railroad trestle is being hastened to completio that it may be placed in commission. As soon as this approach to concentrator is completed it is purposed to finish west end of bins, where ore will be stored for test mill. Stee shelving for warehouse has been assembled and is practically ready to be put in place. A large shipment of electrical supplies has been received and work on transformer and distributing stations will now proced without delay. Pouring of walls and piers for station at Inspiration is already wel under way.

Greenlee County

ARIZONA COPPER CO., LTD. (Clifton)—Results for hal year ended Mar. 31 show that free profits, subject to fina adjustments, and including £13,394 brought forward from Sept. 30, 1913, amount to £151,117. Dividends for half yea on "A" preference shares are at the rate of 7%. Preferenc dividend amounts to £12,266, leaving a sum of £138,851. Out o this sum directors have resolved to pay, July 27, an interim dividend of 1s. per share, free of tax, on ordinary shares This will absorb £75,995 and leave a balance of £62,856 to be carried forward, subject to deduction of an amount to b set aside at close of financial year to meet redemption o debt, capital expenditure and contingencies. Price received for coppr was £5 9s. 8d. per ton less than that for corresponding period of last year.

Mohave County

FAY (Hancock)—Three cars of machinery for Lusk mil to be built at these mines, has been received. Treatment wil consist of amalgamating and cyaniding 25 tons of ore daily Water is piped in from Granite Springs.

COPPER CAÑON (Copperville)—Compressor and engin have reached camp after a long trip through rough country where there are no roads. Adit is now in over 200-ft giving a back that high. Some shipping ore has been developed but not enough to justify road building.

Pinal County

MAGMA (Superior)—All machinery for concentrator has been on the ground for some time and concentrator should soon be ready for operation. Electric power from Roosevelt has been available some time and tram between mine and concentrator is in operation. Management has not yet given out decision as to which route will be chosen for proposed aerial tram over which concentrates will be shipped for disposal. Direct line to smelting plant at Miami is thought by mining men in this region as route that will be selected.

Yuma County

D & W (Parker)—Slow Speed mill has proved a failure Concentrates carried $175 gold, while only $6 was recovered on plates. Mine and mill are closed pending investigations as to advisability of remodeling mill or building a new one

CALIFORNIA

Amador County

HARDENBERG (Jackson)—It was reported that mine would be sold, but this is now denied. Present owners wil continue operations.

KEYSTONE (Sutter Creek)—Twenty stamps of old mill have been overhauled and four vanners have been installed Mill will be run on ore from 900- to 1200-ft. levels. A large tonnage is being blocked out on 2600-ft. level.

PLYMOUTH CONSOLIDATED (Plymouth)—Construction of new mill is progressing as fast as machinery can arrive It is reported that 110,000 tons of ore have been blocked out On 2000-ft. level, which is lowest, orebody is said to be 21 ft. wide. Grade runs from $5 to $6.50 per ton.

SOUTH EUREKA (Sutter Creek)—Repairs to shaft are about completed and 40 stamps of 80-stamp mill will be started crushing ore. During a part of time repairs were in progress ore was mined, but it was found more expedient to stop taking out ore and hasten shaft work.

Butte County

DIVING APPARATUS FOR RECOVERY OF GOLD from crevices in bedrock is used in Feather River near Belden Depth of water is 10 to 15 ft. ,and each of two divers remains on bottom half an hour. It is reported that these men are making good wages. Diving suits have frequently been used for this kind of work in California, but not extensively owing chiefly to swiftness of current in most streams in which gold is found.

UNDINE MINING CO. (Chico, president, G. F. Dyer)—Mining machinery and equipment recently purchased of Forbestown Mining Co. will be installed at this mine on Butte Creek.

San Bernardino County

TRINIDAD (Westville)—A cyanide plant is being built. This mine is known as Old Salvation Army mine, and is said to have been a producer.

AMERICAN TRONA CO. (Trona)—A daily railroad service will be started from Mojave on Southern Pacific to Searles Lake, connecting with new railroad of American Trona Co., at Searles or Garden station. Trona R.R. will be used largely for hauling material for construction of new plant.

Plumas County

BELLEVUE (La Porte)—A new tunnel will be driven 2500 ft. on bedrock to tap gravel further up than present tunnel now extends. Last summer yield from this mine is reported to have averaged higher than usual.

CLAYBANK (La Porte)—This gravel mine is to be reopened under new management and ownership. Great difficulty was encountered under old management in maintaining a drainage tunnel. It is now planned to install steel pipe in tunnel and allow the rough to cave in.

Sierra County

KATE HARDY (Forest)—Electric pumps are being installed and sinking will be resumed to a depth of 100 ft. below tunnel level. Shaft is on a shoot of milling quartz 6 ft. wide, of more than average value. A rich strike was recently made, but its extent has not been announced by those in charge.

SWASTIKA (Sierra City)—This old property, from which pockets and rich bunches of ore were taken in early days, is to be developed by a deep shaft to be sunk on shoot of high-grade ore which was encountered two years ago when systematic development was begun. Mine is now owned by New England men.

COLORADO-YELLOW JACKET (Alleghany)—After having been practically abandoned by C. C. Crary, this mine has suddenly become one of the most promising in district. Caretaker left in charge, an experienced prospector, has uncovered a large shoot of gold-bearing quartz, and owner has returned from South Dakota to develop mine. An electrically operated air compressor will be installed and ore will be opened by drifts. This mine is on Kanaka ridge and is a south extension of El Dorado.

EL DORADO (Alleghany)—After two months idleness pending blocking out of ore, mill is again in operation, and with an abundant water supply, will be kept running indefinitely. An interest has been secured by Armstrong Bros., retiring merchants of Alleghany, who will join with Tessler Bros., in management of enterprise. During last six months mine has produced $30,000 in coarse gold with but four men working underground, and is believed capable of doing proportionately well with a larger force.

Siskiyou County

GREAT NORTHERN (Yreka)—Large amount of pay ore has been mined. It is being sampled, and if grade of ore warrants it McCook mill will be removed to this mine on middle fork of the Humbug.

Trinity County

NASH (Carrville)—Hydraulic mining has been resumed at this mine, on Coffee Creek. Sawmill will be put in commission and a large amount of new flume built. This is one of the largest hydraulic producers in the state.

Tuolumne County

RAND—A 10-stamp mill is being built. This mine was formerly known as Poor Man. It was a producer, but poorly managed.

HOPE (Sonora)—New 5-stamp mill has made a test run. It is driven by 25-hp. gasoline engine. Ore is blocked out and stoping will begin immediately.

SPRINGFIELD TUNNEL (Springfield)—Mill is being moved to mouth of big tunnel on Stanislaus River slope. development is progressing actively.

EAGLE SHAWMUT (Shawmut)—Thirty-five stamps are dropping. Electric cars have been installed in tunnel for hauling ore from underground hoist to mill.

COLORADO

San Juan Region

GERTRUDE (Gold King Basin)—This property is being developed by August Anderson and J. H. Brink. Ore, which is similar to that from Alta vein and requires concentration, will be treated in custom mills.

BALLARD (Telluride)—Ore from this property, which is operated by Weller Gold Mining Co., is treated in company's mill in Bear Creek. Mill has recently been remodeled and one Wilfley table has been added to equipment.

SUFFOLK (Ophir)—A cyanide plant is to be erected by D. C. and D. W. Reinohl, of Detroit, for treatment of old Suffolk mill tailing and Suffolk dumps. Machinery, which is manufactured by American Rapid Cyaniding Co., of Detroit, is on ground.

MAMMOTH (Telluride)—This property, in Bear Creek Gulch, two miles south of Telluride, is being reopened and placed in condition for operation by Colorado Milling & Mines Product Co. Ground is being broken for a small mill, construction of which will begin Aug. 1.

Teller County

A RAILROAD STRIKE broke out at midnight July 3, all train crews running into Cripple Creek district going out on strike because of refusal of operating company to reinstate a conductor who had been discharged. Samplers and a number of the larger mines are either shut down, on account of shortage of coal or of bin-room for storing ore. No settlement of strike is yet in sight.

BLUE-FLAG (Victor)—A contract has been let for sinking this shaft.

VINDICATOR (Independence)—The steel frame-work for the new concentrating plant is completed, and some of the machinery installed.

DRAINAGE TUNNEL—Work of laying tracks and pipe lines and digging trench is almost completed up to breast, and work of driving tunnel will commence soon.

PORTLAND (Victor)—A Davis-Calyx drill is boring a 6½-in. hole, for ventilation, between 1600 and 1700 levels. A storage battery locomotive has been ordered for tramming on 17th level.

IDAHO

Cœur d' Alene District

COPPER AT ADAIR, on Chicago, Milwaukee & St. Paul Ry. may make that place an important camp. Well known mines heretofore have been reached by way of Saltese. Monitor, Richmond, St. Lawrence and others, some of which lie on Idaho side of divide, eventually will find an outlet for their products at Adair. Much ore has been shipped from these properties, all of it being hauled to railroad at Saltese, and all have been developed to an extent that indicates persistence of ore. Plans are now being worked out for deep development of Monitor through a long tunnel to start near Adair and this will afford means for exploring other properties at great depth. Near railroad at Adair, so close that it is almost possible to shoot ore from dump to car, is the Big Elk. Ore was found practically at grass roots and several cars have been shipped to smelters from which large returns were received. Recent work has been concentrated in raising 90 ft. from lower to upper tunnel. Upper drift seems to have passed through top of an oreshoot, and it is expected that a drift of 50 ft. from raise in lower level will strike it. Well up on divide between Idaho and Montana, and connected with Saltese by wagon road, is the Monitor. Property has been developed through a shaft, and ore has been shipped. Mine was well equipped with hoisting plant, compressor and buildings, but these were all swept away by forest fire in 1910. As it was not intention to operate mine through this shaft, company did nothing toward restoring property, but immediately took up a plan to drive a long tunnel from a point on a branch of Milwaukee railroad on Idaho side of divide. This enterprise contemplates opening Monitor orebodies at a depth of 1800 ft. Work of financing project is now under way and tunnel has actually been started. Tunnel will develop not only Monitor, but will make it possible to explore Richmond and St. Lawrence at depth. Richmond is situated in Idaho, just over Idaho-Montana divide. It is developed through a shaft, from which high-grade ore has been taken. A crosscut tunnel has been driven to vein giving an additional depth of 600 ft. and which will be future outlet for mine.

RAY-JEFFERSON (Wallace)—Washington Water Power Co., of Spokane has completed its power line to this mine in Sunset district, and everything is now in readiness to start new compressor with electric power.

COPPER KING (Mullan)—Company has filed a protest against Missoula Copper Mining Co. for patenting Wisconsin fraction claim. Copper King Co. alleges that Missoula company's survey embraces five acres of its Blue Streak claim, and contends that it has a right to ground in controversy because of fact that Blue Streak was located in 1901, while Wisconsin fraction was not located until 1907. Ground in controversy is along strike of vein not far distant from where Missoula is getting some of its best ore showings.

MICHIGAN

Copper

INDIANA (Houghton)—Lately, exploratory work on 1100-ft. level was resumed. Results have been satisfactory to say the least. Operations for some time past have been confined principally to 600-ft level.

HOUGHTON COPPER CO. (Houghton)—A campaign of exploratory development work is being carried on. Two drifts are being driven from bottom of winze and each is in a good grade rock, presumably the Superior lode. While these openings are limited in extent as yet, they are encouraging.

SOUTH LAKE (Houghton)—Shaft is down 618 ft., but no sinking is going on at present and there is no intention to resume sinking in the immediate future. All efforts are directed to extending 600-ft. level to rich zones which were shown by drill cores. This will mean a total drifting of 1200 ft. Unusual interest is taken in this work because of the showing made in drill cores.

NORTH LAKE (Houghton)—Crosscut on 300-ft. level is 350 ft. long and has 300 ft. more to go to get into zones opened in South Lake and showing such sastisfactory results. These three zones are commonly supposed to be the Evergreen series. This North Lake crosscut went through 125 ft. of conglomerate as it left the shaft, and since that time it has been in trap all the way.

MINNESOTA

Duluth

ESTIMATED IRON ORE OUTPUT FOR 1914—John H. McLean, general manager for Oliver Iron Mining Co., estimates that Lake Superior districts will send forward from 38,000,000 to 40,000,000 tons this season, comparing with 50,000,000 last year. This is most optimistic estimate that has appeared to date.

GRAND MARAIS & NORTHERN RY.—Contract has been awarded to John Bergman, Duluth, for construction of first 20 miles of this line, being from Grand Marais, Minn., to intersection with Dulutth & Northern Minnesota Ry. This leaves 55 miles to complete line to Ely, Minn., on Vermilion range. Road opens up a country rich in mineral possibilities.

DELL DEVELOPMENT CO. (Duluth)—Company has awarded to Mesaba Boiler Works a contract for erection at Duluth of a furnace designed to treat manganiferous iron ores, in manufacture of spiegel and ferro-manganese. Plant is to be ready by September. Company will purchase ores in open market. Some months ago this company began erection of a larger plant of same character at Aitkin, Minn., on eastern end of Cuyuna range, but for some reason work was abandoned and all company's mineral lease options were dropped.

Cuyuna Range

ROWE (Riverton)—Shipments are now being made at rate of 80 cars daily. This pit is unique in that only English-speaking workmen are employed. Efforts are being made to conduct a model operation.

INTERSTATE IRON CO. (Ironton)—This subsidiary of Jones & Laughlin Steel Co. has taken a three-months' option of lease on holdings of Cuyuna Iron & Manganese Ore Co., adjoining Pennington pit on north. New lease, if taken, provides for a substantial increase in royalty rate over 40c. lease held by Cuyuna Iron & Manganese Ore Co. Latter company began explorations over a year ago, property having before that time been abandoned as worthless by an operating company. Recent developments have shown several million tons of nonbessemer ore of good grade, besides a considerable tonnage of manganiferous iron ore. Jones & Laughlin company already controls Hill Lumber Co. property, adjoining on southewest. Operations on all properties will be by open-pit method.

Mesabi Range

MINNEWAS (Virginia)—Oliver Iron Mining Co. is erecting a concrete shaft house at this new property, between Eveleth and Virginia.

OLIVER IRON MINING CO (Hibbing)—Butler-Coons Contracting Co. has completed work on Carson Lake project, and Oliver company now has two 10-in. centrifugal pumps draining lake, water being forced into ditches which convey it to Kelly Lake.

MILLER (Aurora)—Pitt Iron Mining Co. will try out a gasoline motor for underground tramming. Motor is similar in form to those used in coal mines and is said to be first of kind to be installed in a Minnesota iron mine. Mine has heretofore employed 14 mules, work of which will in future be done by three motors if test proves satisfactory.

Vermilion Range

CHANDLER (Ely)—Ore is being hoisted daily from this once-abandoned mine, and a considerable stockpile has been accumulated. A relatively large tonnage has been developed by new operators, new buildings have been erected and operation put on a substantial basis. Mine had been practically abandoned for a number of years prior to resumption of activities last September.

MONTANA

Broadwater County

OHIO-KEATING (Radersburg)—Owing to high cost of transportation and smelting mines of company which have been operating at a loss for last year, have been shut down. A meeting will be held Aug. 5 to consider following propositions: To change stock from non-assessable to asssessable; to consider issue of a mortgage bond to replace outstanding bonds and to discuss plans for erection of a mill which can treat ore profitably. Management favors an assessment of 15c. per share, payable in three installments of 5c. each during a period of nine months. This will liquidate pressing floating debt of $113,925 and provide funds for erection of a cyanide plant which, it is estimated, can treat ore at a cost of $1.50 per ton while present cost of transportation and smelting is $8.35 per ton. Value of ore blocked out and on dumps is estimated at $206,000.

Deer Lodge County

WASHOE WORKS (Anaconda)—One of eight reverberatory furnaces which have been fitted up for new pulverized coal feeding system, was fired up for first time June 30 and worked without a hitch. Greatest item of cost is plant for crushing and drying coal. Run-of-mine coal is broken in a Jeffrey coal crusher from a maximum of 24 in. to 1 in. and finer. After iron has been removed by an electro-magnetic pulley, coal is dried in a Ruggles-Cole drier in which it remains for 20 min. It is then pulverized in a Raymond 5-roll mill so that 85% of it will pass through a 200-mesh sieve. From Raymond mill coal is taken up by a vacuum separator and carried to furnace by screw conveyors. A No. 11 Buffalo fan with 9-oz. air pressure blows pulverized coal into furnace where it catches fire practically as a flaming gas. "Safety-first" policy has cost $10,000 at Washoe works for rearrangements that will make for greater safety to employees. Guards have been placed over gears and pulleys, railings constructed on platforms, doors have been changed to avoid opening on tracks and everywhere signs have been posted to remind men to take all necessary precautions against accidents.

Granite County

ROYAL BASIN MINING CO (Maxville)—Company has contracted with Allis-Chalmers Mfg. Co., of Milwaukee, for construction of a hydro-electric station on Boulder Creek, a distance of four miles from mine. Contract calls for generation of 1000 hp., alternating-current generator to operate at a potential of 6600 volts and a speed of 360 rev. per min. About 200 cu.ft. of water per min will be conveyed to turbine in power station from forebay on Boulder Creek by a wood-stave pipe line 2000 ft. long. Water enters a spiral casing in turbine, which will be of reaction type, and passes out to draft tube through vanes of the runner. Runner will be cast in one piece and connected directly to extended shaft of generator. Speed of waterwheel, as load comes off and on, will be controlled by an oil pressure governor Power will be used in connection with new electrolytic flotation method of treating carbonate and sulphide ores.

Silver Bow County

BUTTE & SUPERIOR (Butte) June output was smallest in tonnage for many months, resulting in 8600 tons of concentrates, assaying 54.7% zinc. Decrease is partly ascribed to labor disturbances.

BUTTE-ALEX SCOTT (Butte)—A meeting of directors was called for July 14 to consider question of declaring a dividend. President Hugo states that there are funds in treasury to pay a dividend and that money has been earned by operation of company's property. The question to be decided is whether a dividend is warranted at present time considering condition of copper market and outlook for continuance of operations in near future, in light of recent labor disturbances.

NETTIE (Butte)—Unwatering of this mine, a property of Anaconda company, in old silver district, three miles west of Anaconda hill, has progressed down to 350 level. Shaft is 540 ft. deep and within next three months it is expected that entire mine will be clear of water. Upon completion of this work, sinking will be started at once, followed by extensive exploration work. Enough ore running from 20 to 60 oz. silver is known to have been blocked out when mine was shut down in 1897 to pay for present work of unwatering and for contemplated development. Indications are strong that these western silver mines may develop commercial bodies of zinc ore at depth as in similar veins in Butte & Superior and Elm Orlu mines in eastern portion of Butte district. Both Davis-Daly and Butte & Superior companies own ground in vicinity of Nettie mine and development in it will have an important bearing on these mines.

NEVADA

Clark County

FREDRICKSON (Goodsprings)—A new gasoline hoist has been installed, and sinking in main shaft will be resumed.

BULLION (Goodsprings)—No ore is being shipped, owing to low lead market, but men are at work on development, and a considerable tonnage of high-grade lead ore has been accumulated on dumps.

MOUNTAIN TOP (Goodsprings)—Men are at work on this property, which is under lease to M. G. Wadey, and a considerable tonnage of lead and zinc ore has been mined. It is reported that a new road will be built to property, and an aërial tramway constructed.

BOSS (Goodsprings)—New aërial tramway is completed and copper ore is being hauled to railroad at Jean for shipment to Salt Lake smelters. A strike of rich gold ore was made in a winze from the upper tunnel, during the latter part of June. A small shipment of this ore, forwarded by express to smelter, assayed $2500 per ton, and a car of ore is now being sacked, which assays indicate will carry $300 per ton in gold. Ore occurs in talc gouge along a fracture in limestone and ranges in thickness from a few inches to several feet. There has been considerable excitement over rich find, and claims have been staked for several miles from the Boss.

YELLOW PINE (Goodsprings)—New two-compartment shaft has reached a depth equal to lowest of old workings, and connections are being made with seventh level. Several stations and ore pockets will be constructed before new shaft can handle entire output of mine. During June, 1200 tons of zinc concentrates and 250 tons of lead concentrates were shipped, a considerable increase over previous months. Mill operated at but two-thirds capacity, and it is expected that full capacity will be maintained as soon as shaft-work is complete. Company paid regular monthly dividend of 1c. per share in June, but announced intention of paying dividends quarterly instead of monthly, hereafter.

Churchill County

NEVADA HILLS (Fairview)—Report for May, 1914, is as follows: Ore treated, 5300 tons; gross value, $42,350; net costs, $32,812; loss in tailings, $4267; net profit, $5271. Total extraction of 89.9% was made, 19.1% by concentration and 70.8% by cyanidation.

Esmeralda County

LOU DILLON-SILVER PICK (Goldfield)—A consolidation of these two properties will be effected. New company will be called Lou Dillon-Silver Pick Extension Consolidated Co.

JUMBO EXTENSION (Goldfield)—Extraction in 10-stamp section of Goldfield Consolidated mill has been increased from 75 to 83%. Lower portion of big stope above 921-ft. level has caved, necessitating suspension of work in east drift on 850-ft. level until a crosscut can be driven around cave. Mine production is not curtailed.

Humboldt County

DONNELLY MOUNTAIN MINES CO. (Gerlach)—Articles of incorporation have been filed. Development work will be done on six claims on Donnelly mountain in northwestern part of county.

NATIONAL MINES CO. (National)—It is reported that a cache of 20 sacks of high-grade ore has been found in an old abandoned drift. Good-grade oreshoot was struck recently in deepest workings. Mill is running steadily.

Lander County

AUSTIN-DAKOTA (Austin)—Main vein is being developed by a tunnel 300 ft. to northeast of incline shaft. Bottom of shaft is in ore containing native silver. Drifting from shaft and driving of tunnel are being done under contract. Mine is equipped with hoisting plant and pumps.

Lincoln County

AMALGAMATED PIOCHE (Pioche)—Crosscut on 1400-ft. level has cut shoot of silver-lead ore 7 ft. wide. Discovery was unexpected, and further development is necessary to determine extent of shoot.

YUBA (Pioche)—Shoot of good-grade silver-lead ore has been opened west of shaft on 800-ft. level. This ore contains both lead carbonate and steel galena. It is planned to drive from old Boston-Pioche shaft to Yuba workings, and deal for use of this shaft and equipment is now under way. Compressor will be installed at No. 3 shaft.

Lyon County

ACTIVITY IN MOUNT GRANT DISTRICT is considerable. A small mill is in operation on Burke property, and another mill has been moved from Aurora to Lewis property.

MOUND HOUSE GYPSUM CO. (Moundhouse)—Property is being examined for purchase by United States Asbestos Co.

NEVADA-DOUGLAS (Ludwig)—Following estimate of cost of mining, and treating ore by leaching is taken from statement of A. J. Orem, superintendent: Acid loss, $0.35; acid regeneration, $0.35; handling of solutions, $0.50; electrolytic precipitation $0.45; superintendence, $0.52; mining, $2; crushing and grinding, $0.50; interest and depreciation, $0.30; freight handling, etc., $0.21; total, $5.18.

MASON VALLEY MINES CO. (Thompson)—Ore receipts for June, 1914, were as follows: From Mason Valley mine, 7558 tons; from Nevada-Douglas, 3403 tons; from other mines, 9905 tons; total, 20,866, or a daily average of 696 tons. During same month 13 cars of blister copper were shipped. Exploratory work is being done in Bluestone mine, Mason Valley district. A large tonnage of ore is now being received from Balaklala company, cf Kimberly, Calif.

Nye County

TONOPAH CASH BOY (Tonopah)—Shaft is now 1245 ft. deep and sinking will be continued to 1400-ft. level, where crosscut will be driven to cut extension of Murray vein from Tonopah Extension ground. Shaft is now in ore-bearing formation and indications are favorable.

WHITE CAPS (Manhattan)—Two shifts of miners are laying air lines for machine drills, removing débris left in mine from lease operations, putting down rails, catching up several incipient caves through fault plane. Soon mining operations on company account will be at full capacity. Next addition to surface plant is to be two large ore bins, which will be used immediately upon completion. It is understood that a shipment to renovated Associated mill will be made as soon as mill is in shape to receive it.

White Pine County

FIRST AID AND MINE RESCUE CONTEST was held in Ely on the Fourth as part of celebration. First aid contest was won by Copper Flat team and mine rescue by Veteran mine team.

WILLOW CREEK CONSOLIDATED (Ely)—It is planned to build a stamp mill this autumn.

WILLOW CREEK GOLD MINING CO. (Ely)—Good tonnage of milling-grade ore has been developed and mill may be built.

NEW MEXICO

Bernalillo County

SANTA FE DREDGING CO. (Golden)—Eighteen cars of machinery are en route and three cars are already on property. Company is employing 34 men and 18 teams in transportation; 360-hp. Corliss engine and 250-kw. generator supply electric power, supplanting steam. Dredge is being remodeled. Company will work 570 acres proved placer ground. Work will commence with day and night shifts after Aug. 1.

Grant County

COLORADO FUEL & IRON CO. (Fierro)—Company continues to ship 10 carloads iron ore daily to Pueblo, Colo., from Brockman property. District in general rather dull at present time.

CHINO COPPER CO. (Santa Rita)—Steel structural work on crushing plant is nearing completion. Ore bins are latest addition to Santa Rita plant. Railroad construction to Northwest orebody is finished. Many road improvements and new business houses are adding to appearance of Chino camp.

Socorro County

MOGOLLON MINES CO. (Mogollon)—Incorporation papers have been filed with state corporation commission, paid up capital being given at $1,655,015. Ex-Postmaster-General Frank H. Hitchcock is president of company. Company is incorporated under laws of Maine.

UTAH

Juab County

TINTIC SHIPMENTS FOR FIRST HALF OF 1914 have amounted to 3656 cars, ore coming from 39 mines and leases.

GRAND CENTRAL (Mammoth)—Conditions are stated to be such as to insure continuance of present dividend rate of 15c. to 20c. a share yearly.

EAGLE & BLUE BELL (Eureka)—Ore has been opened below 1600, and it is planned to sink main shaft from 1550 to 1700, where drifting will be started.

TINTIC ZINC (Eureka)—This company's tunnel is in 540 ft. at a vertical depth of 300 ft. Some mineralization is showing in the face, which is nearing a large iron blow out.

GEMINI (Eureka)—This company, capitalized at 5000 shares, has declared a dividend of $10 per share, or $50,000. This will make a total dividend record of $2,280,000 since payments began in '80s. In 1912 there were produced approximately 14,000 tons; in 1913, 22,000 tons; and 12,000 tons thus far in 1914. Work carried on by lessees is being done from 200- to 1600-ft. levels.

SIOUX CONSOLIDATED (Silver City)—This property has been leased and a small force is at work. It is expected that operating expenses will be met from small bunches of ore left in some old workings. Stringers of ore now exposed will be followed in hope of finding offshoots from Beck Tunnel-Colorado vein, which continues for several hundred feet in Sioux ground. A large dump will be sampled.

CHIEF CONSOLIDATED (Eureka)—Company has just declared a dividend of 5c. per share, or $43,820, payable Aug. 25. This will bring total from this company thus far to $263,030. In June 3850 tons of ore were marketed, and monthly output during last six months has ranged from 3250 in February, lowest month, to 5000 tons in May, highest; 24,000 tons has been produced thus far in 1914. Main working shaft is to be provided with heavier guides, which will be placed during the early part of July.

Summit County

MINES OPERATING CO (Park City)—This company's mill is treating stope fillings from Ontario at increased profit, owing to greater efficiency of recently installed new machinery.

DALY WEST (Park City)—Foundations for new mill are being laid, and work on mill building will begin shortly. Capacity will be 250 tons per day. In 1913 Daly West mill treated 59,233 tons of ore, which gave 8332 tons of lead and 1592 tons of zinc concentrates. New mill will be similar to old, but improvements are contemplated, by which greater efficiency is expected. Upper levels are being worked by lessees, who drop their ore to 1200 level tunnel, from which it is loaded. Shipments of crude ore from mine during 1913 amounted to 5038 tons.

Tooele County

BULLION COALITION (Stockton)—A station has been cut 1300 ft. vertically underground and 8500 ft. in from portal of Honorine tunnel. Work is in dolomite limestone. A shaft will be sunk 150 ft. and crosscutting started for an orebody, which has been found to continue downward from tunnel level. An engine is being installed. Mill is treating 50 tons of low-grade ore daily.

Utah County

PACIFIC (American Fork)—New lessees have a force of 10 men at work; shaft is being sunk and prospecting is being done in various places. A pump will be installed to take care of water which has interfered with shaft sinking. Gasoline engine will be used.

WASHINGTON

Ferry County

SAN POIL-REPUBLIC (Republic)—While a plan to consolidate these two companies is still under consideration, leaders in movement admit that prospects for success are not encouraging. At an adjourned meeting in Spokane, July 3, of Republic stockholders proposed plan was practically turned down, but another plan has been suggested, nature of which has not been made public. Consolidation plan, which originated with San Poil company, provides for organization of a new corporation, capitalized for 1,500,000 shares at $1 each, San Poil stockholders to be apportioned half issue and Republic stockholders half. This means that San Poil company, now capitalized for 1,500,000 shares, will sacrifice half of its stock and Republic, capitalized for 1,000,000 shares, will suffer a loss of but 25%. This discrepancy is offset, however, by proportionate indebtedness, San Poil having outstanding obligations of $150,000 and Republic but $90,000.

Okanogan County

RATTLER (Chesaw)—New equipment is being installed and preparations are being made for enlarging the force.

WISCONSIN

Jackson County

DIAMOND DRILLING HAS BEEN STARTED at Iron Mound, near Black River Falls, to explore for iron ore, of which there are some indications. Locality is 75 miles northwest of recently abandoned Baraboo district, and is far removed from any other known iron region. University of Wisconsin is now having a geological survey made of southern Sawyer and northern Rusk counties, 50 miles north of Black River Falls. A total of 80 men are employed. Field work will be completed by Sept. 20.

Zinc-Lead District

THOMPSON—R. E. Davis and H. A. Roessler, of Platteville, have organized a company to develop J. J. Thompson land near Lead Mine, in Benton district.

ALDERSON—Charles Kistler, of Platteville, has begun shaft sinking on Alderson 80-acre tract, three miles south of Platteville; 50-ton mill and equipment of St. Rose Co. have been purchased and will be removed to the Alderson.

CANADA

Ontario

PORCUPINE LAKE (Porcupine)—This mine has been closed down owing to lack of funds. An attempt will be made to reorganize.

COCHRANE (Cobalt)—An oreshoot from 3 to 5 in. wide of 2000-oz. ore has been opened up on 100-ft. level. Same vein has been cut on level below, where it is of much lower grade.

TIMISKAMING & HUDSON BAY (Cobalt)—Mill of this company was closed down July 6 and mine will shortly be closed. Company is still operating its claim south of McKinley-Darragh.

DOME LAKE (Porcupine)—No. 1 vein has been opened up for over 40 ft. on 300-ft. level, showing high-grade ore. Main shaft is now down to 400 ft. and crosscutting will be undertaken to tap veins proved up on upper levels.

MEXICO

Chihuahua

AMERICAN SMELTING & REFINING CO.—Company has blown in two of six furnaces at Chihuahua plant, and hopes to be able to do something in way of resumption of operations at Velardeña in near future. Difficulty of obtaining an operating force is chief obstacle company has to meet. Chihuahua plant requires 900 men to operate at capacity and mines at that place 2500 men.

TRANSVAAL

GOLD PRODUCTION IN JUNE is reported by cable at 717,926 oz., which is 2303 oz. less than in May and 29,151 oz. less than in June, 1912. The average daily output for June, however, improved, being 23,931 oz., against 23,233 in May. For the six months ended May 31 the total was 4,640,427 oz. in 1913, and 4,086,847 oz.—or $84,475,127—in 1914, a decrease of 553,580 oz., or 11.9% this year.

The Market Report

METAL MARKETS

NEW YORK—July 18

The metal markets have been quieter this week, the activity reported recently having passed over. Price fluctuations have been small.

MONTHLY INDEX NUMBERS

Month	1912	1913	1914	Month	1912	1913	1914	Month	1912	1913	1914
Jan......	111	126	108	May....	118	126	111	Sept......	127	118	...
Feb.......	109	125	115	June...	117	117	109	Oct.......	133	114	...
March...	111	125	110	July.....	114	110	...	Nov......	129	110	...
April.....	115	124	107	Aug.....	120	116	...	Dec......	129	110	...

Average for year 1913, 118; year 1912, 119; year 1911, 112; year 1910, 115.

Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and alumioum.

Copper, Tin, Lead and Zinc

Copper—The activity in the market during the early part of July had petered out before the beginning of our last week. The publication of the June statistics threw a further wet blanket over the market. At the moment the world's production of copper is in excess of its consumption. The producers are averse to carrying more than their natural proportion of the increasing unsold accumulation, which is equivalent to saying that everybody wants to sell copper, but everyone is more or less circumspect in his way of going about it. In the early part of the week copper was offered freely by producers and second hands at 13¾c., delivered, usual terms, and some domestic business was done at 13⅝c. During the latter part of the week 13⅝c. was the asking price openly named. The attitude of some of the producers toward customers seems to be, "We offer at this price, what will you give?" Certain of the large producers, however, have ostensibly maintained a higher asking price and have avoided putting any pressure on the market, although there have been indications that they have been fishing for the level at which worth-while business might be done. The total volume of the business done during the last week was small.

Prime Lake copper was sold by producers in round lots right through the week at 13½c., basis, cash, New York.

The average of quotations of electrolytic during the week is 13.49 cents.

The London standard market has been quiet and weakish, fluctuating around £61 for spot and £61 10s. for three months. It closes on July 15 at £61 2s. 6d. for spot and £61 11s. 3d. for three months.

Base price of copper sheets is now 19c. per lb. for hot rolled and 20c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14⅞@15⅛c. per lb., carload lots at mill.

Tin—The advance of last week did not increase the interest in the market. In fact, trading ceased almost entirely, and selling orders from this side which were placed on July 14 on the London Metal Exchange easily upset this market. It declined about £4 and failed to rally. The close is easy at £142 17s. 6d. for spot and £144 7s. 6d. for three months, and about 31⅝c. here.

Lead—This market also has been weaker. While some small lots of special lead have been sold at a cent or two above quotations, the larger business was done at 3.75c. and a trifle under. There appears to have been a distinct pressure to sell from several quarters, and the demand has not been good.

The London market is also lower, Spanish lead being quoted £19 2s. 6d.; English lead, £19 12s. 6d. per ton.

Exports from Baltimore for the past week included 846,676 lb. lead, to Hamburg and Bremen, Germany, and to Rotterdam, Holland.

Spelter—During the early part of the week certain important producing interests took the bull by the horns and sold largely at a reduced price, realizing about 4.75c., St. Louis. During the latter part of the week the metal was freely offered at that price without finding takers.

The London market is unchanged, good ordinaries being quoted £21 12s. 6d; specials, £22 7s. 6d. per ton.

Base price of zinc sheets is $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—Business continues on a moderate scale, and prices are a little easier. Current quotations are 17.50@17.75c. per lb. for No. 1 ingots, New York.

The Bremer-Waltz Corporation, 30 Church Street, New York, has been recently organized with W. S. Bremer, president; J. L. T. Waltz, secretary and treasurer, to handle aluminum in all its forms. Mr. Waltz has been engaged in importing aluminum for a number of years, having been manager for Guiterman, Rosenfeld & Co., of New York.

DAILY PRICES OF METALS

NEW YORK

July	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Dts. per Lb.
9	4.8765	56⅛	13.55 @13.65	32⅝	3.87½ @3.90	3.72½ @3 75	4 87½ @4 92½	4 72½ @4 77½
10	4.8750	55¾	13.47½ @13.50	32⅜	3.87½ @3 90	3 72½ @3 75	4.87½ @4 92½	4 72½ @4 77½
11	4.8750	55⅞	13.45 @13.50	32⅜	3.87½ @3.90	3.72½ @3.75	4.87½ @4.92½	4.72½ @4.77½
13	4.8750	55¾	13.45 @13.50	32⅜	3.87½ @3 90	3 72½ @3.75	4 87½ @4 90	4 72½ @4 75
14	4.8740	55¼	13.40 @13 50	31¾	3.87½ @3 90	3.72½ @3 75	4 87½ @4.90	4 72½ @4 75
15	4 8710	54⅞	13 40 @13 50	31⅝	3.87½ @3 90	3 72½ @3 75	4 87½ @4.90	4 72½ @4 75

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0 15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0 25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triests, 22c.

LONDON

July	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
		£ per Ton	Cts. per Lb.								
9	25 11/16	61½	13.36	62	66	147¾	148¾	19⅜	4 24	21½	4.67
10	25 11/16	61¼	13.31	61¾	66	146½	148	19⅜	4 24	21½	4.67
11	25¾	.		..	..	.		...	......	.....	....
13	25 11/16	61½	13 36	62	66¼	146¼	147¾	19¼	4.21	21½	4.67
14	25 7/16	61	13 25	61¼	65	143¼	144¾	19	4 13	21½	4 67
15	25¼	61⅛	13 28	61 9/16	65	142⅞	144⅜	19⅛	4 16	21⅞	4.70

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0 925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅜c.; £15 = 3.26⅛c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Antimony—Business has a better tone and demand shows some improvement. Ordinary brands—Hungarian, Chinese, etc., are, however, a little easier at 5.60@5.75c. per lb. Cookson's holds at 7.10@7.30c., with 6.90@7.10c. for other special brands.

Quicksilver—While there is a fair demand prices are rather softer. New York quotation is $36@37 per flask of 75 lb. with 53@54c. per lb. quoted for jobbing lots. San Francisco, $36.50 per flask, with about $2 less for export. London, £7 per flask, with £6 17s. 6d. quoted by second brands.

Nickel—Quotations for ordinary forms—shot, blocks, or plaquettes—are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Minor Metals—Quotations for **Bismuth** are $1.80 per lb. for imported, $1.72 for metal from native ores—**Cadmium**, 750 marks per 100 kg.—81c. per lb.—at works in Germany—**Magnesium**, $1.50 per lb., New York—**Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, and $5 per lb. for small quantities.

Gold, Silver and Platinum

Gold—While the European banks are carefully holding their gold, the special demand for arrivals in London was less keen, and no premium was paid, the price continuing at 77s. 9d. per oz. for bars.

Transvaal Gold Production in June is reported at $14,839,530, showing decreases of 0.3% from May, and of 4.1% from May, 1913. For the five months ended May 31 the total gold reported was $95,917,626 in 1913, and $84,475,127 in 1914; a decrease of $11,442,499, or 11.9%, this year.

Platinum—The market here is quiet and unchanged, dealers asking $43@44 per oz. for refined platinum, and $46@51 per oz. for hard metal. The foreign market is reported unsettled.

Silver—The market continued dull and quiet on small demand until July 14 and 15, when the price broke under selling pressure by the Chinese Banks. Indian demand continues light owing to heavy stocks on hand, unfavorable Monsoon reports and the probability that the India Mint will not buy in the near future.

Shipments of silver from London to the East, Jan. 1 to July 2, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£4,012,000	£3,893,000	D. £119,000
China	417,000	40,000	D. 377,000
Total	£4,429,000	£3,933,000	D. £496,000

Stocks in London are reported as gradually decreasing, and there is little speculation in futures.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—July 11

There was a slight slump in the market this week, the base price paid for 60% zinc ore being $37@38.50 per ton. For 80% lead ore the market price was $46@47 per ton. No sales of lead ore were reported.

SHIPMENTS WEEK ENDED JULY 17

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,463,520	....	711,600
Year	80,103,920	2,862,610	21,419,930

Shiped during week to separating plants—3,087,350 lb. zinc ore.

JOPLIN, MO.—July 11

Zinc blende sold at $42, though there is a drop of $1 in the base price, which is $37.50@39 assay, and $36@37.50 metal base. Calamine is $19@22 per ton of 40% zinc. The average selling price of all grades is $35.80 per ton. Lead sold as high as $48, the base remaining at $46 per ton of 80% metal content, and the average of all grades is $46.08 per ton.

The further decline in zinc ore prices is pressing some producers very hard, and a few cannot long continue with no margin of profit showing, unless an arrangement can be made with miners to accept a lower wage scale, and this is not probable yet.

SHIPMENTS WEEK ENDED JULY 11

	Blende	Calamine	Lead	Values
This week	8,539,290	565,830	1,264,390	$199,930
28 weeks	287,477,960	20,728,810	49,353,280	$7,047,515

Blende value, the week, $164,620; 28 weeks, $5,629,150.

Calamine value, the week, $6180; 28 weeks, $235,835.

Lead value, the week, $29,130; 28 weeks, $1,182,535.

MONTANA ZINC ORE

Butte & Superior in June produced 8600 tons of blende concentrates, averaging 54.7% zinc.

IRON TRADE REVIEW

NEW YORK—July 15

The iron and steel markets seem surely to have taken an upward turn, and the improvement is the more manifest since July is generally regarded as a dull month.

The pig iron market is more active for both foundry and basic, especially foundry iron. Orders are small generally, but more numerous than they have been.

A sale of low phosphorus pig for export to Wales is reported to have been made at 61s., or $14.64 per ton. The analysis of the iron shows 2% silicon, 0.35 sulphur and phosphorus, 0.2 manganese and 0.5% copper.

The United States Steel Corporation reports unfilled orders on its hooks June 30 at 4,032,857 tons of material of all kinds. This is 34,697 tons more than on May 31 and is the first increase shown for a number of months. It is 249,251 tons less than on Dec. 31 last.

Pig Iron Rates from Virginia Furnaces will be reduced Aug. 15 by the decision of the Interstate Commerce Commission in the complaint of the Low Moor Iron Co. against the Chesapeake & Ohio and other roads. The Commission finds that the present rates are too high and discriminate against the Virginia furnaces in competition with those in Pennsylvania. The reduction ordered is 10%, the new rates being $2.25 per gross ton to Baltimore; $2.75 to Philadelphia; $3 to New York; $3.25 to Boston.

Pig Iron Production in June again showed a decrease. The reports of the furnaces, as collected and published by the "Iron Age" show a total of 193 coke and anthracite stacks in blast on July 1, having a total daily capacity of 63,700 tons; a decrease of 800 tons from July 1. Making allowance for the charcoal furnaces, the estimated total make of pig iron in the United States in June was 1,946,500 tons; for the six months ended June 30 it was 12,365,200 tons. Of this total 8,718,200 tons, or 70.5%, were made by the furnaces owned or operated by steel works.

PITTSBURGH—July 14

The improved rate of buying of steel products for prompt shipment which obtained in June has continued with scarcely any abatement since the first of this month, while buying on contract has increased, and on the whole the total bookings, in contracts and prompt orders, appear to be at a somewhat greater rate than in June. Prices have responded to the better buying to the extent that declines are entirely arrested in finished-steel products, though perhaps not in unfinished steel, and in some directions there is slightly more firmness.

Sentiment throughout the iron and steel trade has greatly improved in the past week, on the part of buyers as well as sellers, and there is a more general disposition to buy ahead, even to the extent, in many cases of paying a premium for far forward deliveries. Prices are expected to firm up or advance slightly, but no large advances are expected for material for delivery any time this year. The improvement is expected in tonnage rather than in prices.

An agreement on the wage scale to govern the operation of union iron mills was reached last Friday between the Western Bar Iron Association and the Amalgamated Association, whereby slight advances are given in rates in the sliding scale when bar iron ranges under 1.25c., there being no change in rates from the old scale when bar iron is 1.25c. or higher. On 1.00c. bar iron the puddling rate is 25c. higher, at $5.50 per ton.

Pig Iron—There is a moderate movement in foundry iron, chiefly in small lots. Small lots only of bessemer iron are changing hands. One of the Allegheny river steel plants has purchased 6000 tons of basic iron, the price reported being $13.90, delivered. Several other steel interests are expected to buy basic shortly. We quote: Bessemer, $14; basic, foundry and malleable, $13; gray forge, $12.50 to $12.75, at Valley furnaces, 90c. higher delivered Pittsburgh, except that one or two furnaces having 75c. freight to Pittsburgh would probably sell foundry at $13 at furnace or $13.75, Pittsburgh.

Ferromanganese—The price of $37, Baltimore, on German ferromanganese seems to be made upon authority from the German producers, while English is still quoted at $38. In some quarters it is believed that a part of the arrangement between the English and German producers is that the latter be allowed occasionally to undersell the former's price. The market is very quiet.

Steel There are reports of lower prices quoted by some of the Youngstown mills on both billets and sheet bars. There are very few regular transactions, most of the consumers having contracts on which price adjustments are made from time to time. We quote prices f.o.b. Youngstown mill at $19 for billets and $19.50 for sheet bars, or 50c. lower than formerly, and prices f.o.b. Pittsburgh mill at $19.50 for billets and $20 for sheet bars. Rods are $24.50 to $25, Pittsburgh.

IRON ORE

Shipments of iron ore from the Lake Superior region in June were 5,502,367 gross tons. For the season to July 1 the total shipments were:

Port	1913	1914	Changes
Escanaba	1,800,601	1,076,020	D. 724,581
Marquette	1,059,776	383,948	D. 675,828
Ashlaod	1,509,702	883,081	D. 626,621
Superior	4,677,349	3,733,502	D. 943,847
Duluth	3,995,948	1,779,876	D. 2,216,072
Two Harbors	3,081,666	1 767,689	D. 1,313 977
Total	16,125,042	9,624,116	D. 6,500,926

Out of the total shipments in June 4,383,045 tons, or 79.7%, went to Lake Erie ports.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 259,252 short tons; shipments, 275,902 tons. Production of the Greensburg and Upper Connellsville districts, 35,826 tons.

The Otto Coking Co., New York, has been awarded the contract for the construction of the byproduct coke plant of the Niagara Coke Corporation near Buffalo. The company plans a plant to cost about $1,000,000, to employ 700 men and capable of carbonizing 1700 tons a day.

Connellsville Coke—The market continues very quiet, but with a little interest shown, two consumers having inquired for furnace coke on contract for the second half of the year. One of these represents a furnace now in blast, with a contract just expired, the other being a furnace which may possibly go into blast. In general consumers are covered at least for the present month. A contract is reported for 18 cars weekly of foundry coke the next twelvemonth at the full market price for the best grade. We quote: Prompt furnace, $1.75@1.80; contract furnace, $1.90@2; prompt foundry, $2.25@2.35; contract foundry, $2.35@2.50, per net ton at ovens.

Anthracite Shipments in June were 6,130,196 long tons, an increase of 160,189 tons over June, 1913. For the six months ended June 30 the total shipments were 34,851,854 tons in 1913, and 32,945,789 in 1914; a decrease of 1,906,065 tons, or 5.5%, this year.

Coal Imports of Spain, four months ended Apr. 30 were 939,728 tons, a decrease of 9471 tons; coke imports, 126,501 tons, an increase of 1197 tons over last year.

Fuel Production in Germany five months ended May 31 is reported as below, in metric tons:

	1913	1914	Changes
Coal	77,618,129	79,131,777	I. 1,483,648
Brown coal	35,041,459	37,192,341	I. 2,150,882
Coke	13,333,419	13,309,963	D. 23,456
Briquettes	10,965,055	12,078,029	I. 1,112,974

Of the briquettes reported this year, 9,414,818 tons were made from brown coal, or lignite.

CHEMICALS

NEW YORK—July 15

Midsummer quiet seems to have settled over the general market, and business is quiet.

Nitrate of Soda—While there is no special activity at this season, there is some business doing. Prices are 2.10c. per lb. for spot and 2.07½c. for futures.

W. Montgomery & Co., Ltd., of London issue the following statement giving the movement of nitrate of soda for the year ended June 30, in long tons:

	1912-13	1913-14	Changes
Shipments from S. America	2,617,000	2,631,000	D. 16,000
Estimated consumption	2,451,000	2,633,000	I. 182,000
Visible supply June 30	420,000	400,000	D. 20,000

Visible supply includes quantities afloat. The estimated consumption last year was: Europe, 1,990,000; United States, 553,000; other countries, 90,000; total, 2,633,000 tons.

Latest quotations at Chilean ports were $1.81@1.92 per quintal. Freight to Europe or the United States, $2.16 per ton by steamer.

Arsenic—The market remains quiet and easy, but price do not change. The current quotation is $3 per 100 lb. fo both spot and futures.

Copper Sulphate—Business is fair but not specially active Prices are a little lower, $4.50 per 100 lb. being quoted fo carload lots and $4.75 per 100 lb. for smaller parcels.

PETROLEUM

Announcement is made that the Valley Pipe Line Co. has awarded to Sanderson & Porter, of New York, a contract for the entire installation of a pipe line for transporting oil from the San Joaquin oil field in California to tidewater. The Valley Pipe Line Co. is one of the subsidiaries of the Royal Dutch-Shell combination, and the new line will be 175 miles in length. Surveys for the pipe line have been completed and contracts for the pipe have been placed with the Youngstown Sheet & Tube Co. Equipment for stations will be furnished by the Llewellyn Iron Works of Los Angeles.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude cooper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded

	February	March	April	May	June
Alaska shipments	1,803,579	2,069,960	1,279,537	585,387	1,114,758
Anaconda	21,300,000	23,800,000	22,900,000	23,500,000	23,800,000
Arizona, Ltd.	3,062,000	3,286,000	3,570,000	3,092,000	3,742,000
Copper Queen	6,987,366	7,637,042	7,562,723	8,388,203	7,613,719
Calumet & Ariz.	5,596,850	5,875,000	5 450,000	5,495,000	4,630,000
China	5,642,426	5,309,814	5,926,591	5,496,875	....
Detroit	1,814,214	1,973,725	1,790,926	2,105,034	2,129 100
East Butte	1,193,960	1,546,180	1,178,000	1,179,762	1,215,323
Giroux	90,017	287,980	45,948	429,553	......
Mason Valley	1,254,000	1,250,000	862,000	916,000	....
Mammoth	1 400,000	1,800,000	1,850,000	1,750,000	1,725,000
Nevada Con.	4,588,243	5,218,257	4,880,043	4,959,589	....
Ohio	582,000	797,520	610,518	625,000	.....
Old Dominion	3,066,000	2,997,000	2,779,000	3,302,000	2,937,000
Ray	5,432,000	6,036,908	6,089,362	6,300,847	....
Shannon	903,761	1,082,000	1,012,000	1,056,000	....
South Utah	333,874	406,381	247,641	55,394	....
Tennessee	1,232,812	1,262,184	1,370,800	1,336,950	....
United Verde*	2,700,000	3,100,000	3,000,000	3,100,000	....
Utah Copper Co.	9, 07,111	12,323,493	12,739,757	13,208,483	....
Lake Superior*	8,500,000	11,000,000	13,000,000	12,500,000	16,000,000
Non-rep. mines*	7 600,000	8,200,000	8,000,000	8,200,000	....
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	....
Total prod.	96,790,213	107,036,667	108,554,846	110,082,077	....
Imp., bars, etc.	19,918,448	22,676,605	17,043,191	....	....
Total blister	16,708,661	129,713,272	125,598,035	....	....
Imp. ore & matte.	9,713,164	7,029,646	10,400,122	....	....
Total Amer.	126,421,825	136,742,918	135,998,157	....	....
Miami†	3,316,482	3,361,100	3,130,772	3,347,000	3,124,750
Shattuck-Arizona	1,134,480	1,136,458	1,386,594	1,353,043	....
Brit. Col. Cos.:					
British Col. Cop.	....		....		....
Granby	1,661,212	1,775,852	1,692,102	1,669,334	....
Mexican Cos.:					
Boleo†	1,984,080	2,735,680	2,204,720	2,213,120	....
Cananea	2,688,000	4,260,000	2,632,000	2,222,000	....
Moctezuma	2,642,543	2,882,884	2,654,926	2,834,616	3,370,800
Other Foreign:					
Braden, Chile	2,362,000	1,810,000	2,720,000	2,480,000	741,440
Cape Cop., S. Af.	479,200	660,800	468,160	....	....
Kyshtim, Russia.	1,534,400	..	...	....	....
Spassky, Russia.	902,720	896,000	904,960	907,200	....
Exports from Chile	6,720,000	6,944,000	9,072,000	7,616,000	....
Australia	7,952,000	8,176,000	7,168,000	8,400,000	....
Arrivals-Europe‡	18,354,560	17,572,800	17,299,520	13,558,720	....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡ Does not include the arrivals from the United States, Australia or Chile.

COPPER STATISTICS

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	....	....	....
VII, '13	138,074,602	58,904,192	78,480,071	52,814,606	77,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,917	66,420,480	120,015,385
IX	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X	139,070,481	68,173,720	68,123,472	29,793,092	53,625,600	83,418,692
XI	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr., '13	1,622,430,829	767,261,760	869,062,784	....	....	... ...
I, 1914	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,355,667
II	122,561,007	47,586,657	83 899,183	87,296,685	50,108 800	137,405,485
III	145,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV	151,500,5[illegible]1	63,427,633	82,315,216	64,609,319	46,435,200	111 044,519
V	142,308,287	55,592,170	72,710,477	70,337,001	52,371,200	122,708,201
VI	141,345,571	46,227,353	73,350,196	84,342,641	61,062,400	145,405,041
VII				106,110,663	64,220,800	170,331,463

Note—Visible supplies in Europe do not include copper afloat.

Mining Companies—United States

Name of Company and Situation		Shares		Dividends		
		Issued	Par	Total	Latest	Amt.
Acacia, g	Colo.	1,438,989	$ 1	$ 122,004	Jan '11	$0 01
Adams, s.l.c	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c	Mich.	50,000	25	2,030,000	Apr. '14	2.00
Alaska Mexican, g	Alas.	180,000	5	3,345,381	May '14	0.20
Alaska Treadwell, g	Alas.	200,000	25	14,335,000	June '14	1 00
Alaska United, g	Alas.	180,200	5	1,666,840	May '14	0 20
Am. Zinc, Lead & Sm	U. S.	165,360	25	1,071,420	Jan. '14	0 50
Anaconda, c	Mont.	4,662,500	25	87,916,875	Apr. '14	0.75
Argonaut, g	Calif.	200,000	5	1,200,000	June '10	0 05
Arizona Copper, pf.	Ariz.	1,426,120	1 20	1,950,242	Apr. '14	..
Arizona Copper, com	Ariz.	1,519,896	1.20	16,446,145	Feb. '14	0.30
Bagdad-Chase, g., pf	Calif.	84,819	5	202,394	Jan. '09	0 10
Baltic, c	Mich.	100,000	25	7,950,000	Dec. '13	2 00
Bingham N. H., c	Utah	228,690	5	385,695	Apr. '14	0 10
Bonanza Dev., g	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g	Calif.	200,000	1	841,000	June '14	0 05
Bunker Hill & Sul., l.s.	Ida.	327,000	10	15,225,250	June '14	0 25
Butte-Alex Scott, c	Mont.	74,000	10	148,000	Oct. '13	0.50
Butte & Ballaklava, c	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	596,353	10	20,504,287	June '14	1 25
Calumet & Hecla, c	Mich.	100,000	25	124,250,000	June '14	5 00
Camp Bird, g.s	Colo.	1,100,051	5	9,761,377	Jan. '14	0 24
Centen'l-Eur., l.s.g.c	Utah	100,000	5	4,050,000	Apr. '14	1.50
Center Creek, l.z.	Mo.	100,000	10	500,000	Apr. '14	0.05
Champion, c.	Mich.	100,000	25	8,400,000	Oct. '13	1.00
Chief Consolidated, s.g.l.	Utah	876,453	1	218,138	Feb. '14	0.10
Cliff, g	Utah	300,000	1	90,000	Jan. '13	0.10
Cliff, g	Alas.	100,000	1	210,000	Oct. '13	0 01
Colo. Gold Dredging	Colo.	100,000	10	550,000	Jan. '14	2.50
Colorado, l.s.g.	Utah	1,000,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s.	Utah	285,540	5	226,832	Oct. '07	0.20
Commercial Gold	Ore.	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercur, g	Utah	1,000,000	1	3,445,313	July '13	0.03
Continental, z.l.	Mo.	22,000	25	308,000	Jan. '14	0.50
Copper Range Con., c	Mich.	393,445	100	13,986,746	Oct. '13	0.75
Daly Judge, s.l	Utah	300,000	1	765,000	Apr. '14	0.15
Daly West, s.l	Utah	180,000	20	6,606,000	Jan. '13	0 15
Doctor Jackpot, g	Colo.	3,000,000	0.10	45,000	Mar. '11	0 00½
Doe Run, l	Mo.	65,782	100	3,550,969	Dec. '13	0 76
Eagle & Blue Bell, g.s.l.	Utah	893,146	1	223,286	Apr. '14	0.05
Elkton Con., g	Colo.	2,500,000	1	3,379,460	May '14	0.02
El Paso, g	Colo.	490,000	5	1,707,545	Feb. '14	0.10
Ernestine, g.s	N.M.	300,000	5	165,000	Mar. '13	0.05
Fed. M. & S., com	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf	Idaho	120,000	100	8,567,434	Mar. '14	1.50
Florence, g	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g	Calif.	200,000	2.50	236,000	June '14	0 02
Frontier, z	Wis.	1,250	100	146,202	Nov. '13	2 00
Gemini-Key'ne, l.g.s	Utah	5,000	100	2,289,000	June '14	10 00
Gold Chain, g	Utah	1,000,000	1	130,000	May '13	0 03
Gold Coin of Victor.	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con	Colo.	2,500,000	0.10	100,000	Dec. '12	0 00½
Gold King Con., g	Colo.	5,750,370	1	1,407,319	Dec. '11	0 03
Golden Cycle, g	Colo.	1,500,000	5	2,865,000	June '14	0 03
Golden Star, g	Ariz.	400,000	5	140,000	Mar. '10	0 05
Goldfield Con., g	Nev.	3,558,367	10	27,398,214	Apr. '14	0.30
Grand Central, g	Utah	500,000	1	1,595,750	May '14	0 05
Granite, g	Colo.	1,650,000	1	269,500	Nov. '12	0 01
Hazel, g	Cal.	900,000	1	971,000	Dec. '13	0.01
Hecla, l.s.	Idaho	1,000,000	0.25	3,070,000	June '14	0.02
Hercules, l.s	Idaho	1,000,000	1	3,650,000	July '11	0.06
Homestake, g	S. D	218,400	100	35,251,486	June '14	0.65
Horn Silver, l.s.z	Utah	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	216,832	July '13	0.00½
Iowa-Tiger Leasing g.s	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah	1,000,000	0 10	1,970,000	Apr. '14	0.10
Iron Silver, s.l.g	Colo.	500,000	20	4,900,000	Apr. '14	0.10
Jamison, g	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g	Colo	2,500,000	0.10	175,000	Aug. '12	0.01
Kendall, g	Mont	500,000	5	1,475,000	Nov. '12	0 02
Kennedy, g	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g	Ariz.	200,000	1	396,000	Aug. '09	0 12
Klar Piquette, z.l	Wis.	20,000	1	187,500	Apr. '13	0 50
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0 00½
Liberty Bell, g	Colo	130,551	5	1,452,338	Sept. '12	....
Little Bell, l.s	Utah	300,000	1	75,000	Mar. '11	0 05
Little Florence, g	Nev.	1,000,000	1	430,000	Jan. '08	0 03
Mammoth, g.s.c	Utah.	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g	Colo	1,309,252	1	1,143,123	Apr. '14	0 02
May Day, g.s.l	Utah.	800,000	0 25	132,000	Feb. '13	0 03
Mexican, g.s	Nev.	201,600	2.50	161,910	June '14	0 75
Miami, c	Ariz.	664,993	5	3,338,869	May '14	0.50
Modoc, g.s	Colo	500,000	1	275,000	Dec. '11	0 01
Mohawk, c	Mich.	100,000	25	3,175,000	Aug. '13	2 00
Monarch-Mad'a, g.s.l	Colo.	1,000,000	1	40,000	May '11	0 01
Montana-Tonop., s.g	Nev.	921,865	1	530,000	Dec. '12	0 10
Mountain, c	Cal.	250,000	25	4,216,250	May '08	0.44
National, g	Nev.	750,000	1	570,000	May '11	0 10
Nevada Con., c	Nev.	1,999,524	5	16,226,911	June '14	0 37½
New Century, z.l	Mo.	330,000	1	237,600	Oct. '09	0 01
New Idria, q	Cal	100,000	5	1,740,000	Apr. '14	0 10
North Butte, c.	Mont.	410,000	15	11,685,000	Apr. '14	0 50
North Star, g.	Cal	250,000	10	4,262,040	June '14	0 30
Old Domin'n, M. & Sm.	Ariz.	162,000	25	3,563,000	Jan. '14	1.25
Ophir, s.g.	Nev.	201,600	3	2,068,360	Jan. '12	0 10
Opohongo, g.s.l	Utah.	898,978	0 25	80,907	Jan. '13	0 02
Oroville Dredging	Cal	700,000	5	1,468,086	Mar. '14	0 12
Osceola, c	Mich.	96,150	25	12,083,525	Apr. '14	1 00
Parrot, c	Mont.	229,850	10	7,359,085	May '14	0 15
Pearl Con., g	Wash.	1,909,711	0.05	181,422	Dec. '10	0 02
Pharmacist, g.	Colo	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g	Alas.	5,000,000	1	2,041,526	Oct. '11	0 03
Pittsburgh-Idaho, l.	Iad.	803,000	1	216,810	Oct. '12	0 04
Pittsburgh Silver Peak, g	Nev.	2,790,000	1	715,400	Mar. '11	0 02
Portland, g	Colo.	3,000,000	1	9,577,080	Apr. '14	0.02
Quilp	Wash.	1,500,000	1	67,500	Feb. '13	0.01
Quincy, c	Mich.	110,000	25	20,952,500	Dec. '13	1.25
Republic, g	Wash.	1,000,000	1	85,000	Dec. '10	0 01½
Rochester, l.z.	Mo	4,900	100	188,396	Dec. '10	0 50

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares		Dividends		
		Issued	Par	Total	Latest	Amt
Round Mountain, g.	Nev.	866,426	$ 1	$ 363,365	Aug. '13	$0.04
Seven Troughs Coal., g	Nev.	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l	Mo.	1,000,000	10	9,279,180	June '14	0.05
Shannon, c	Ariz.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c	Ariz.	350,000	10	1,925,000	Apr. '14	0.50
Silver King Coal., l.s	Utah	1,250,000	5	2,534,085	Apr. '14	0.15
Sioux Con., s.l.g	Utah	745,389	1	872,097	July '11	0.04
Skidoo, g	Cal	1,000,000	5	275,000	May '12	0.02½
Snowstorm, c.g	Ida	1,500,000	1	1,192,103	Oct. '13	0.02
South Eureka, g	Calif.	299,981	1	366,881	Apr. '12	0 07
Standard Con., g.s	Cal	178,394	10	5,274,407	Nov. '13	0.25
Stratton's Ind., g	Colo.	1,000,000	0 60	425,250	May '13	0.06
Success, z	Ida	1,500,000	1	925,000	May '13	0 02
Superior & Pitts., c	Ariz.	1,499,793	10	7,179,028	June '14	0.38
Tamarack, c	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c	Tenn.	200,000	25	4,156,250	June '14	0 75
Tomboy, g.s	Colo.	300,000	4 85	3,482,905	June '14	0.48
Tom Reed, g	Ariz.	909,555	1	1,937,246	June '14	0.06
Tonopah Belm't, s.g.	Nev.	1,500,000	1	6,133,000	May '14	0 25
Tonopah Ext., g.s	Nev.	943,433	1	473,709	Apr. '14	0 05
Tonopah of Nev., s.g	Nev.	1,000,000	1	11,600,000	Apr. '14	0.25
Tri-Mountain, c	Mich.	100,000	25	1,450,000	Dec. '13	2.00
Tuolumne, c	Mont.	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l	Utah.	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c	Wash.	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.) g	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c	Ariz.	23,000	10	1,794,000	Apr. '14	4 00
United Verde, c.	Ariz.	300,000	10	34,372,000	June '14	0 75
Utah, s.l	Utah.	100,000	10	281,860	Dec. '10	0 02
Utah, c	Utah.	2,797,182	10	22,350,809	June '14	0 75
Utah Con., c	Utah.	300,000	5	8,250,000	Mar. '14	1 00
Valley View, g	Colo.	1,000,000	1	210,000	Dec. '10	0 04
Victoria, g.s.l	Utah.	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g	Colo	1,500,000	1	2,902,000	June '14	0.03
Wasp No. 2, g	S. D.	500,000	1	441,965	June '14	0 01
Wellington Mines, g	Colo.	10,000,000	1	300,000	July '13	0.00
Wolverine, c	Mich.	60,000	25	7,740,000	Apr. '13	5 00
Work, g	Colo.	1,500,000	1	172,500	July '08	0.00
Yak, s.l	Colo.	1,000,000	1	1,757,685	Mar. '14	0.02
Yankee Con., g.s	Utah.	1,000,000	1	143,500	Jan. '13	0 01
Yellow Aster, g	Cal.	100,000	10	1,216,789	June '14	0.05
Yellow Pine, l.z.s	Nev.	1,000,000	1	423,008	June '14	0.02
Yukon Gold, g	Alas.	3,500,000	5	2,998,000	June '14	0.07

Iron, Industrial and Holding Companies

Amalgamated, c	Mont.	1,538,879	$100	$85,893,067	May '14	$1.50
Am. Sm. & Ref., com	U. S.	500,000	100	26,333,333	June '14	1.00
Am. Sm. & Ref., pf	U. S.	500,000	100	48,208,333	June '14	1.75
Am. Smelters, pf. A	U. S.	170,000	100	8,640,000	Apr. '14	1.50
Am. Smelters, pf. B	U. S.	300,000	100	13,087,000	Apr. '14	1.25
Cambria Steel.	Penn.	900,000	50	20,035,000	May '14	0 62½
Greene Cananea	U. S.	486,302	100	4,363,646	June '14	1.00
Guggenheim Expl	U. S.	831,732	25	19,665,933	Apr. '14	0.87½
Inter'l Nickel, com	U. S.	115,826	100	12,933,715	June '14	2.50
Inter'l Nickel, pfd	U. S.	89,126	100	7,957,424	May '14	1.50
Inter'l Sm. & Ref.	U. S.	100,000	100	3,900,000	May '14	2.00
National Lead, com	N. Y.	206,554	100	8,106,055	June '14	0.75
National Lead, pf	N. Y.	243,676	100	28,963,779	June '14	1.75
Old Dominion, c	Ariz.	293,245	25	5,340,344	Apr. '14	1.00
Phelps, Dodge & Co	U. S.	450,000	100	33,971,527	June '14	4.00
U. S. Steel Corp., com	U. S.	5,083,025	100	207,569,744	June '14	1.25
U. S. Steel Corp., pf	U. S.	3,602,811	100	376,578,945	May '14	1.75
U. S. S., R. & M., com	U.S.-Mex.	486,320	50	6,098,852	Apr. '14	0.75
U. S. S., R. & M., pf	U.S.-Mex.	351,105	50	13,816,321	Apr. '14	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s	Mex.	50,000	$ 5	$ 212,500	Oct. '12	$0.25
Amparo, g.s	Mex.	2,000,000	1	1,400,884	May '14	0.05
B. C. Copper	B. C.	591,709	5	615,198	Jan. '13	0.15
Beaver Con., s	Ont.	1,996,490	1	409,879	Dec. '13	0.03
Buffalo, s	Ont.	1,000,000	1	2,707,000	Apr. '14	0.03
Canadian Goldfields, g	B. C.	600,000	0 10	187,099	Jan. '14	0.001½
Chontalpan, g.s l.z.	Mex.	7,000	25	63,000	May '14	0.75
Cobalt Townsite, s.	Ont.	1,000,000	1	1,180,000	May '14	0.48
Coniagas, s	Ont.	800,000	5	6,400,000	May '14	0.45
Con. M. & S. Co. of Can	B. C.	58,052	100	1,480,413	May '14	2.00
Crown Reserve, s	Ont.	1,768,814	1	5,748,645	June '14	0.02
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dos Estrellas, g.s	Mex.	300,000	0.50	9,885,000	Sept. '13	1.25
El Oro, g.s.	Mex.	1,147,500	4 85	8,947,261	July '13	0.24
Esperanza, s.g	Mex.	455,000	4.85	11,996,303	Jan. '14	0.24
Granby, s.l.c	B.C.	148,496	100	5,533,357	June '14	1.50
Greene Con., c	Mex.	1,000,000	10	9,044,400	May '14	0.50
Guanajuato D., pf., s	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold.	B. C.	120,000	10	1,353,520	June '14	1.50
Hollinger, g	Ont.	600,000	5	1,980,000	June '14	0.15
Kerr Lake s.	Ont.	600,000	5	5,220,000	June '14	0.25
La Rose Con., s	Ont.	1,498,407	5	5,686,841	Apr. '14	0.45
Le Roi No. 2, g	B. C.	120,000	24.30	1,472,580	Jan. '13	0.36
Lucky Tiger Com., g.	Mex.	715,337	10	2,340,608	June '14	0.06
McK-Dar. Sav. s	Ont.	2,247,692	1	4,335,748	Apr. '11	0.06
Mines Co. of Am. (new)	Mex.	1,700,000	10	*1,215,000	July '13	0.12½
N. Y. & Hond. Ros., g	C. A.	150,000	10	3,350,000	Apr. '14	0 20
Nipissing, s.	Ont.	1,200,000	5	11,790,000	Apr. '14	0 37½
Peñoles, s.l g	Mex.	80,000	25	6,361,688	June '13	1.25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	660,000	Apr. '12	3.00
Right of Way Mns†s.	Ont.	1,685,500	1	202,260	Dec. '11	0.02
Rio Plata, s.	Mex.	373,437	5	345,744	Feb. '13	0.05
San Rafael, g.s	Mex.	2,400	25	1,441,180	Oct. '13	0.50
San Toy, g.s	Mex.	5,750,000	1	530,000	July '13	0 01
Sorpresa, g.s	Mex.	19,200	20	3,979,240	Jan '11	34 00
Stand'd Silver-Lead.	B. C.	2,000,000	1	1,375,000	June '14	0 05
Timiskaming, s.	Ont.	2,500,000	1	1,534,155	Apr '13	0 06
Tem. & Hud. Bay, s	Ont.	7,761	1	1,916,967	June '14	3.00
Trethewey, s	Ont.	1,000,000	1	1,001,998	Dec. '13	0 10
Wettlaufer-Lorrain, s	Ont.	1,416,590	1	637,465	Oct. '13	0 05

*Previous to reorganization, $5,258,881.

†Previous to January, 1910, $321,644.

Assessments

Company	Delinq.	Sale	Amt.
Atlas Wonder, Nev	July 6	July 29	$0.01
Aurora-Sampson, Ida	July 18	Aug. 18	0.002
Caledonia, Nev	July 3	July 24	0.05
Challenge Cons., Nev	July 21	Aug. 11	0.05
Crown Point, Nev	July 6	July 28	0.10
D. & M., Utah	July 11	July 31	0 05
Emerald, Utah	July 15	Aug. 18	0.0033
Enterprise, Ida	July 31	Aug. 17	0.002
Evergreen, Utah	July 23	Aug. 22	0.01
Federal-Ely, Nev	July 20	Aug. 21	0.005
Hamburg-American, Ida. post'd	......	Aug. 6	0.001
Holy Terror, Ida	July 15	Aug. 15	0.0005
Idaho-Nevada, Ida	July 7	Aug. 1	0.001
Jack Waite, Ida	July 21	Aug. 18	0.01
Moonlight, Ida	July 13	Aug. 20	0.005
Nabob, Ida	July 20	Aug. 17	0.005
New Hope, Ida	July 13	Aug. 13	0.002
North Star, Ida	July 10	Aug. 8	0.0015
Overman, Nev	July 8	July 29	0.05
Paymaster, Ida	July 15	Aug. 12	0.002
Saltese, Mont	June 20	July 20	0 002
Santaquin King, Utah	July 11	July 27	0.0025
Silver Mt., Ida., postponed	....	July 22	0.003
Silver Pick, Nev	June 22	July 27	0.01
Smuggler, Utah	July 11	Aug. 11	0.005
Snowshoe, Ida postponed	......	July 27	0.005
Spider, Utah	July 21	Aug. 18	0.0025
Sunset, Ida	July 10	Aug. 1	0.002
Utah-United, Utah	July 6	July 27	0.01
Wasatch-Utah, Utah	July 13	Aug. 17	0.01

Monthly Average Prices of Metals

SILVER

Month	New York 1912	New York 1913	New York 1914	London 1912	London 1913	London 1914
January	56.260	62.938	57.572	25 887	28 983	26.553
February	59 043	61 642	57.506	27.190	28.357	26 573
March	58.375	57.870	58 067	26.875	26.669	26 788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	58 175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25.948
July	60 654	58.721	......	27.919	27.074	......
August	61 606	59.293	......	28.375	27.335	......
September	63 078	60.640	......	29.088	27.986	......
October	63 471	60.793	......	29.299	28.083	......
November	62.792	58.995	......	29.012	27.263	......
December	63.365	57.760	......	29.320	26.720	......
Year	60.835	59.791	......	28.042	27.576	......

New York quotations cents per ounce troy, fine silver, London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic 1913	New York Electrolytic 1914	London Standard 1913	London Standard 1914	London Best Selected 1913	London Best Selected 1914
January	16.488	14.223	71 741	64.304	77.750	69.488
February	14 971	14.491	65 519	65.259	71.575	70.188
March	14 713	14.131	65.329	64.276	70.658	69.170
April	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.096	68.807	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14 190	......	64 166	......	69.446	......
August	15 400	......	69.200	......	74.313	......
September	16 328	......	73.125	......	78.614	......
October	16.337	......	73.383	......	79.250	......
November	15 182	......	68.275	......	73.825	......
December	14 224	......	65.223	......	69.583	......
Year	15.269	..	68 335	......	73.740	......

New York, cents per pound, London, pounds sterling per long ton.

TIN

Month	New York 1913	New York 1914	London 1913	London 1913
January	50 298	37 779	238.273	171.905
February	48 766	39 830	220.140	181.556
March	46 832	38.038	213.615	173.619
April	49 115	36 154	224.159	163.963
May	49 038	33 360	224 143	150.702
June	44 820	30.577	207 208	138.321
July	40 260	......	183 511	....
August	41 582	....	188.731	....
September	42 410	......	193 074	....
October	40.462	....	184 837	....
November	39 810	....	180 869	....
December	37 635	....	171 786	....
Av. year	44 252	....	206 279	....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York 1913	New York 1914	St. Louis 1913	St. Louis 1914	London 1913	London 1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4 048	4.175	3.937	16.550	19 606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3.688	17.597	18.225
May	4.342	3.900	4.226	3.808	18.923	18.503
June	4.325	3.900	4.190	3.810	20.226	19.411
July	4.353	......	4.223	......	20.038	......
August	4.624	......	4.550	......	20.406	......
September	4.698	......	4.579	......	20.648	......
October	4.402	......	4.253	......	20.302	......
November	4.293	......	4.146	......	19.334	......
December	4.047	......	3.929	......	17.798	......
Year	4.370	......	4.238	... ..	18.743	......

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1913	New York 1914	St. Louis 1913	St. Louis 1914	London 1913	London 1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5 228	25.338	21.413
March	6.078	5.250	5.926	5 100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5.074	5.256	4.924	24.583	21.393
June	5.124	5.000	4.974	4.850	22.143	21.345
July	5.278	......	5.128	......	20.592	......
August	5.658	......	5.508	......	20.706	......
September	5.694	......	5.444	......	21.148	......
October	6.340	......	5.188	......	20.614	......
November	5.229	......	5.083	......	20.581	......
December	5.156	......	5.004	......	21.214	......
Year	5.648	......	5.504	......	22.746	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer 1913	Bessemer 1914	Basic 1913	Basic 1914	No. 2 Foundry 1913	No. 2 Foundry 1914
January	$18.15	$14.94	$17.35	$13.23	$18.59	$13.90
February	18.15	15.06	17.22	14.12	18.13	14.09
March	18.15	15 07	16.96	13.94	17.53	14 18
April	17.90	14.90	16 71	13.90	16.40	14.10
May	17.68	14.90	15.80	13.90	15.40	14.23
June	17.14	14.90	15.40	13.90	15.10	13.97
July	16.31	......	15.13	......	14.74	......
August	16.63	......	15 00	......	14.88	......
September	16.65	......	15 04	......	14.93	......
October	16.60	......	14 61	......	14.80	......
November	16.03	......	13.91	......	14.40	......
December	15.71	......	13.71	......	14.26	......
Year	$17.09	......	$15.57	......	$15.77	......

STOCK QUOTATIONS

COLO. SPRINGS July 11

Name of Comp.	Bid.
Acacia	.02¼
Cripple Cr'k Con	.006
C. K. & N	.06½
Doctor Jack Pot	.05½
Elkton Con	.46
El Paso	1.40
Findlay	.008
Gold Dollar	.03
Gold Sovereign	.01
Golden Cycle	1.00
Isabella	.10¾
Jack Pot	.05½
Jennie Sample	.03½
Jerry Johnson	.02½
Lexington	.004
Old Gold	.01
Mary McKinney	.50½
Pharmacist	.009
Portland	1.00
Vindicator	1 08½

SALT LAKE July 14

Name of Comp.	Bid.
Beck Tunnel	.03½
Black Jack	.03
Cedar Talisman	.00⅜
Colorado Mining	.11½
Crown Point	01½
Daly-Judge	4 95
Gold Chain	.08
Grand Central	.67
Iron Blossom	1.42½
Little Bell	.10
Lower Mammoth	.00½
Mason Valley	2 25
May Day	.06
Opohongo	.01
Prince Con	.18
Silver King Coal'n	2.82½
Silver King Cons.	1.77½
Sioux Con	.02
Uncle Sam	.04
Yankee	.01⅜

TORONTO July 14

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.00⅜	Foley O'Brien	25
Coniagas	7.00	Hollinger	18.50
Peterson Lake	.33¾	Imperial	.01½
Right of Way	.02½	Jupiter	.05¾
T. & Hudson Bay	48.00	Pearl Lake	.03
Timiskaming	.14	Porcu. Gold	.01½
Wettlaufer-Lor	.05	Preston E. D.	.01
Big Dome	9.15	Rea	.13
Crown Chartered	.00½	Swastika	.01
Dome Exten	.08	West Dome	.07

SAN FRANCISCO July 11

Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks.		Misc. Nev. & Cal.	
Alta	.05	Belmont	6.62½
Belcher	.30	Jim Butler	1.02½
Best & Belcher	.06	MacNamara	01
Caledonia	.45	Midway	.20
Challenge Con.	‡.02	Mont.-Tonopah	.55
Chollar	.03	North Star	.26
Confidence	.22	West End Con	.68
Con. Virginia	.13	Atlanta	.14
Crown Point (Nev.)	.30	Booth	.04
Gould & Curry	.03	C.O.D. Con	.02
Hale & Norcross	.06	Comb. Frac	.04
Mexican	.50	Jumbo Extension	.19
Occidental	.70	Pitts.-Silver Peak	.37
Ophir	.15	Round Mountain	.38
Overman	.20	Sandstorm Kendall	.06
Potosi	.01	Silver Pick	.06
Savage	.07	Argonaut	‡3.00
Sierra Nevada	.06	Brunswick Con	1.50
Union Con	.11	Central Eureka	.12
Yellow Jacket	.36	So. Eureka	1.40

N. Y. EXCH. July 14

Name of Comp.	Clg.
Amalgamated	69¾
Am.Sm.&Ref.,com	65½
Am. Sm. & Ref., pf.	102½
Am. Sm. Sec., pf. B.	82
Anaconda	31
Batopilas Min	.75
Bethlehem Steel, pf.	84¾
Chino	40¾
Colo. Fuel & Iron	25½
Federal M. & S., pf.	33
Great Nor., ore., ctf.	31½
Guggen. Exp	53⅝
Homestake	113
Inspiration Con	18
Mex. Petroleum	61½
Miami Copper	22¾
Nat'l Lead, com	45
National Lead, pf	107½
Nev. Consol	13¾
Ontario Min	2¼
Phelps Dodge	175
Quicksilver, pf	1½
Ray Con	21
Republic I&S, com	22
Republic I&S, pf	85½
SlossSheffi'd, com	25
Sloss Sheffield, pf	84½
Tennessee Copper	32¾
Utah Copper	57
U. S. Steel, com	60⅛
U. S. Steel, pf	109¾

BOSTON EXCH July 14

Name of Comp.	Clg.
Adventure	1⅛
Ahmeek	275
Alaska Gold M	27⅜
Algomah	.95
Allouez	39
Am. Zinc	15½
Ariz. Com., ctfs.	4$\frac{11}{16}$
Bonanza	.51
Butte & Balak	2⅛
Calumet & Ariz	64¾
Calumet & Hecla	400
Centennial	16⅛
Cliff	1
Copper Range	35⅜
Daly West	2
East Butte	9⅜
Franklin	4⅜
Granby	79
Hancock	13½
Helvetia	.33
Indiana	4
Island Cr'k, com	49½
Island Cr'k, pfd	87
Isle Royale	19½
Keweenaw	3½
Lake	6¾
La Salle	3¾
Mass	4¾
Mayflower	5⅜
Michigan	.70
Mohawk	44
New Arcadian	4⅜
New Idria Quick	‡3½
North Butte	24½
North Lake	1⅜
Ojibway	1
Old Colony	4
Old Dominion	49
Osceola	76
Quincy	55½
Santa Fe	1⅜
Shannon	5
Shattuck-Ariz	23
Superior	27½
Superior & Bost	1½
Tamarack	34
Trinity	3$\frac{1}{16}$
Tuolumne	.35
U. S. Smelting	34¾
U. S. Smelt'g, pf	46⅜
Utah Apex	1½
Utah Con	10⅜
Victoria	2
Winona	2⅜
Wolverine	39½
Wyandot	.50

N. Y. CURB July 14

Name of Comp.	Clg.
Beaver Con	.24
Big Four	‡.05
Boston Montana	9⅜
Braden Copper	7⅜
B. C. Copper	1⅛
Buffalo Mines	1
Can. Cop. Corpn	2¼
Con. G. & S	.08
Caribou	.66
Chambers Ferland	.17
Con. Ariz. Sm	.50
Cons. Nev.-Utah	⅛
Coppermines Cons	1⅛
Davis-Daly	.58
Diam'field-Daisy	‡.05
Ely Con	.06
Florence	.38
Gold Hill Con	‡$\frac{7}{16}$
Goldfield Con	1⅜
Greene Cananea	29½
Kerr Lake	5⅜
La Rose	1
McKinley-Dar-Sa	.64
Mines of Am	3
Mother Lode	‡.26
Nevada Hills	.32
New Utah Bingham	‡⅜
Nipissing Mines	5⅜
Ohio Copper	.31¼
Oro	.09
Puebla S. & R.	2¼
Stand'd Oil of N.J.	403
Stand'd Silver Lead	1¼
Stewart	1$\frac{3}{16}$
Tonopah	6$\frac{13}{16}$
Tonopah Ex	2⅜
Tonopah Merger	.38
Tularosa	⅛
West End Ex	.03
Yukon Gold	2¼

LONDON July 2

Name of Comp.	Clg.
Camp Bird	£0 8s 9d
El Oro	0 13 6
Esperanza	0 15 0
Mexico Mines	4 15 0
Oroville	‡0 10 10½
Santa Gert'dis	0 11 3
Stratton's	‡0 0 6
Tomboy	1 2 6

BOSTON CURB July 14

Name of Comp.	Bid.
Bingham Mines	.04½
Boston & Corbin	28
Boston Ely	.35
Butte & Lon'n Dev.	27
Calaveras	1$\frac{5}{16}$
Calumet-Corbin	.13
Chief Cons	85
Corbin	.90
Cortez	.25
Crown Reserve	1$\frac{3}{16}$
Eagle & Blue Bell	.95
First Nat. Cop	1⅜
Houghton Copper	2
Majestic	.20
Mexican Metals	.19
Nevada-Douglas	1½
New Baltic	1½
Oneco	.55
Raven Copper	.12
Smokey Dev	.15
So. Lake	3⅜
S. W. Miami	‡1
Tonopah Victor	.30
Trethewey	.16
United Verde Ext	.70

‡Last Quotations.

The Engineering and Mining Journal

VOLUME 98 JULY 25, 1914 NUMBER 4

Cyaniding a Furnace Product*

By Herbert A. Megraw

SYNOPSIS—A plant in which the cyanide process fills a place in connection with furnace work, is unique. At the works of the Deloro Mining & Reduction Co., the ore is first smelted and the speiss produced is desulphurized, chloridized and cyanided. Silver chloride delivered to the cyanide plant is easily dissolved in exceedingly short time. Aluminum precipitation recovers the silver; probably the first instance of its practical use on any such scale. The plant also produces oxides of cobalt, nickel and arsenic for commercial use.

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Plant of Deloro Mining & Reduction Co., Deloro, Ontario

When the cyanide process was first applied, not so many years ago, to some simple gold ores, there was little thought that it was of more than exceedingly limited application. The search was for clean ores without any cyanide-consuming properties, and strenuous efforts had to be made to secure positively successful results in even such cases. Later, when the treatment of silver ores was proposed by the process, serious doubts were expressed of the successful outcome. These doubts have long since disappeared. Within the last few years, we have seen the cyanide process applied to some of the most, seemingly, impossible problems, only to finally realize that the thing is possible. Perhaps the most revolutionary application, however, has been to the highly complex silver ores of the Cobalt district, of Ontario, Canada.

Treatment of High-Grade Cobalt Ores

Having accustomed itself to the possibility of successfully treating the so called "rebellious" silver ores, the metallurgical world has another object lesson to study. That is the installation of a cyanide plant as an important unit of a smelting works, where it is expected to recover silver from high-grade, complex blast-furnace products. Such a unit is now part of the works of the Deloro Mining & Reduction Co., at Deloro, Ontario. The blast-furnace product that is so treated is speiss, a most unusual material to be subjected to cyanidation.

The plant is working upon rich ore from the Gowganda and Cobalt districts of Ontario. It is not a large installation, but the high-grade ore treated insures a large production of material of great value. In the last year, the plant treated 2920 tons of rock from the districts mentioned, its average content being 2211 oz. Ag, 33% As, 3% Ni and 6% Co. Not only the silver is recovered, but all of the elements mentioned are produced in marketable form, hence the complicated processes followed and the complexity of the plant itself.

The ore is received in car lots from the mines, so that the operation of grinding is not continuous. Each car, as it is received, is sampled carefully. Some of the cars have been previously sampled at the sampling plant at Cobalt, but this is the exception, most of them being sampled at Deloro, with a representative of the shipping company on hand.

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*This is the twelfth of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvement. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, Jan. 31, Mar. 7, Mar. 21, Apr 25, May 23 and June 20. The next article will deal with "Cyanide Development at Porcupine, Ontario," and will appear in the issue of Aug. 29, 1914.

The ore is first crushed to 10 mesh in a Krupp No. 5 ball mill, and the mill is thoroughly cleaned up after each sampling, and the metallics can be fully estimated at their value with respect to the entire shipment. The ground material is then passed through a Snyder sampling installation which cuts out a 14% sample. This is then mixed, again cut mechanically, then quartered and cut down by hand, the reject from the cutting being retained until agreement between the buyer and seller is final.

Blast-Furnace Smelting

The ore is taken from the sampling plant to the blast furnace and smelted. Previously, the ore was cyanided before smelting, but with the development of the later process it has appeared to be better practice to smelt it first.

The blast furnace yields four products: volatiles which contain arsenic; silver, speiss and slag. The arsenic fumes are led through a series of flues and chambers to baghouses, where they are collected. Arsenic finally issues from the plant in the form of white arsenic. The silver from the furnace is refined and mixed with the silver from cyanide treatment in such proportions that none of it shall fall below the low limit of 996 fine. The cyanide bullion is 999 fine, or over, so that it will stand mixing with the furnace product, the ultimate product being a silver bar upon which no refining charges have to be paid.

The furnace slag is taken to the dump, except a certain quantity, that necessary to keep the furnace open, which is returned to the smeltery. The slag is kept clean and free from any of the elements which it is desired to recover. Should any of it contain any of these elements, it is included in that part returned to the furnace. The speiss is treated by cyanide.

Cyaniding the Speiss

The speiss produced by the furnace is crushed in the Krupp ball mill to 10 mesh. It then begins a special treatment which finishes with cyanidation.

Speiss is a material which does not appear to be a good subject for cyanide treatment. The accompanying table shows its analysis:

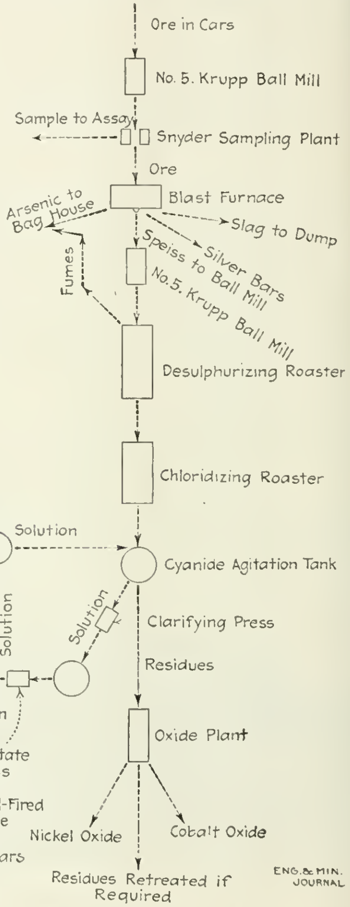
ANALYSIS OF DELORO SPEISS

Silver	1400 oz.
Arsenic	25%
Cobalt	20-25%
Nickel	12-15%
Iron	15-20%
Sulphur	5-10%
Copper	0.5-2%

Much as this material appears to be unsuited to cyanide treatment, the problem is not so great, and it seems absurdly simple, when the methods have been explained. The first step is roasting, which is performed in mechanically rabbled furnaces, in order to remove the sulphur and arsenic. Sulphur is effectually driven off, but the elimination of the arsenic is not so simple. It is easy enough to reduce it to about 10 or 15%, but to get it materially below that point is a detail which has required much study and experiment. As a matter of fact, the arsenic content is reduced to 6 or 7%, a highly creditable result. That which remains is likely to be in combination with some of the metals as arsenates. Volatilized arsenic is collected in the chambers together with that portion which comes from the blast furnace.

Chloridizing the Silver

Putting the silver in such form that the cyanide solution can act upon it is the step which follows. This is accomplished by roasting the ore again, this time with salt, so that the metal chlorides are formed. It will readily be seen that this operation is a rather delicate one, the limits being on the one hand a sufficiently high heat to insure the chloridization of a sufficiently large proportion of the metal, and on the other, so keeping down the temperature that volatilization of the metal shall not take place. The operation has been so perfected that practically no volatilization loss is incurred, and of the 1500 or more ounces of silver in the desulphurized material, only 30 to 60 oz. is insoluble.



Flow Sheet of Deloro Plant

Cyaniding the Ore

Silver in the ore has now been put into such form that it is readily soluble in cyanide solutions. Arsenic remains only as arsenate, and is not very soluble. The little copper in the ore has been put, by careful roasting, in such form that it is only slightly soluble and it offers no difficulties in the treatment. Nor do the other elements go into solution readily. The problem, then, is simply the cyaniding of silver chloride, one of the easiest compounds to dissolve. Thus the real problem has been solved before the stage of cyanidation is begun.

Cyanide treatment is by agitation, there being no separation of sands and slimes. The whole of the material is put into an agitation tank and pulped at a ratio of about six of solution to one of solids. Sands and slimes are agitated together, the agitation being performed with a centrifugal pump.

AGITATION OF THE PACHUCA TYPE

Agitation is performed in a tall tank of the Pachuca type, 11 ft. in diameter and 27 ft. 6 in. deep, including the cone bottom, which is 10 ft. from base to apex. From the apex a pipe connects with a 6-in. centrifugal pump. The pump delivers the pulp in the center of the top of the tank. Agitation is positive and there is little chance for any solids to settle out.

Agitation treatment is by charges consisting each of seven tons of ore with its quota of solution. Sodium cyanide is used, the strength being carried at about 1%. Caustic soda is used in quantity sufficient for the aluminum precipitation process, as set forth by Hamilton[1] and Kirkpatrick.[2] The use of lime is entirely avoided, since it introduces complications in the treatment. Of course, no lead salt is required under the circumstances. The agitation period of each charge is only six hours, during which time practically all the soluble silver is put into solution.

Settling is performed in the same tank in which agitation takes place. The solution is clarified before going to the precipitation department, where the silver is recovered as described in Kirkpatrick's article already referred to. The residues are filtered and washed and sent on to the next treatment.

PRECIPITATE MELTED WITH FLUX

Silver precipitate is lightly fluxed with small quantities of borax and soda and melted in a Schwartz oil-fired furnace. Fluxing is required to produce the highest possible quality of bullion, the furnace output averaging over 999 fine.

Precipitate from the aluminum process is different in appearance from that given when zinc is used. It is of grayish color, such that the operator accustomed to zinc precipitate would be likely to call it low grade. When a brownish or black precipitate is obtained, such as would be high-grade with zinc, it is of much less value. The aluminum product has also the property of amalgamating into metallic form when it is beaten or worked under friction. It is stated that in the tube mill this precipitate will agglomerate into masses of metallic silver. The centrifugal and plunger pumps handling the solution and precipitate become silver plated, and the packing in the centrifugal-pump gland acquires a coating of metallic silver.

Consumption of aluminum dust amounts to 8.9 lb. per 1000 oz. of silver recovered, and of soda, 29.8 lb. per 1000 oz. The cyanide used amounts to about 11 lb. per ton of speiss treated. A much greater quantity, of course, is used in dissolving the great quantity of silver present, but precipitation with aluminum dust allows the regeneration of most of it.

TREATMENT OF CYANIDE RESIDUES

Residues from cyanide treatment are sent to the oxide plant, which occupies a special department at the Deloro works. Here the cobalt and nickel are dissolved, separated from the remainder and precipitated separately as oxides. The cobalt oxide made is the black Co_3O_4, used as a coloring in ceramic and enameling arts. In producing the black cobalt oxide, great care has to be exercised to avoid the production of the gray oxide, which has a different composition, the reason being not the higher or lower percentage of cobalt, but the fact that in producing colors, the artisans use weight formulas, and if the color-producing element were not absolutely uniform, the product would vary in shade. The black oxide contains about 71% cobalt, and the gray 76%. Both the cobalt and nickel oxides produced are of first grade.

The Deloro plant is a good example of the modern tendency to turn every possible element to good account, and where many difficulties have had to be surmounted to accomplish that end.

For the opportunity to examine the Deloro plant and publish this account of their system of treatment, thanks are due to Prof. F. S. Kirkpatrick, of Queens College, Kingston, Ont., consulting engineer for the company, and to S. B. Wright, manager in charge.

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Mineral Production of New Zealand in 1912

The mineral production of New Zealand, for 1912, as officially reported, was as follows, the items being arranged in order of descending value: Gold, 343,163 oz.; coal, 2,177,615 tons; kauri gum, 7908 tons; silver, 801,165 oz.; other minerals (stone, greenstone, pumice, scheelite and pyrites), to the value of £20,571. The total value of the mineral production was £3,042,224. The total number of miners employed in the gold mines was 5162, compared with 7365 in 1911. The production of gold and silver was less than that of the preceding year, while coal and kauri gum showed a small increase.

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Barytes in 1913

The production of crude barytes in the United States in 1913, according to the U. S. Geological Survey, was 45,298 tons, compared with 37,478 tons in 1912. The total quantity of refined barytes reported as sold by mills in 1913 was 37,033 tons, valued at $525,300.

The greater part of the barytes produced in the United States is used as a pigment in the manufacture of mixed paints. It is also used in the manufacture of lithopone, a white pigment. Wall-paper manufacturers are said to use some barytes for giving weight to their products. Other uses for the mineral are in the manufacture of rubber, asbestos cement, and poker chips and in tanning leather

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Important Extensions to the Joachimsthal Radium Works are being made, says "l'Echo des Mines," with the intention of increasing the output from five grams to 10 grams per year.

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[1] "Aluminum Precipitation at Nipissing," "Eng. and Min. Journ.," May 10, 1913.

[2] "Aluminum Precipitation," "Eng. and Min. Journ.," June 28, 1913.

Chiksan Mines, Chosen--I

By Clarence L. Larson*

SYNOPSIS—This American-controlled concession is just beginning to take its place as a productive property, along with the Oriental and Seoul companies. The mines are near Tsunpo Bay of the Yellow Sea, at slight elevation. Scarcity of timber is a leading feature. Transportation is difficult, and use is made of men, bull carts and pack bulls. A motor truck has been tried without much success. Korean, Japanese and Chinese labor is used, the rate of wages being low; the average from 30 to 37c. per day. Graft is widespread and must be reckoned with.

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Among names familiar to those interested in mining, are two in Chosen, the Oriental Consolidated Mines and the Suan Mine of the Seoul Mining Co., these two having successfully operated for several years. They are the only foreign-owned and managed properties in Korea that have proved profitable up to this time. During the past six months the results obtained on the French concession indicate the beginning of a successful period for that property.

The Chiksan mines, although an old concession, had not been developed in proportion to its size until two years ago, when it fell into the hands of the present company. This property is more conveniently situated than any other in Korea, being but 9 miles from the Saikwan station of the Seoul-Fusan Ry., and but 50 miles south of Seoul. Thus it is afforded quick rail and ferry connection to Japanese markets and direct rail connection to Chemulpo for supplies by steamer from Japan, America and England.

The concession has had a long and a varied history, having been originally granted in 1900 to Baron E. Shibusawa and S. Asano, by the old Korean government. This partnership was allowed two years in which to select and survey the ground. Their work resulted in the present concession limits, approximately a rectangle, 20 miles long and 13 miles wide, inclosing about 270 square miles. The concession grant was for mining rights only.

After several years of rather unsuccessful operations, negotiations with an American group of capitalists were opened and the Korean Exploration Co. assumed charge of operations in 1907, 50% of the stock being allotted to the Shibusawa-Asano partnership and the remainder to the American group.

A two-stamp Nissen mill was operated for a time, and then a lack of funds resulted in the cessation of operations until 1909, when two additional Nissen stamps were purchased and installed. Operations with the four stamps from May, 1909, to December, 1910, yielded $118,000 of gold bullion and concentrates. During this time, some 500 acres of placer ground had been drilled and declared worth dredging. The total showing of quartz and placers influenced the formation of the present Chiksan Mining Co., American in control, the new company receiving 52% of the $1,000,000 capitalization and full concession rights in consideration of $500,000 cash to be invested in development operations. The remaining 48% of the stock was halved between the Shibusawa-Asano partnership and the Korean Exploration Co. The present company thus obtained control late in 1911, and since then have pushed operations as rapidly as possible. Thirty-five additional stamps, in batteries of five, were installed and put in operation Nov. 1, 1912.

Geography and Character

The principal mines lie but 15 miles from the Tsunpo Bay of the Yellow Sea, and hence the altitude is not great, varying from 300 to 2000 ft. above sea level. The hills are low and much eroded, although one range, which contains the main vein system, is high and rugged. This range strikes approximately northeast and southwest, and practically all the known ledges are to be found on the north slopes of this range, and the placers in the main valleys below.

The Jiggie Man or Korean Porter

The hills are barren of timber, except for the recently started reforestation of pine, and vegetation is scarce. This is due to the lack of foresight and indifference of generations of Koreans who have stripped the hills of vegetation, using it for fuel. No better argument for the conservation of natural resources can be found than the treeless plains and hills of southern Korea. The Japanese authorities are endeavoring to remedy the situation, enforcing the setting out of trees and guarding them carefully while growing. A certain worm is destructive to these small pines, and is fought in this way—a tax of a certain measure, usually an empty oil-can, is assessed per unit-sized house, and each Korean family is forced to go out upon the hills and collect its measure of these worms and bring them in to the gendarmes. The valleys are used almost entirely for the raising of rice with occasional small patches of truck, such as corn, beans, greens, tobacco and peppers. Farming and mining are the two industries of the Chiksan district.

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*Box 24, Moscow, Idaho.

Transportation Methods

The main camp, Yangdei, is approximately 10 miles from the railway station and is composed of the general offices, residences, mill and the Korean villages, attendant upon the mill and office. The mines are scattered in every direction from this central point.

The main road to the station has been placed in good condition and is almost without grade for the greater part of the distance. There is but one hill of consequence which has about a mile rise on one side at a 3 or 4% grade and a quarter-mile rise on the other side at about 7%. Aside from this hill, but few grades are encountered. The important mines and prospects are also connected by good roads with Yangdei, and by short-cut pack-animal paths with the main road to the station.

There are five modes of transportation—the jiggieman; horse and mule wagons; bull-carts; pack bulls and motor truck. Accompanying photographs show the jiggies, carts and pack-animals. Jiggies are employed principally on short hauls and are paid in proportion to the distance and load carried. Rates are based on about a 20c. per day scale. A coolie will carry loads remarkable both in volume and weight, once they have been placed on his jiggie, but he is almost worthless for lifting. This type of freighting is important where roads are absent and trails are steep; also in construction work where materials must be carried short distances. When employed by the day, 17½c. is the wage.

Two- and four-wheeled bull carts and four-wheeled mule and horse wagons carry the bulk of the freight between the railway and Yangdei camp, although pack bulls carry much coal and practically all the timber used. The rate paid on all miscellaneous freight and on coal, is $1.20 per ton to the main camp, a distance of 10 miles, making a cost per ton-mile of 12c. The rates to the different mines are proportioned to the distances and grades involved. Timber is hauled at an arranged price per piece.

Pack cows carry 350 to 450 lb. of coal or ore, and bulls from 400 to 600 lb. Thus a good bull and driver nets 30 to 35c. per load, making one load in a long day's work. Wagons carry 2000 to 2200 lb. per load and also make but one trip per day. Return freight is paid for at the rate of $1 per ton.

Most of the transportation noted above is by contract, and the company maintains but a small stable used on odd jobs and for saddle animals.

Ore from prospects is brought to the mill principally by pack-bulls and is paid for by the ton, rated to equal 30 to 35c. per day in wages. Each delivery point, therefore, requires a scale and a native weigher. At the mill a large platform scale is now available, and the mines are provided with small 1000-lb. scales. Each freighter's load is weighed in carrying boxes and credited on his invoice; the invoice is presented to the Yangdei office for payment. The native weighers are fairly honest, of necessity, since partiality toward any particular freighters would be soon noticed and reported by the less favored ones. A weigher receives from 35 to 45c. per day, but usually has other duties to perform.

A Garford 3-ton motor truck has been used, though not steadily, due to difficulties with the gendarmes as to the width of the road, to road troubles, to bad weather, etc. The Japanese driver received $25 per month. Early tests were rather disappointing as it seems that the engine is not sufficiently powerful to handle the load on the big hill. This made the trip a slow one and the gasoline consumption was high and did not compete successfully with the native freighting cost. The accompanying table shows costs and earnings for the truck.

MOTOR-TRUCK DATA

	Per Day	
	Two Trips	Three Trips
Gasoline—8½ gal. per trip.	$5.10	$7.65
Driver—$25 per month ..	0.59	0.59
Interest—$4858.50 @ 6%..	0.795	0.795
Depreciation—20%.	2.655	2.655
Operating cost per day . .	9.14	11.69
Earnings @ $1.20 per ton—3-ton trip	7.20	10.80

This shows, on a two-trip day, a loss of $1.94 plus repairs, and on a three-trip day, a loss of $0.89, plus the repair cost. Although the record shown in this table has been slightly bettered as far as gasoline consumption is concerned, two-trip days are a loss and three-trip days scarcely break even, when the repair and tire costs are considered. The difficulty of competing with the native freighting is shown. However, one credit must be given the truck; although not in constant use, it enables the company to hold a whip hand over the natives; the cost per ton of freighting was reduced 5c. immediately upon the arrival of the truck.

Transporting a Boiler with Natives and Bulls

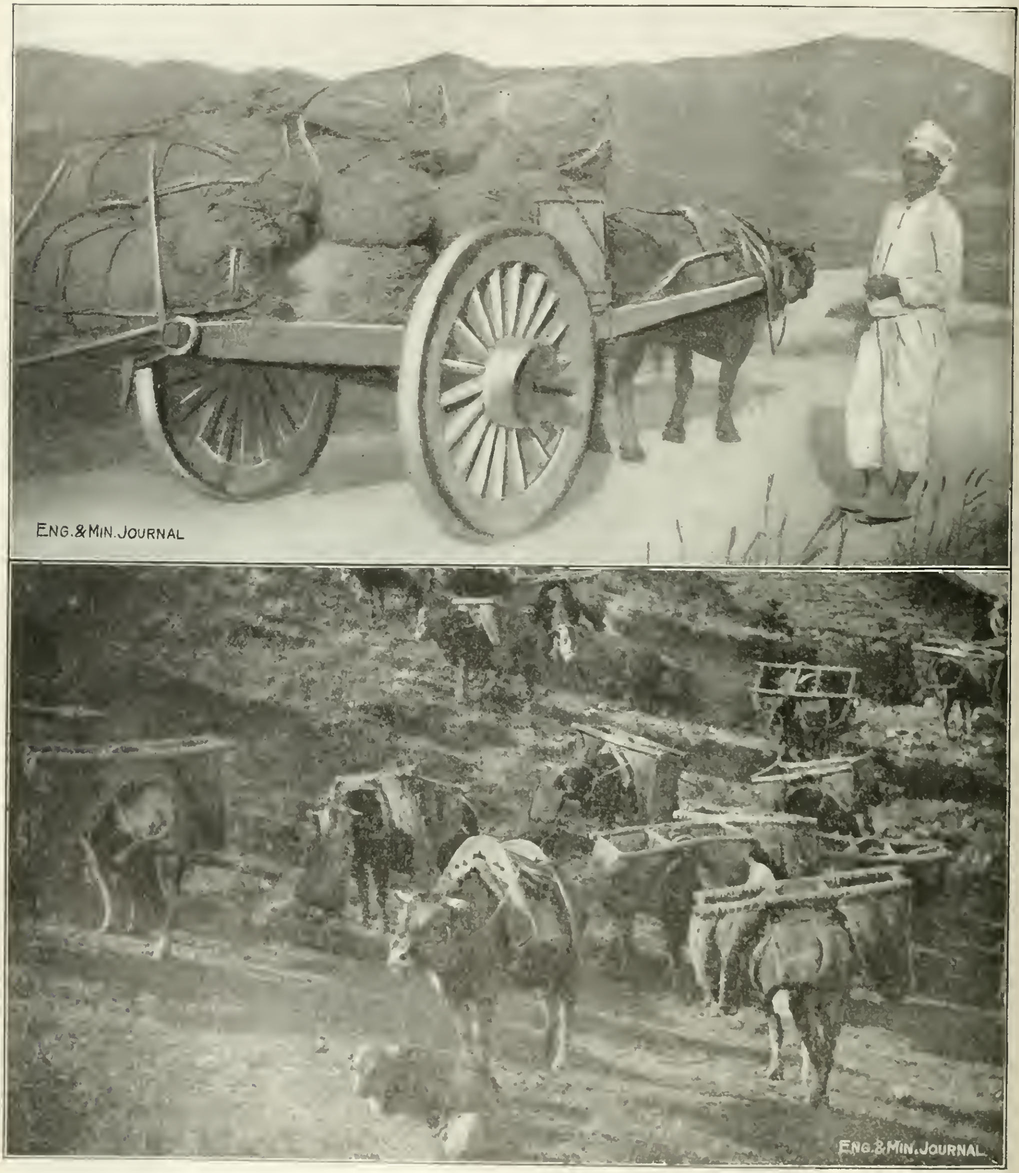
Large pieces of machinery to be brought in from the station are loaded on wagons and hauled by means of bulls and coolies. It is better to contract such work, preferably to Japanese freighters. The boiler shown in the accompanying photograph was transported over the main road, described above, 10 miles, and then an added mile and one-half up a steady 2% grade having many turns in it. The total cost was $95. The cost of bringing in four mortars for 5-stamp batteries, each mortar weighing nearly 3½ tons, was $280.50, or about $2 per ton-mile. This was company day's-pay work. Two boxed compressors weighing 3½ tons each, traversed the same road as the boiler, for $30 each, or $0.745 per ton-mile. This was contract work, and about indicates a proper comparison of the two methods when considered with the previous figure. (However, part of the trouble or high cost of bringing in the mortars was due to the poor choice of a carrying wagon.)

LABOR AND ITS PECULIARITIES

Three kinds of native labor are employed: Korean, Chinese and Japanese. Korean labor preponderates, of course, and is used in all branches of the work. At the mines but a single Japanese is employed, a skilled blacksmith-mechanic, who receives 90c. per day. At the Yangdei mill, Japanese carpenters are employed at 87½c. daily. Chinese carpenters of equal ability are available at from 75 to 87½c. Japanese blacksmiths and mechanics are also used at the mill and in the machine shop, receiving from 80c. to $1 per day.

Masonry and concrete work is all done by Chinese who are capable and do good work under foreign direction and inspection. Nearly all of this work is done by contract: day's-pay wages are set at 40c. for good men and 25 to 30c. for helpers. No Chinese or Japanese are employed in the milling department.

At the mines, both Korean and Chinese labor is em-



TRANSPORTATION METHODS IN CHOSEN. BULL CART AND PACK BULLS AND COWS ployed, the scale of wages being the same for both. The Chinese are but a small minority of the total number of mine workers. The scale of wages is shown in the accompanying table.

WAGE SCALE OF NATIVE AND FOREIGN LABOR

Mine foremen	$0.625
Shift bosses, all Korean	0.45 to 0.50
Mine storekeeper, interpreter	0.62½
Hoisting engineers	0.37½
Compressor engineers	0.32½ to 0.40
Firemen	0.30
Watchmen—Chinese	0.32½
Weighers, interpreters, clerks	0.35 to 0.45
Korean timber framers	0.32½
Hand drill-steel sharpeners	0.30
Machine-steel dressers	0.35 to 0.40
Timbermen	0.30 to 0.40
Hand miners, single and doubleband	0.25
Shaft hand miners	0.30
Waugh machine miners	0.30
Piston-machine miners	0.37½ to 0.40
Muckers, car men	0.20
Skip tenders	0.25
Pump men	0.30
Surface coolies, ore-sorters	0.17½

A Korean mechanic who has had eight years of experience under foreigners and who is capable of handling almost any work around boilers, pumps, engines, compressors, etc., receives 90c. per day. His No. 1 helper receives 50c. Hoisting engineers and practically all development hand miners work 8-hr. shifts. Stoping miners, machine miners, and all men such as firemen, watchmen, car men, etc., work 10-hr. shifts.

Successful handling of this native labor requires much study. Contract work is done wherever possible and is based upon the wage scale already given, but is varied slightly to suit conditions which change from time to time, such as scarcity of labor in crop times, and to suit underground conditions, such as wetness, and hardness of rock. Holiday seasons require watching also as the Koreans have customs peculiar to themselves.

Brotherhoods exist among them, some good and some bad, each usually containing but a small number of members. These must be watched so that they become not too powerful in any one department. Thus one avoids the small difficulties due to strikes and quarrels with nonmembers securing positions.

The average Korean laborer seems to be endowed with a shiftless tendency; he never plans much beyond the day at hand. To him debt is not a discouragement but rather an e.m.f., inciting him to move to other fields. Upon securing employment he rarely works steadily more than a month or two, in that time borrowing as much money as he can at 12 to 15% interest per month. Then after all is gone and the interest cannot be met by the amount of his wages he quietly leaves for parts as unknown as possible. Lately, the Japanese gendarme service is becoming efficient enough to trace them and bring them back to trial, and is gradually stamping out the evil. It affects the mines only as it provides a roaming class of labor, which is not as efficient as a more permanent class. "Squeeze" (graft) is the greatest thing that must be contended with and is prevalent, to be eternally so, as some think, among Japanese, Korean and Chinese alike. It is directed not only at employers but at each other, even in their very own families. No system will ever be found to stamp it out. The best that can be done is to regulate it. When readers stop to think that 17½ to 30c. per day is the range of wages for 90% of the workmen, it will be realized that a few cents amounts to a high percentage of squeeze. Half a candle a day is a 3% gain, so where in America the shift going off is searched for high grade, in Korea it is searched for candles, inch pieces of powder, short lengths of steel, etc. Another instance: in weighing, a squeeze increase of 20 lb. on a bull-load of coal means 5 per cent.

Drill steel and all the supplies used by a contractor are charged out to him. On the first of each month, inventory of his material is taken and he is credited on the finished month with the invoice and debited the same amount on the new month. Every possible precaution is thus taken to insure against the removal of any supplies from the mine, and to make any such removal chargeable directly to the contractor.

Laborers are given numbered checks, brass and aluminum in alternate months, which they must present each day in order to be marked present upon the timebooks. On the monthly payday, these same checks are presented for payment.

The question of the efficiency of these laborers comes next. It is difficult to compare them with those available in the United States. Korean and Chinese single- and double-hand miners, timbermen, mechanics, hoisting engine men, Chinese carpenters, are all efficient, and especially so considering the wage paid. Car men, firemen, and blacksmiths are not highly efficient at routine work, as they lack pride in it. Native machine men do not compare with U. S. laborers. One American miner can do more work with a small piston machine than three of these natives. Still, for the price paid all the workmen, the native labor should be considered fairly efficient, much more so than the average Spanish or Mexican labor.

Coal is used entirely for fuel, both at the mill and at the mine power plants. Laid down ready for use, it costs $5.50 per ton. The grade in use is known as Fushun coal, coming from the Japanese mines of that name in Manchuria, and is probably the most generally used coal in the northern part of the Orient.

Timber Brought from a Distance

As has been stated, the concession is barren of mature timber. The company recently purchased rights to a forest a considerable distance away. Timber from this forest is cut and delivered to the various mines by a Korean contractor. Another native contractor brings in timber from his own forest. All of this timber is transported by pack bulls, the length of haul being about 25 or 30 miles. Most of it is round timber running from 5 to 10 in. in diameter and from 6 to 10 ft. in length. The transportation costs in all cases amount to more than 75% of the total cost of the timber. Costs of the various sizes as laid down at the mines are as shown in the accompanying table.

COST OF TIMBER

1-in. boards—5 ft. long. 1c per in. of width
2-in. boards—5 ft. long. 2c per in. of width
2x4-in., 10 ft.—$0.16 per piece
4x4-in., 10 ft.— 0 30 per piece
4x6-in., 3½ ft.—$0 10½ per piece
6x6-in., 6 ft.—$0.22½ per piece
6x6-in., 10 ft.—0 40 per piece
8x8-in., 6 ft.— 0.55 per piece
6-in. round, 7 ft. long $0 22½ per piece, increasing 2½c. per ft. length
7-in. round, 7 ft. long 0.30 per piece, increasing 2½c. per ft. length
8-in. round, 7 ft long 0 32½ per piece, increasing 2½c. per ft. length
9-in. round, 7 ft long 0 35 per piece, increasing 2½c per ft. length
10-in. round, 7 ft. long 0 37½ per piece, increasing 2½c. per ft. length

Sawed 8-in.x8-in.x10-ft. timbers have been secured in lots of 1000 pieces from a point on the railroad some 150 miles to the north, landed at the mines at a total cost of $1.10 each. Wedges are made by a contractor, hewn out by hand from waste pieces from framing sets. The rate paid is 15c. per 100 wedges. A workman turns out about 200 in a 10-hr. day. Ladders are also made by contract at 7½c. per ladder. They are 10 ft. long, the stays being of 2x4-in. stuff, and rungs 2x2-in., 15 in. wide, placed 15 in. apart. The cost of such a ladder is as follows:

2 pieces	2x4-in., 10 ft.	$0.32
12 ft.	2x2-in.	0 08
20	4-in. nails	0 03½
	Labor	0.07½
Total		$0 51

Native timber framers are employed, receiving $0.32½ per day. Two men are employed at each of the two largest mines, on day shift only, and handle all the framing, posts, caps, winze sets, raise sets, and shaft sets alike, framing from either round or square timber.

WATER-SUPPLY

Sufficient water is at all times produced from the mines by ordinary pumping, to supply their steam plants, and as there are no reservoirs at hand, the mine water is used almost entirely. The rains come usually within two short periods, one in early spring and the other in latter July or August. The watershed is away from the mines and is rapid. The other seasons are dry.

COST OF PRINCIPAL SUPPLIES

4-lb. hammers	$0 62½	1-in. unions, each	0 14
4-lb. hammer handles	0.10	1-in. tees, each	0 06
8-lb. hammers	0 75	1-in. nipples, each	0 12
8-lb. hammer handles	0 10	Front skip wheels	2.00
Picks	0 50	Rear skip wheels	2 50
Shovels	0 75	12-lb. track spikes, each	0 00¾
Handsaws	1 50	bolts	0 01¼
8-in. monkey wrench	0 87½	fish-plates	0 03¼
10-in. monkey wrench	1 25	rail, per ft.	0 11
12-in. Stilson wrench	1 12½	25-lb. track spikes	0 02½
14-in. Stilson wrench	1 50	bolts	0 02
18-in. Stilson wrench	2.12½	fish-plates	0 05
		rail, per ft.	0.27
Round, square and strap iron, lb.	0 03¼	Tar, gal.	0 20
Angle iron, per ft.	0 06¼	White lead, lb.	0 55
Corrugated roofing	0 50	Brown lead	0 65
Hand drill steel—¾, ⅞ lb.	0 07	Red lead	0 45
Machine drill steel	0 09	Lime—sack	0 45
Rivets, per lb.	0 07½	Fire-clay (Denver) lb.	0 01
Compressor oil, gal.	0 40	Cement—Manchuria portland, per bag	3 00
Engine oil	0.25		
Cylinder oil	0 50	Rubber packing, lb.	1.00
Kerosene	0 20½	Victor packing	1 12
Hard oil	0 10	⅜-in. wire cable, ft.	0.02
1-in. pipe, ft.	0 07½	½ steel cable	04¼
1-in. glove valves, each	2 25	⅞ steel cable	0 16½
1-in. elbows, each	0 05		

Candles, Balloon brand—1½c. each—15-oz. candle
Caps, Nobel-Glasgow, 6A—$0 0065 each
Fuse, Nobel-Glasgow, special—White, waterproof, ½c. per ft.
Powder, Nobel Geliguite, 60%—22c. per lb.

The mill has received its supply from a small creek which has been dammed at the mill site. From this reservoir, 60 or 80 ft. of pumping is necessary. During the past few months, dams on two separate forks leading into this main creek were built. Water thus caught is led in flumes, partly natural earth ditches and partly constructed of wood, to the mill tanks. This saves pumping and eliminates losses of water during rains by providing excess reservoir capacity in addition to the original dam. This arrangement together with settling ponds has solved what at first threatened to be a serious problem during the dryest seasons. Tailings are run into stock piles and the drained off water led into the settling ponds, thus removing the slimes, which then become available for cyanidation. The water is ultimately passed through a large settling box, or spitzkasten, and pumped back to the mill tanks and used as battery water. This is done only in the dry seasons.

Water for domestic purposes is available from numerous springs. For the use of the foreign residents, it is usually boiled or distilled.

In order to make all cost figures and general statements complete, the cost of the principal supplies are shown in the accompanying tables printed above, the figures representing the total cost of the articles delivered at the mines.

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The Diamond Outlook and the Premier Diamond Mine

JOHANNESBURG CORRESPONDENCE

The number of loads of 16 cu.ft. each of blue ground treated was 10,435,000 in 1913, compared with 9,707,000 in 1912. The total number of loads hauled was 11,028,738, which included tailings and waste rock, an average of 919,000 loads per month and an average per day of 35,461. The highest number of loads hauled per day was 47,098. A load of blue ground of high specific gravity weighs about $\frac{9}{10}$ ton, so that the tonnage dealt with amounted to about 44,000 tons. The only other mine approaching this output is the porphyry copper at Bingham, Utah, U. S. A., which dealt with 30,000 tons. The total yield of diamonds was 2,107,983 carats, or an average of 0.202 carats per load. The average cost per load treated was 2s. 3.545d., and cost per carat 11s. 4.35d. Maintenance charges equaled 6.803d. per load. Hammer drills are being introduced for drilling in the benches and 200 natives have been displaced and the cost per load of recent months reduced to 2s. 1.54d. The 310-ft. level of the open cut has now been attacked and above that level there are 25,000,000 loads available.

The average depth of the workings was 209 ft. Recruiting natives cost £60,552 for 21,886 natives. The daily average of natives employed was 14,518. Natives earned 3s. per day, finding their own food. The death rate fell from 31.75 to 17.66 per 1000 per annum, due largely to decrease of pneumonia, due to inoculation with prophylactic vaccine. There were 879 white employees earning in wages £261,816. Sixteen electrically driven air compressors are situated in various parts of the mine to supply air to the hammer drills.

The price per carat obtained was 22s. 2d. A profit of £1,003,098 was made after paying £84,826 toward the workers' provident and benefit fund. Of this sum the shareholders received £400,000 and the government £600,000.

The chairman of the committee, who represents the interests of Messrs. Barnato Bros., who are largely interested in De Beers mines, stated that the prospects of a steady gradual improvement in the demand for diamonds was good. The value of diamonds won in South Africa in 1913 probably equaled £1,200,000. He practically announced that at last a diamond combine had been formed to regulate production. I am pleased to state that the big producers have not only practically recognized the principle of adjusting the production to the demand, but they also recognize the importance of maintaining prices; both our government and the German government must realize the importance and the advantage of an effective combination. It is thus apparent that the conflict between the Premier Co. backed by the Transvaal government and De Beers Proprietary is now at an end. At the same time, the fact remains, that should the world be unable to continue to absorb £1,200,000 worth of diamonds per year indefinitely, and of this there must be some doubt, in the struggle for existence among producers the Premier mine can maintain its position only by a large production as the margin of profit is small.

Mine Sampling at El Tigre

By Charles M. Heron*

SYNOPSIS—Description of the samples taken and records kept, and how these records are used in distributing costs, in a mine where the stoping width averages 3½ ft. The vein is vertical. High-grade ore is sorted for shipment and milling ore is stamped, concentrated and the tailings cyanided.

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The method of sampling at the El Tigre mine, Sonora, Mexico, although probably not radically different from systems employed elsewhere, having been evolved to meet the existing needs and conditions, may be of interest to others. Briefly stated, the conditions are: The orebody, in rhyolite, is a nearly vertical vein, carrying gold and silver associated chiefly with lead sulphides. It ranges in width from 1½ to 8 or 10 ft., but for sake of uniformity the stope width has been assumed to be 3½ ft., and when samples are taken their assays are reduced to this standard. For the most part, overhead stoping is used; the high-grade ore is sorted in the stopes, and the second-class, or milling ore, is left as filling, to be drawn through the chutes as needed. Nearly all stoping is done by hand drilling, Mexicans there being fairly proficient at this kind of labor. Little cobbing is done in the stopes, but before being shipped all high-grade ore is carefully sorted on the surface. The second-class ore passes over a sorting belt at the head of the mill, where once more high-grade and waste are removed. The ore is crushed by stamps, concentrated, and the tailings cyanided. In general, therefore, in sampling three objects are to be kept in mind; first, the determination of what shall be shipped without further treatment, what milled, and what sent to the dump; second, the determination of what portions of the vein can be mined profitably; third, the estimation of the value of ore reserves.

FIG. 1—STOPE SHEET

Level. . . . . Month of . . . . . . 19 .

Dist. from Chute	Stope Width						Sq.Ft. Broken	Tons Broken	Assay						Contents	
	1	2	3	4	5	Ave.			1st-2nd Wks.		3rd-4th-&5th Wks		Ave.		Tons × Ave.	
									Au	Ag	Au	Ag	Au	Ag	Au	Ag

Development Samples

The samples might be classed somewhat arbitrarily under three heads; development, stope and record. Development samples are taken every day or as required, to show the grade of the ore exposed in prospecting and developing. The samplers cut grooves across the vein at the face, taking a uniform cut. When the vein is in distinct seams, each one is sampled. For example, the usual cut consists of a seam of high-grade, bounded on each side by second-class ore, and often with these there is a seam of quartz or vein breccia, cemented by siliceous material. An example of a report of these samples will show how they are reduced to the stoping width, 42 in. Assume the vein to be 3½ ft. wide, of which 6 in. is high-grade sulphides, assaying 210 oz. of silver, 30 in. more or less siliceous breccia or gouge, averaging 28 oz., and 6 in. of low-grade assaying 6 oz.; then the assay at this point would be, $(^6/_{42} \times 210) + (^{30}/_{42} \times 28) + (^6/_{42} \times 6) = 50.97$ oz. The object of this sort of sample is to show what is developed, and what is to be done with the broken rock; hence the report of these samples concerns chiefly the mine superintendent.

Stope Samples

Stope samples, as the term is used at El Tigre, includes samples of muck and cut samples of high grade. These are taken at the end of each week, at 10-ft. intervals, measuring from the center of the manways, and are numbered consecutively. For instance, the sample tag labeled "No. 4 level, 65-70 stope, No. 10" would refer to the sample of muck taken 100 ft. from manway No. 65 toward 70, on No. 4 level. The samplers record the widths of the vein and of the high grade, putting down zero when no high grade occurs, so that when the average width of high grade is computed for the area, each measurement may be given its due proportion. The muck samples are taken straight across the stope, fragments being picked up indiscriminately. Assays are made twice monthly of samples taken from the same place, those of the first two weeks being combined, and those of the last two or three, as the case may be. All high-grade samples for each interval are combined, and the assay made once for the month. These bimonthly and monthly assays, together with the widths which they represent, are recorded by the samplers for use in monthly reports. The objects of stope sampling are: First, to determine the efficiency of the stope, to know whether it is being worked at a profit or loss; and second, to have a record of the grade of broken ore in the stopes in order that what is sent to the mill may be kept at a uniform standard, ore being drawn from the high-grade stopes to raise the average of ore of lower grade.

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Recording of Stope Samples

Supplementary to this sampling is the measurement of stopes. During the last two days of the month a profile is made of each stope and plotted for permanent record on the stope map. The area of the rock broken is then measured graphically. From this information and that supplied by the samplers, the volume, tonnage and assay are computed by the following simple calculation. The product of the average width and the number of square feet, divided by 12, or the number of cubic feet per ton, gives the tonnage, or "Tons Broken" (see Stope Sheet, Fig. 1). In the columns next to this are recorded the bimonthly assays; their average is entered under "Average Assays." The product of the tonnage and the average assay equals the metal content, or "Contents." This same computation is made for each 10-ft. interval. The total contents of the stope being then summed up and divided by the total tonnage, the average assay of the stope is determined. In this way each 10 ft. is automatically weighed.

The "Stope Statement," Fig. 2, is next made out. The first four columns are taken directly from the preceding stope sheet. The column marked "Tons," under the section "Ore Broken," is obtained by subtracting from the total tons broken in each stope the waste from each stope. The record of waste, kept by the shift bosses, and turned into the engineering office at the end of each shift, includes an itemized account of waste sorted from each of the working stopes, entered under "Tons of Waste." In the section "Sorted High Grade (Calculated)," under columns "Area" and "Width," are given, respectively, the area recorded in the first section of the sheet, and the average of the high-grade widths in inches as reported by the samplers. From these the volume and tonnage are calculated as before. The calculated total is invariably much greater than the amount of sorted high grade actually shipped, because of the careful sorting and cobbing done at the *planilla,* sorting floor. The section marked "Sorted High Grade (Actual)" is obtained as follows: The actual total of high grade shipped being known, it is divided among the various stopes proportionally to the calculated tonnage. For instance, if the calculated tonnage is 175 and the actual tonnage shipped is 100, and the calculated tonnage in a certain stope is 7 tons, then the actual tonnage in that stope is $^{100}/_{175} \times 7$ tons = 4 tons. In the same manner from the calculated and actual total the contents of each stope is obtained. The foreman of the *planilla* keeps an account of the cars of second class taken from the sorting floor to the mill, and takes a composite sample for the month. From his report and that of the assay, the total tonnage and contents are obtained and divided among the various stopes proportionally to the high grade taken from each. The section marked "Total Second Class" is the sum of the second class broken in stopes and the *planilla* second class. The section "Total Rock Broken" is the sum of the total second class and actual high grade from each stope, the values of which are recorded opposite them in the next column. This completes the stope statement. Its purpose is to afford the cost clerk definite information as to the value of the shipping ore and the second class taken from each stope.

FIG. 2. STOPE STATEMENT, MONTHLY REPORT ON

Month of ....19 .

		Ore Broken				Fill					Planilla Second Class			Total Second Class					
		Dimensions					Assay		Contents			Contents			Assay		Contents		$ U.S. Currency Gross Value
Level	Stope	Area	Width	Cu Ft.	Tons	Tons	Au	Ag.	Au.	Ag.	Tons	Au	Ag	Tons	Au	Ag	Au	Ag	

Mexican Currency
Tons at 2000 Lb.

FIG. 3. FINANCIAL

			Shipping Ore							Mill Ore		Labor Costs (Boletas)				
Level	Stope	Tons Ore Broken	Tons	Gross Value	Sorting Cost	Marketing $59 per Ton	Loss, Taxes 13%	Total Deductions	Profit	Tons	Gross Value	Miners	Air Drills	Timbermen	Miners	Air Drills

FINANCIAL STATEMENT OF STOPES

From the preceding statement and from records kept in the general office is worked out the financial statement of the stopes, Fig. 3. The first three items "Level," "Stope" and "Tons of Ore Broken," are taken directly from the stope statement, as are also the first two columns "Tons" and "Gross Value," under the section "Shipping Ore." The next three columns are taken from data kept by the cost clerk. The total "Sorting Cost" is divided among the stopes proportionally to the tonnage of shipping ore taken from each. Transportation, treatment charge and commissions, which make up the "Marketing Cost," vary so little from month to month that they are considered as a fixed deduction per ton. In like manner losses and taxes, varying but slightly, are taken at a constant fixed percentage. Subtracting these three costs from the gross value gives the total profit on shipping ore for each stope.

MINE TONNAGE AND ASSAY

Tons of Waste	Shipping Ore															Ore Broken				
	Sorted High Grade (Calculated)								Sorted High Grade (Actual)								Assay		Contents	
	Dimensions				Assay		Contents		Tons	Assay		Contents		$ U.S Currency Gross Value						
	Area	Width	Cu.Ft.	Tons	Au	Ag	Au	Ag		Au	Ag	Au	Ag			Tons	Au	Ag	Au	Ag

STATEMENT OF STOPES

Month of .... 19..

Mining Costs						Sundry Costs								
Miners and Air Drills	Blacksmith, Nippers, Superintend., Samplers, etc.	Timbering	Hoisting and Pumping	General Tramming	Total Mining Cost	Tramming to Mill	Concentrating	Cyaniding	Loss and Marketing Cost 27%	General Costs	Total Deductions Mill Ore	Profit or Loss on Mill Ore	Total Profit or Loss	Profit or Loss Per Ton

The section headed "Mill Ore" is taken directly from the stope statement. The data under "Labor Costs" are obtained from the time slips, upon which is entered by the shiftbosses the location, class of work and price paid, and which, being segregated by the time clerk, first as to location and secondly as to class of labor, i.e., "Miners," "Air Drills" and "Timbering" include the cost of labor to wages, which is entered directly upon the financial sheet. The cost clerk furnishes all information under the section "Mining Costs." The three columns "Miners," "Air Drills" and "Timbermen" include the cost of labor given in the previous section and also that of explosives, lights, etc., which additional cost is allotted proportionally to the labor cost. The column "Miners and Air Drills" is the sum of the two columns "Miners" and "Air Drills," and is merely the basis of distribution of the costs of the following column, "Blacksmith, Nippers, Superintendent, Sampling," etc. The hoisting and pumping costs, which are small, the mine being fairly dry and entered by tunnels, are distributed at the discretion of the mine superintendent. The product of the tons of milling ore broken in each stope and the cost of general tramming, divided by the total tonnage sent to the mill, for the month, gives the cost of tramming charged to each stope. The sum of the last five costs, including "General" gives the "Total Mining Cost." Finally come "Sundry Costs," including "Tramming to Mill," "Concentrating," "Cyaniding," "Loss and Marketing," and "General Costs," which are obtained by use of the following simple formulas:

Tramming cost per stope = tonnage broken in each stope multiplied by cost per ton of tramming to mill.

Concentrating cost per stope = total concentration costs divided by tonnage of ore sent to the mill, multiplied by tonnage broken in the stope.

Cyaniding costs per stope = average monthly cost of cyaniding one ton of ore multiplied by 96% of monthly tonnage broken in the stopes. (4% of the total ore milled is removed by concentrating before the tailings are cyanided.)

Loss and marketing cost have been found, after two years' observation, to equal practically 27% of the gross value of milling ore.

General cost = tonnage multiplied by general cost per ton.

The total deductions equal the sum of mining, transportation, milling, marketing and general costs. The profit or loss on milling ore equals gross value of milling ore broken in each stope, minus the total costs charged to the stope. The total profit or loss equals profit or loss on shipping ore plus profit or loss on milling.

From this somewhat detailed financial statement a brief summary, including the location, the total gross profit or loss, and the profit or loss per ton of each stope, is tabulated for the use of the mine superintendent and all others whom it concerns. This is the main object of this statement, but there is another advantage, in that from the record upon the stope sheets, Fig. 1, of the contents of each 10 ft. of area, at the end of the year, the contents of the broken ore in the stopes can be approximated with a fair degree of accuracy.

Assay Records

Among the records kept in the engineering office is the assay map, a projection upon the plane of the vein of all the workings of the mine. Upon this are plotted all assays of which it is desirable that a permanent record be kept. All development work in drifts, raises and winzes is carefully sampled at definite intervals, usually 5 ft., and the assays are there recorded. Thus, as the ore is blocked out, the general trend of the grade may be seen at a glance, and the desirability of prospect raises and winzes easily determined. Toward the end of the year when careful estimates of the ore reserves are made, cut samples are taken in all stopes pertinent to the calculation, and the assays recorded on the map, the position of the roof of each stope being indicated by a dotted line. From this map, when the ore reserves are estimated, the assays surrounding a block of ore are used to calculate the value of that particular block. This approximation of ore in place has proved consistent with the actual contents when mined. It is apparent that there are certain parts of this system which are essential to every mine. Other parts not absolutely essential, but requiring little extra labor, are at the same time wholly consistent with the possible accuracy of sampling and of cost distribution, and possess distinct advantages and ultimately of value.

Administration of the Calumet & Hecla

The system of administration and supervision of the Calumet & Hecla company was described by the manager, James McNaughton, before the Congressional Committee investigating the recent strike.

There is a board of five directors which selects a president. One of the directors is Mr. McNaughton, himself, who is also second vice-president and general manager, in charge of all the operations of mines, mills and smelting and refining plants. Under him is John Knox, as general superintendent. Each of the mines has a superintendent under the general superintendent and each also has a head mining captain. The mining captain has full charge of all underground operations at his property. At the Calumet & Hecla proper there is a head mining captain on the conglomerate lode and another on the amygdaloid lode. Each of these lodes is again divided into sections called branches. There are three of these on the conglomerate, namely, the Calumet & Hecla, the South Hecla and the Red Jacket shaft. The amygdaloid is divided into north and south branches. Each of these five branches itself has a head mining captain and under him there is a shaft mining captain on each shift. Under the shaft captain there is a shift boss on each shift, a trammer boss on each shift and timber bosses. This is the arrangement at the Calumet & Hecla, but the same general arrangement is followed at the subsidiary properties. There is, furthermore, a railroad superintendent, a stamp-mill superintendent and smelting-plant superintendents.

The branch mining captains hire the men for their departments, but the shaft captain can discharge men with the approval of the branch captain. The trammer boss, who will have supervision of the trammers on from three to six levels, is known among the men as the "$5-boss."

The total number of bosses in the employ of the company and its subsidiaries is about 750 to 800, and the total number of men is something over 8000.

Electro-Thermic Iron-Ore Smelting in Norway

Christiania Correspondence

Professors H. L. Vogt and P. Farup, of the Norwegian electrometallurgical commission, reported on the causes of the economic failure of the Elektrometal smelter at the Hardanger Iron & Steel Works in Norway as follows:

> The type of smelter used at Hardanger (the Elektrometal) has, with charcoal as a reducing material, proved a success at several Swedish works.
>
> It has been ascertained at the Hardanger works that it is also adapted to coke. The results obtained after a few hours' trial with coke in Sweden—from which it was stated that coke was unemployable—have not been confirmed after many months' working at Hardanger. The latter has obtained good results, notwithstanding that the Hardanger furnace's dimensions were less suitable than those of the Swedish smelter used at Trollhättan, and despite the fact that in the Hardanger smelter considerably finer charges were treated.
>
> It was found at the Hardanger works that, with coke, an excellent quality of pig iron can be produced. The consumption of carbon is the same whether charcoal or coke is employed. The consumption of electric energy has shown itself to be that originally computed by us, both for poor and rich ores. While the operations at Hardanger proved to be not economical the cause should be attributed partly to the nature of the ores treated and partly to their low iron content, conjointly with the unsatisfactory condition of the agglomerating roasting oven, and several parts of the electrical equipment; in other words, conditions which neither bear on the electric iron-ore smeltery nor the smelter type used.

Engineer Gustaf Oedquist, on the other hand, in his statement before the Christiania Polyteknik Forening, says:

> The committee is of opinion that the type of smelter used did not conduce to the unfavorable results at Hardanger. I am of a different opinion. The reason why it is not adapted to coke consists in the greater variation in the electric resistance in the furnace itself by the use of coke, owing to which the average load as well as the production is diminished. To which must be added that the larger quantity of limestone thereby necessitated contributes to a lesser production of pig iron per horsepower-year

He attributes to an oversight in the installation of the electrical plant the fact that only two-thirds of the available energy was a benefit to the smelter. This brought down the pig-iron results per horsepower-year, and, owing to the difficulty in obtaining the necessary heat, the "scrap" went up as high as 25%. As regards the ores, he considers the Sydvaranger briquettes and Rödsand slig suitable for the process, but not the Klodeberg and Perslerg ores. He describes the pig-iron product as varying widely in quality. He concludes:

> The causes of the unsatisfactory result of Hardanger were many, but the type of smelter used bears a large share, which must not be overlooked. On the other hand, these results must not be made to apply to electric iron-ore smelting with coke generally. On the contrary, efforts should be made to arrive at a type of smelter which by the use of a cheap reducing material will produce an excellent article at a price which can defy the sharpest competition.

Engineer Lindemann, in dealing with the operations at Hardanger, says:

> In the second working period, from July 10, 1912, to Feb. 20, 1913, Sydvaranger briquettes were treated in the smelter with a little addition of Rödsand slig, or Klodeberg ore. This was so far favorable that it gave between 50 and 51% pig iron; but it was found that the condition of the briquettes in the smelter caused as great trouble as did the Klodeberg ore. It was found that the briquettes, owing to the action of the hot carbonic oxide, fell completely to powder and made gas circulation impossible. The briquette question was, in itself, of great moment for Norway. If ores are to be smelted with comparatively much slag and at high temperatures they must be low in phosphorus. Now, it is generally known that if one uses Norwegian ores the latter must be in the form of briquettes. These briquettes, in themselves an excellent ore (containing from 64 to 65% Fe and well suited for electric smelting), have the peculiarity, as stated, that in contact with hot carbonic oxide the latter separated by catalytic action in such a way that the carbon is deposited and the briquettes increase in bulk. The Swedish experiments have shown that when sufficient gas is conducted over the briquettes the latter increase three or four times in volume. It is, therefore, clear enough that an electric high shaft furnace could be closed up so effectually as to preclude all gas circulation.
>
> During the third working period, from Mar. 2, 1913, to May, 1913, the Swedish Persberg ore and the Norwegian Rödsand slig were treated. As a result of the high percentage of silica in the Persberg ore it was necessary to add so large a quantity of limestone that the iron content went down to 42% Fe. This was sufficient of itself to render impossible any economical result from the operations. As in the first working period the charges proved too poor to give economical results. In that period the smelter worked satisfactorily, in spite of the large quantity of fine-grained ore (Rödsand slig), which was treated, and the energy results obtained agreed with the calculations previously made by the electrometallurgical commission.

From the foregoing Herr Lindman concluded that the Hardanger works had never treated charges which would have made economical results possible. Generally speaking, there were two causes for this: the crumbling of the briquettes in the smelter, and the inadequacy of the agglomerating roaster used for the Rödsand slig.

> When, eventually, this slig on which the whole of the working was based, was obtainable, and the roaster brought into use, it was found that while it expelled the sulphur satisfactorily it lacked the main quality predicted for it. It did not agglomerate. It produced a fine powder. And when a shaft furnace 8 m. high is filled up with fine powder it is not difficult to understand that anything that may be termed gas circulation is out of the question.

The Bie-Lorentzen Smelting Works

Full constructional details of the "Bie-Lorentzen" smelter in operation at the Tinnfos, and quite recently at the Ulefos Iron Works in Telemarken, Norway, have not hitherto been available. It differs, however, essentially from the Elektrometal type used at Hardanger in that two separate shafts come into the smelting chamber with connecting arches. The electrodes pass through these arches into the charge and the current passes through it to the lower electrodes and the bottom of the furnace. This obviates the overheating and destruction of the arches, which are protected, as it were, by the electrodes. No gas circulation is used at Tinnfos, and the two shafts are rather high to produce a good draft for the ascending gases.

General Olssön, a director of the Tinnfos company, in a paper read before the Polyteknik Forening, states that the ores located at Tinnfos are all low-grade (45 to 48% Fe) and are of three kinds: the Klodeberg, Grevinde Wedel, and Fru Anker ores.

There are at present four furnaces completed, of which the last is a modification of the original design. In the meanwhile, as two of the smelters had been in continual use from 10 to 11 weeks without any of the difficulties mentioned in connection with Hardanger, the result may be considered as being satisfactory. These runs were with Klodeberg and Grevinde Wedel ores, which are both basic, and there were no additions of lime. It had been sought to blend the ores in such a manner that the least possible addition of lime might be necessary.

Apart from unfavorable results, when the smelting had to be discontinued, the average during several weeks has been 3100, 3000, 2900, 2800, 2700, and, in one week, only 2600 kw.-hr. per ton of iron. It is estimated that to get a result as good as that obtained by the Trollhättan smelter no more than 2800 kw.-hr. per ton of iron should be necessary.

There have not been the same heavy expenses entailed in the production as were apparent at Hardanger, where, from some acounts, they had gone up as high as $25.66 per ton of pig iron, and more than that the goods can scarcely have fetched in Germany. On this point, however, nothing can be stated with certainty.

It is the intention, later, of the Bie-Lorentzen Works to go over to steel production taking the pig iron in its molten state direct to the electric steel furnace. At present it is usual first to treat the pig iron in a Siemens-Martin or bessemer furnace, finally dealing with it in an electric steel furnace. But when the pig iron is so pure as that at Tinnfos, with so little phosphorus and sulphur, and with power so cheap, it can be dealt with directly in the electric furnace. It has been tried with a pig iron much higher in silica, phosphorus and sulphur than that produced at Tinnfos.

It had been said that the Klodeberg ore had a zinc content of about 0.3%, and that this had been a disturbing effect on smelting operations with the Elektrometal system at Hardanger, owing to the smallness of the pipes through which the gas passed, and the deposition of zinc oxide in lumps on the walls and iron connections. At Tinnfos a case did occur which caused some trouble, but, generally speaking, the zinc has not proved particularly disturbing. There is, besides, no gas circulation at Tinnfos, nor has the gas available hitherto been used, and the furnace has an open top. The zinc caused no difficulties during the smelting operations at the old iron works at Nes.

The Modified Bie-Lorentzen, at Ulefos

A smeltery has decently been established at Ulefos, in Telemarken, Norway, for the electrothermic treatment of iron ores by a modified type of the original "Bie-Lorentzen" installed at Tinnfos. In the power station three turbines have been placed: a double 1100-hp. turbine coupled to a single-phase generator for operating the electric smelter, a 500-hp. turbine driving a three-phase generator for delivering power to the mines at Faehn, and a 150-hp. turbine coupled to a direct-current generator for electric lighting. The turbines, which were supplied by the Kvaerner iron foundry in Christiania, receive their power from the recently constructed intake at Ulefos.

The electric equipment was furnished by Siemens-Schuchert. The power from the station is conducted a distance of only 75 m. to the smelting house.

The Ulefos iron works was started in 1650 to treat the hematite ores from the then recently discovered Faehn deposits.

Originally intended for wrought-iron production the works, in 1842, went over entirely to foundry iron. Charcoal was used in the furnaces; but as the cost of timber kept going up conjointly with the falling of iron prices, owing to the adoption of improved smelting methods with coke in foreign countries, the Ulefos works was closed in 1877 and the blast furnace pulled down. Foundry work was, in the meanwhile continued, for which purpose only pig iron from England was used.

The Faehn mines, which were shut down in the beginning of the '80s, were again operated in 1900, and the ore mainly exported. Up to the present time about 500,000 tons have been shipped. With the possibilities of electro-thermic smelting in view, the owner of the mines, Herr Cappelen, decided to supplement the export by electrically treating the ore at Ulefos. The Eidsfoss and Vrangfoss falls were acquired by him in 1907, and a small electrothermic smelter was constructed in 1910. The latter has been replaced by the present smelter, for which the recently built power station supplies an energy of 1400 e.hp. The pig-iron product is to be used for foundry purposes.

Ulefos is the first Norwegian proposition which produces a marketable pig iron from its own mines, by the electrothermic method. The ore reserves of the Faehn mines were stated by Professor Vogt (in 1909) at a certain 500,000 tons, a probable 750,000 tons, and, under favorable conditions, 1,000,000 tons; and the ore content was given as 50% Fe, 0.4 to 0.7% P, and 0.2% S.

THE HELFENSTEIN SMELTER

Dr. A. Helfenstein, the Austrian inventor of the Helfenstein smelter, addressed the Polyteknik Forening in Christiania on Feb. 3, 1914, on the subject of large electric furnaces in their relation to pig-iron production, and the advantages which, in his opinion, the large closed furnaces have over the ordinary shaft furnaces. He made special reference to the large Helfenstein smelter, installed at Domnarfvet in Sweden, and pointed out that among the points in its favor were the minimum of labor arrived at—it had been reduced to five men for each shift—great reduction in cost of construction, facility of operation, and, what was of importance, the possibility of treating considerable quantities of slig. Although charcoal was used in Sweden he was still of opinion that coke as a reducing material was the main problem yet to be solved in connection with iron-ore smelting. It was a problem, moreover, which especially concerned Norway, where only coke can be used with advantage. By the employment of coke a valuable product of first rank, carbonic-oxide gas, is secured, and it was Dr. Helfenstein's opinion that this gas would constitute a chief element in future pig-iron production. Its importance would be realized when it was known that by its aid such products as synthetic sugar, phosphates, soaps, carbide and nitrates could be produced. He pointed out that peat coke was also admirably adapted for electric iron-ore smelting, peat gas having also, as is known, its uses. His particular furnaces were designed for 10,000 to 12,000 hp. On the whole, he was in favor of large aggregates, and he laid special stress on the fact that whereas his furnaces could also be operated with a lower load—down to 4000 hp.—small furnaces are not efficient. The high shaft furnace—his own was a Diesel furnace—was not suited for coke on account of the danger of explosion. His furnace was 6 m. high, but it could develop an effective power up to 12,000 hp.

In conclusion, Dr. Helfenstein, "as a neutral foreigner," expressed his astonishment at the foreign concession policy of the Norwegian government. He described how, in other countries, the state aided industries, and pointed out that here, in Norway, it should be remembered that they had to compete with countries old in industrial experience. His point was that foreign capital should, as in other lands, be welcomed when it came to stay. "No country is so independent, in that respect, that it can afford to leave others out of consideration. They all lived in the great World-Society, where international capital was indispensable."

The above conclusory remarks appeared to be resented by a section of the audience, and Engineer Höy, in the course of the discussion which followed, pointed out that the policy of the Norwegian government was to preserve the country's water-power resources from overwhelming foreign influences. "We are glad to see foreigners in this country; but, in return, they must respect us" (applause). While duly acknowledging the advantages of Dr. Helfenstein's system of furnace he wished to point out that a patent method resembling it had been in favorable operation for several years at Meraker, in Norway.

General Olssön disagreed with Dr. Helfenstein on the respective merits of the closed and the shaft furnaces. He considered the principle of the shaft furnace the best principle. The process was even and effective, and one got the best iron product from it. From his experiences at Tinnfos he did not believe there was any danger of explosion when coke is used in a high shaft furnace.

British Mineral Output

Mineral output of the British Isles in 1913 is summarized in the general report for mines and quarries by the chief inspector of mines. The accompanying table summarizes the statistics:

MINERAL OUTPUT OF THE BRITISH ISLES

Mineral	1913 Long Tons	Mineral	1913 Long Tons
Alum shale	8,741	Limestone (other than chalk)	12,740,664
Arsenic	1,695	Manganese ore	5,393
Arsenical pyrites	35	Mica	32,986
Barium (compounds)	50,045	Natural gas	Cu.ft. 87,450
Bauxite	6,055	Ochre, umber, etc.	14,935
Bog ore	3,835	Oil shale	3,280,143
Chalk	4,858,126	Rock salt	214,573
Chert, flint, etc.	74,858	Salt from brine	2,033,185
Clays and shale	13,859,821	Sandstone	3,977,303
Coal	287,430,473	Slate and slate slabs	370,756
Copper ore and copper precipitate	2,732	Soapstone	40
Diatomite	154	Sulphate of strontia	18,425
Fluorspar	53,663	Tin ore (dressed)	8,355
Gold ore	4	Uranium ore	95
Gravel and sand	2,409,152	Wolfram	182
Gypsum	285,338	Zinc ore	17,294
Igneous rocks	7,098,493		
Iron ore	15,997,328	Total, tons	354,890,667
Iron pyrites	11,427		Cu.ft. 87,450
Lead ore	24,282		
Lignite	81		

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California Mineral Products in 1914 will probably exceed $100,000,000 in value, according to the estimate by F. McN. Hamilton, state mineralogist. The total is derived as follows: Petroleum, $50,000,000; gold, $20,000,000; all other mineral products, $30,000,000 The increase in total value of petroleum is based on larger output and higher prices than last year.

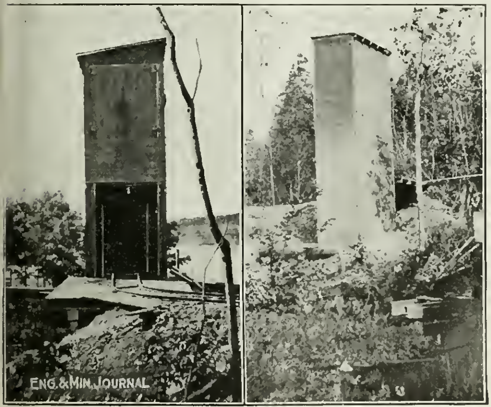
Details of Practical Mining

Otis Elevator Mine Hoist

By L. E. Ives

The Naumkeag Copper Co. is doing exploratory work a large tract of land, about a mile west of the llage of Houghton, Mich., in the heart of the Lake Su- rior copper country. After having done a large amount geological cross-sectioning with the diamond drill, ex- oratory work was started some months ago with an lit, the mouth of which is about on the same level with d approximately 75 ft. from the wagon road that skirts ortage Lake in that vicinity. Because of the lack of evation and the proximity of the road, dump room at e mouth of the adit is at a premium. The difficulty has een overcome, for the time being at least, in a rather ovel and effectual manner.

The accompanying illustration shows an artificial ingle-compartment shaft, constructed by the Otis Elevator Co., New York, and built over the adit at its mouth. The framework of the shaft is built up of flat, rough boards, approximately 7½ in. wide and 1¾ in. thick. Five of these, laid flat sides together and standing on end constitute each corner post, these being about 8¼ in. thick. The sides are divided in panels by horizontal members of similar construction, and each panel is properly braced diagonally. This framework is inclosed by matched, planed boards 8x¾ in., the whole making up the boxed-in shaft, 9x10 ft. 7 in. outside dimensions, shown in the illustrations. The lift from the floor of the tunnel to the level of the dump is 30 ft.



A Peculiar Mine Shaft

The elevator car is nothing more than an ordinary freight-elevator platform with a 2-ft. gage track running across it and two sides boarded to a height of 5 ft., the car itself being 8 ft. long. The hoisting is done by an Otis Elevator Co., 10-hp., alternating-current, 230-volt, 2-phase, 60-cycle motor, placed in a separate compartment over the sheaves at the top of the shaft. Two ¾-in. steel hoisting cables are used and the hoisting speed is 40 ft. per minute. The tram car in use holds 30 cu.ft., and the hoist is capable of lifting 4000 lb., in addition to the elevator car, at the speed and through the distance given. The entire installation is operated by a hand cable, and stopping is automatic at both top and bottom.

Power for operating this hoist is obtained from the service wires of the Houghton County Electric Light Co., which parallel the road, not over 100 ft. away. Since being installed, about 600 tons of rock per month have been hoisted, and this has been done with a power consumption of about 58 kilowatt-hours per month, at a total cost of $1.80. This figures out about 6c. per day for hoisting expense, or 0.3c. per ton hoisted. No hoist men are required. Two trammers push the car out to the shaft and on the platform, pull the cable, go up with the load, dump it and return to the muck pile again. Power is not being wasted when no hoisting is going on, and three safety stops guard against the possibility of overwinding. One cannot help wondering why this same idea—an automatic, electric, freight elevator—should not find favor in many mining districts, both for exploratory and for permanent purposes, and especially where the deposits are comparatively shallow and flat.

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Spotting Railroad Cars with Water-Driven Winch

By Frank M. Leland*

At the Empire Copper Co. works, we ship on an average two 50-ton cars daily over the tracks of the Oregon Short Line and we bring the ore down from the mine over our narrow-gage road, using a Shay locomotive to pull a train of 10 four-wheeled bottom-dump cars, each car containing about seven tons; it takes eight of these to fill a 50-ton car.

We run our train on an old trestle in the smelting plant and we have a Short Line track at the bottom of the trestle. We then dump the small cars in a chute which delivers the ore into the Short Line car. The latter requires moving eight times during loading; it used to take two men with pinch bars to move the car; hard work and expensive.

I figured it carefully and found that if we could move the cars with power, it would save approximately $150 per month, besides being quicker. I investigated several patent winches, both hand and power, but every one called for a man down below to operate it, so I finally hit upon the following: We have an old hoist in the plant which was hardly good enough to use at the mine, but would work if run slowly. I set this up at the end of the track and connected it up to our high-pressure water line which gave 200 ft. of vertical head. I ran the connecting pipe up to the level of the top track and placed the controlling throttle there. In operating now, we hook the cable to two railroad cars coupled together and move them 16 times before unhooking the cable. We set the brake slightly on one car so as to make it stop the moment the throttle is closed. When the two cars are loaded, we take them out with the Shay locomotive and put in two more, throw out the clutch on the hoist, pull out the rope and proceed as before.

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*President, Empire Copper Co., Mackay, Idaho.

After we had tried out the hoist and found that it gave us such good results, we took a small timber hoist which we were not using at the mine and installed it at the top of the trestle to handle the narrow-gage cars. When we are running at full capacity, our engine sets the loaded train of small cars, takes the empties and goes back to the mine immediately, leaving the loaded cars on the trestle. One man, by using the hoists, unloads the 70 tons of ore all alone in less than an hour, and as the water costs nothing, the cost of transferring the ore is only $^3/_7$c. per ton.

The large hoist, which pulls the two 50-ton cars along, is a double-cylinder nonreversible engine with a friction clutch and a brake, although we do not use the brake. The cylinders are 6 in. in diameter with an 8-in. stroke, the crankshaft geared to the drum shaft with a ratio of 5 : 1; the diameter of the drum is 30 in.

When we first turned in the water, the hoist would make only part of a revolution and come up all standing. I made a little wooden model of the valve and valve seats and figured it out that while steam or air would compress, water would not; so I cut out $1\frac{1}{4}$ in. on each side of the exhaust cavity in the valve and the engine worked perfectly. It runs slowly, but is just the thing to pull the cars and actually saves us $120 per month.

When one can take an old hoist, which otherwise would have netted perhaps $20 for scrap, and some water which costs nothing, and get a revenue of $120 per month at a total cost of installation of, say $200, it appears to me it is a profitable operation.

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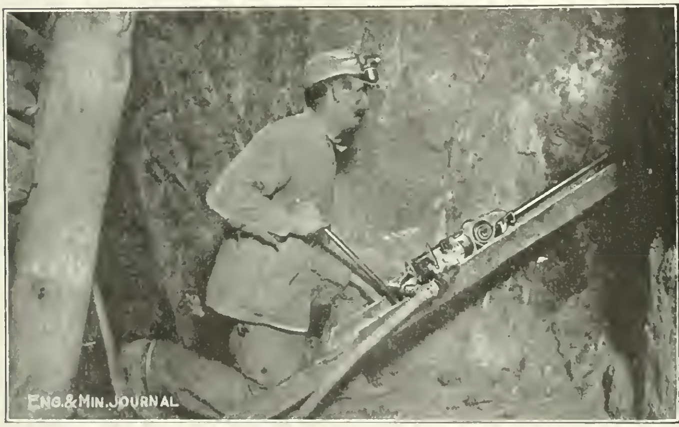
Detachable Bits for Rock Drills have engaged the attention of Rand miners for some time. The "South African Mining Journal," quoting R. W. Shumacher, states that hammer drills seem to make the detachable-bit problem easier of solution, and that undoubtedly a successful detachable bit will eventually be devised. Its advantages from the point of view of steel distribution are manifest.

Drifting with a Jackhamer

By I. A. Chapman*

Three men, leasing a mine in Butte, are drifting an doing all their drilling with a jackhamer. They ar Dick and Harry Cloke and Harry Andrews, each one o whom had considerable experience with jackhamers while operating a lease on the Bullwhacker property In the mine which they are working at present, they are driving a 7x7-ft. drift on a vein varying from 18 in to 7 ft. in width and dipping 35°. The wall rock is s solid that little timbering is necessary. The rock is th easily drilled quartz monzonite of the Butte district, altered principally by the formation of chlorite. Th men preferred the jackhamer, although they had th choice of any other machine.

An important item of equipment is the wooden troug in which they seat their drill. This is about 6 ft. lon with inner side boards to hold the drill as steady as possible. It is laid up against the breast in line with th hole to be drilled, the machine is placed in the troug and the drilling commenced. In order to hold the machine up to its work, it is urged forward by a lever consisting of a short piece of steel, which fits into hole drilled in the base of the trough. Six 5-ft. holes are generally drilled to the round. In harder rock it is sometimes necessary to drill back holes almost flat. This is done by wedging a small stull across the drift 4 ft. from the face at the desired height and spiking the rear end of the trough to the top of the stull.



Use of Lever in Trough for Hole Inclined Upward

Putting in a Lifter

The average time for drilling a 5-ft. round of six holes is 2 to $2\frac{1}{2}$ hr.; the men relieve each other and keep drilling steadily during that time. A special feature of the steel used is a hole 4 in. back of the bit slanting backward and connecting with the center hole of the steel. This extra hole aids in the blowing out of drill cuttings. I believe that this is an idea of Oscar Rohn's, or at least, that he was the first to use it in Butte.

Twenty-four to 26 cars of rock are broken per round. The cars are trammed an average of 300 ft. to the shaft.

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*Box 1375, Butte, Mont.

n order to make the handling of the cars easier, the drift was widened in two places, and switches put in. t was necessary to timber the drift in one place for a listance of 30 ft., where two turns were made. With he exception of running the hoisting engine and compressor and doing a small part of the drill sharpening, he three men do the work, including dumping the cars n the surface. At the end of 25 shifts they had made a rogress of 91½ feet.

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New Type of Copper Queen Change House

Prior to 1913, the change houses or drys for miners of he Copper Queen Consolidated Mining Co. were all of ne type, similar in equipment and construction to others n the Southwest. They were usually two-story wooden uildings, with corrugated-iron roofs and walls. They ad wash rooms and shower baths, and lockers for clothing. The lockers were ventilated and had steam pipes eneath. Each change house had its own heating plant for warming the building and heating water. Exhaust steam was not available, as all power was generated at a entral station and distributed by electricity or compressed air.

When new buildings were designed, an attempt was made to improve on the older construction, particularly in the directions of sanitation and reduction of maintenance costs. In the old buildings, the wooden floors wore rapidly, and gradually became saturated with wash water, etc. Although the lockers were ventilated at top and bottom, wet clothes were packed too closely to allow free circulation of air. It was necessary to keep the rooms uncomfortably hot in order that the clothes might be dried.

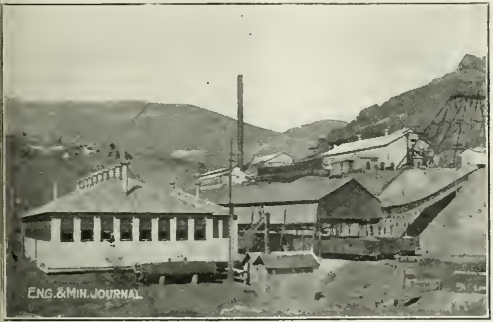


Fig. 1. The New Change House at Sacramento Shaft

The Uncle Sam change room was built in the winter of 1912-13. It was followed by one at the West Atlanta shaft and later by a larger building at the Sacramento shaft. These are all single-story buildings, with cement floors. Small lockers are used for such articles as might be lost or stolen, but all clothing is hung from the ceiling. The wet clothes are thus spread out to favor drying by free ventilation, rather than by the heat of steam pipes. Each change room has a wash room and shower baths, accommodations for foreman, bosses and timekeeper, and a small storeroom.

Fig. 1 gives a view of the outside of the Sacramento building, and Fig. 2 a view of the interior. For one end of the building a cut in the ground was necessary, while the other was built on fill. The building was surrounded by shallow concrete foundation walls and the fill was settled by water. The cement floor was laid on the ground, with the exception of the wash room, which was supported by iron posts and laid on Berger plate. The skeleton of the building is of timber, plastered within and without on Hy-rib. Fig. 3 is a plan of the change house.

The heating plant, separated from the change room to cut down the fire risk, is situated below the building, so that condensed water drains back to the boiler. The heater is an "Ideal" steam boiler of the American Radiator Co., 36-9 section. For heating the main room 650 sq.ft. of radiating surface is provided, and 70 more for the office and the bosses' change room. The steam pipes are laid around the walls above the benches, and protection from burns is given by wooden gratings.

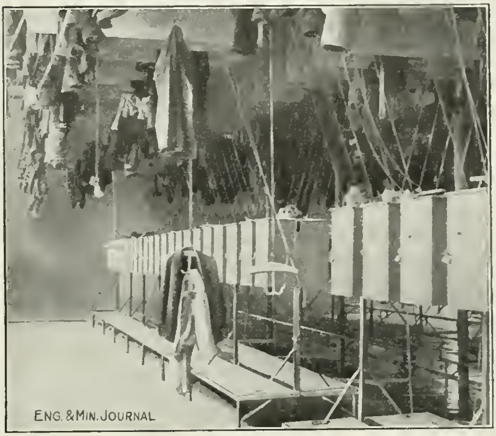


Fig. 2. Inside of Change House, Showing Small Lockers and Clothes Suspended from Hooks

The floor of the building is clear for washing with a hose; nothing but the iron supports of the benches interfere.

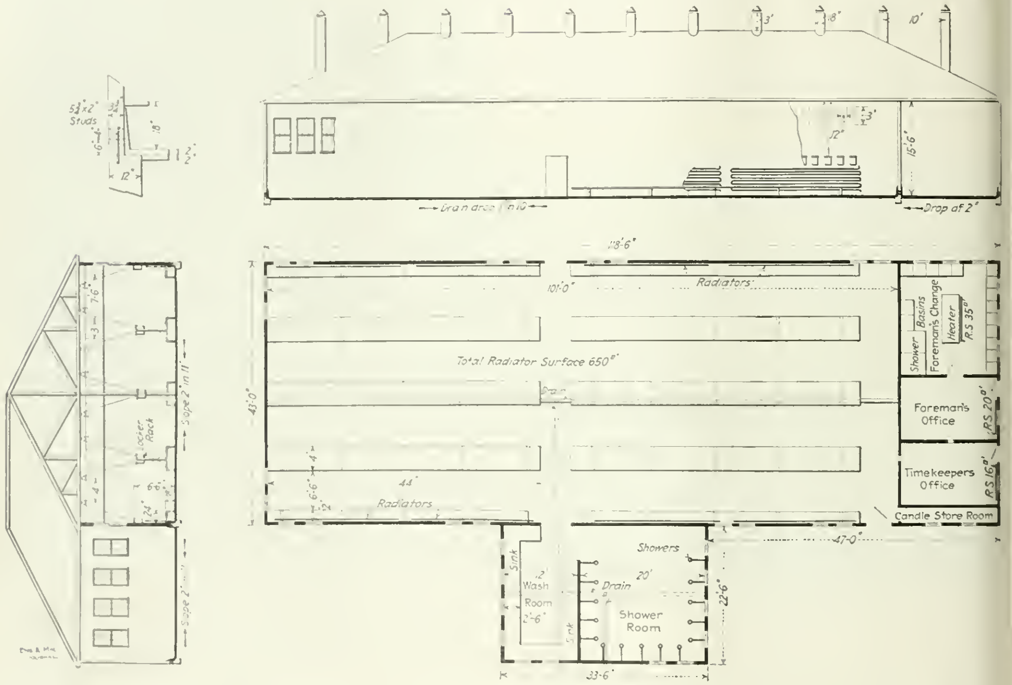
In Arizona, during a large part of the year, the air is so dry that clothes may be dried without heat if there is a free circulation of air. To furnish this, ventilators are spaced at 10 ft. intervals in a row down the center of the building. The room is exceedingly wide, and it may be desirable to provide additional ventilators. It would be even better to leave out the flat ceiling, which would allow the air to pass still more freely through the clothes. Thin sheets of galvanized iron separate the surface and mining clothes, but they appear to be unnecessary.

Miners work eight hours in the Warren district, and clothes have at least 14 hr. in which to dry. As soon as the morning shift has changed, the fire is banked and all windows opened. Little fire is necessary until an hour or an hour and a half before the shift comes up, when the windows are closed and the fire freshened to warm the room and heat water for bathing. The men on the night shift go down an hour and a half after the day shift comes up, and the building is still warm for them while they change their clothes. The fire is again allowed to die down and is started up to warm the room for men coming off shift at 1:30 a.m. and for the morning shift which goes on at 7:30.

The cost of the building was as follows:

Excavation	$303
Concrete foundation walls, and floor	1,589
Building	10,490
Heating plant, etc.	3,056
Total	$15,438

The building is large enough for 500 men, but only 383 lockers are provided. The cost of extra lockers would be about $250 more, making the cost per man $31.37.



Arrangement of a Copper Queen Change House of the Design Recently Adopted

The buildings have not been constructed long enough to give a fair average for cost of maintenance. The expense for fuel is more uniform, and a shorter time is sufficient to give dependable costs. We found that in the new change rooms the cost of fuel per man for a period of nine months ended not long ago was only 72% of that of the older type. None of the new change rooms is used to its full capacity, while the older buildings are crowded. The saving in fuel per man would be even greater if they also were filled.

It may be safely assumed that these buildings will cost less for repairs than the earlier type, and there will be an important saving in fuel. There is also a great improvement in sanitation. The usual rather unpleasant smell of drying clothes is not present.

Vacuum Bailing Tank

A novel device, described by the *South African Mining Journal* of May 23, 1914, has been installed at the Daggafontein Gold Mining Co.'s property on the extreme southeastern Rand, where sinking is proceeding.

A large amount of water was encountered in the shaft, and to handle this a bailing tank was built in which a vacuum is created at the time of filling, so that the water flows in more readily and in greater quantity. An air pump is installed about 300 ft. above the shaft bottom, and 4-in. pipes are carried to a point 40 ft. from the bottom, where a 40-ft. length of flexible hose is attached. On the end of this hose and on the side of the tank are the halves of a vacuum-brake connection coupling.

When the tank arrives at the bottom of the shaft, connection is made between the flexible hose and the tank, and a stop-cock is opened so that the air is allowed to be drawn from the tank. The tank is then allowed to fill through a valve at the bottom, the stop-cock is shut off when the gage-glass on the side indicates that the tank is full, the vacuum couplings are detached and the tank is ready for hoisting. The tank fills in 15 sec. after the water valve at the bottom is open. An air tap 1 in. in diameter is fixed in the top of the tank to admit air at atmospheric pressure when it becomes time to discharge. Other details are added to make the device practicable in operation.

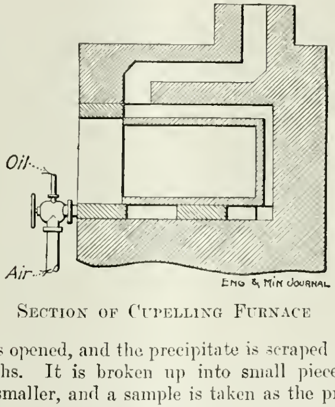
Details of Milling and Smelting

Refining Practice at Colburn-Ajax Mill

By Ralph H. Shaw*

In refining zinc precipitate from a cyanide plant, it is a serious problem to make high-grade bullion economically. The precipitate usually contains many metals, making refining difficult and expensive. The precipitate at the Colburn-Ajax mill, Victor, Colo., contains, besides gold and silver, a large amount of silica and zinc and small amounts of lead, iron and copper. For this mixture complex treatment is required.

Zinc-dust precipitation is used in this plant. When the press pressure reaches 35 or 40 lb., the flow of solution is cut off, and air is blown through the cake for several minutes to dry it out. This reduces the moisture to about 30%. Iron pans are then placed under the press, it is opened, and the precipitate is scraped off of the filter cloths. It is broken up into small pieces, ¼-in. cubes or smaller, and a sample is taken as the precipitate is broken up. A rough analysis is made to determine the amount of zinc present. To remove zinc, 1 lb. of concentrated commercial sulphuric acid is added for every pound of zinc present, which removes most of the zinc. Enough water is added to make about a 10% solution of acid, then the acid is put in. The entire mixture is then steam-heated nearly to boiling, during which time, and for several hours after, the mixture is air-agitated. After all action has ceased, the precipitate is settled and the liquor taken off through a filter press. The precipitate is water washed repeatedly until the discharge from the press gives only a slight cloudiness upon adding a few drops of $BaCl_2$ solution. Usually eight or 10 washings are sufficient to give the desired result. The reason for using a smaller amount of acid than is theoretically necessary is to preserve the presses, since dilute sulphuric acid attacks them rapidly.



Section of Cupelling Furnace

After washing is completed, the precipitate is washed out of the tank into an air receiver and thence forced into the press. The press is dried out and cleaned as before. Two days are usually required to cut down and wash the precipitate from one cleanup. The pans containing the precipitate are almost completely dried, electrically.

The melting is done in an oil-fired tilting furnace with low-pressure burner. The crucibles are Dixon's No. 275 and hold about 175 lb. of precipitate and flux when melted. Fuel consumption is about 0.1 to 0.15 gal. per pound of precipitate treated. From 200 to 250 lb. of precipitate can be melted per day of 8 hr. The life of each crucible is 4 or 5 days, or from 800 to 1000 lb. of precipitate.

Before fluxing the precipitate, it is broken up into small pieces, the flux added and the whole mixed well. The flux is slightly changed nearly every melt, as the percentage of silica in the precipitate varies. An average flux used is, in terms of percentage of weight of precipitate: Soda, 40%; borax, 10%; potash, 5%; coke, 0.5 to 1%, and slag, 20%. It was found that by adding a little coke to each charge, the life of the crucible was greatly lengthened, but that the grade of bullion from the furnace was lowered, due to the reduction of zinc and iron salts in the precipitate. This reduction of base metals is of no great consequence, however, because of the later treatment of the bullion. Slag added is the portion nearest to the bottom in the mold, and usually contains much metal. The contents of the crucible, after fusion, are poured into a mold and allowed to cool. About two pourings can be made per day. The slag from this process is saved and at intervals is shipped. Its average contents are about 35 or 40 oz. gold per ton. No matte is made, except occasionally when for some reason the washing is poor. If a little matte is formed it is broken up and ground and put back in with the next charge. The bullion produced is about 250 fine in gold and 50 to 75 fine in silver.

For a long time no satisfactory method of making a better-grade bullion was found. Making a heavy matte was tried and gave somewhat better results. It was unsatisfactory, however, as the results were erratic, and there was also the matte to ship and have refined, which was expensive, and to treat it was costly as well as difficult. It gave a low-grade bullion also, which had to be shipped separately from the first bullion. After some experiments, cupellation was decided upon. The furnace, as built, resembles, in a degree, the assay furnace described in the Journal of Dec. 6, 1913. It is oil fired, and the muffle is much higher than an ordinary assay muffle, though not so long. The openings in the back are near the top. The muffle is supported by firebricks, so placed as to form baffles, which deflect the flame around the muffle at the sides and back. A space of 2½ in. is left all around the muffle to give free passage of the gases to the stack. The relative positions of the muffle, burner and supports are shown in the accompanying sketch.

Cupels used are made of two parts of bone ash to one of cement. Each one weighs about 12 lb. when dry. They are 8 in. in diameter and about 6 in. high, with a depression 2 in. deep. They are made in a device similar to the ordinary hand cupel mold, the pressure necessary being applied by means of an ordinary jack-screw. Before using, each cupel is thoroughly dried and gradually heated to redness. If any cracks show, it is rejected. A cupel will hold about 15 lb. of base bullion and enough lead to make a good cupellation. About 3 to 4 hr. is required for each operation, and the fuel consumption is 10 or 12 gal. of oil per day of eight hours.

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*Assistant superintendent, Colburn-Ajax mill, Victor, Colo.

After cupellation, the gold button is melted in a small graphite crucible and run into a mold. The bars average about 750 fine in gold and 200 fine in silver. The cupel, after using, is ground up and mixed in with the precipitate and flux going to the melting furnace. By so doing, any cupel absorption is regained and also the litharge in the cupel is reduced to metallic lead, supplying part of that necessary for the next cupellation.

Several mixtures of bone ash and cement were tried for cupels, but with either more or less cement the results were unsatisfactory. If less cement were used the cupel was too soft and would not stand the weight of the button, while if more were used, the expansion of the cupel on heating would cause it to crack around the top. With a mixture of two parts bone ash and one of cement, a cupel either breaks on drying or while heating to redness, but never after the button is placed in it.

By this system of treatment of cyanide precipitate, high-grade bullion is made at reasonable cost. Only two products are made, the low-grade slag from the furnace and the bullion. The system has proved an economical success at this plant. Some skill and considerable practice are required to operate the two furnaces and get good results, but one man can do all the work if he arranges it systematically.

* * *

Some Screen Analyses from Tonopah

By Percy E. Barbour*

The accompanying screen analyses of pulp from a Tonopah mill show some interesting facts regarding the results of the product of running a Dorr classifier at different speeds.

They also show the difference in the slime product from the tube mills with different types of lining. The mill has 30 stamps weighing 1100 lb. each and crushes through a 12-mesh screen on four batteries and a 4-mesh screen on the fifth battery, this having been shown by experience to give a grade of material on which the tube mills run with highest efficiency. There are two 5x18-ft. tube mills, which when equipped with smooth liners give 12 to 20% more efficiency than with the El Oro type, but the wear of the former is considerably greater and a compromise type has been adopted.

VARIATION OF PULP GRADE

	On 60	On 100	On 150	On 200	Through 200
Battery splash:					
From launders....	36.1	14.2	3.0	5.5	41.2
From splash.....	44.5	12.7	2.9	5.1	34.8
From splash....	47.9	17.1	3.5	7.6	23.9
Dorr-classifier overflow					
At 20 strokes......	0.0	1.2	1.4	11.4	86.0
At 12½ strokes ..	0.0	0.125	0.8	5.45	93.62
Tube-mill feed.					
Dorr running 20...	42.9	29.2	17.2	2.7	8.0
Dorr running 12½.	42.9	25.0	6.9	12.2	13.0
Tube-mill discharge:					
Smooth liners... ..	0.64	6.58	19.34	1.34	72.60
El Oro liners	0.7	10.0	30.8	1.08	57.42
Smooth liners.. ...	0.4	6.8	19.5	6.1	67.2
El Oro liners... ..	1.0	14.6	27.7	6.9	49.8

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*887 Middle St., Bath, Me.

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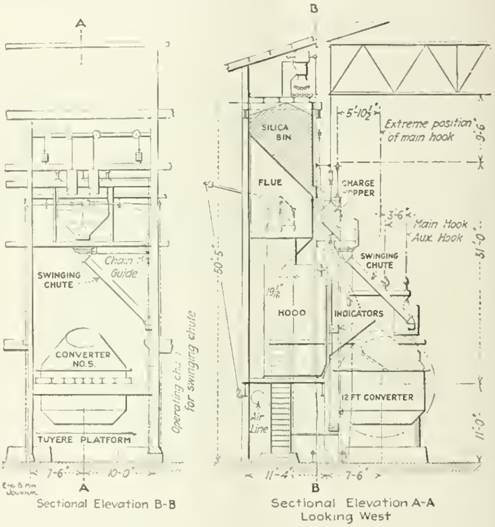
Feeding Siliceous Flux to Copper Converters

The accompanying illustration shows the arrangement for feeding silica to converters at the Calumet & Arizona Mining Co.'s new smelting plant at Douglas, Ariz. The siliceous ore is brought to the converting department by belt conveyors, and discharged into an elevated bin. A gate controlled by a chain enables the operators on the converter floor to fill the charge hopper, in which the silica flux is automatically weighed. When it is desired to feed silica, the converter is turned over only slightly and the pipe chute swung around until it is directly over the mouth of the converter. Another chain-operated gate opens the discharge from the weighing hopper, and permits the silica to run by gravity into the converter. This arrangement makes for greater speed in converter operation, especially if the crane service is inadequate and causes delay in feeding the silica into the converter from boats.



Arrangement for Feeding Silica to Converters

This silica-feeding arrangement has been installed in a number of the new smelting plants that have been constructed in the Southwest under the direction of L. D. Ricketts as consulting engineer, from plans of Repath & McGregor, of Douglas.

* * *

For Sintering Pyrites Residue the Pyrites Co., Ltd., at Roanoke, Va., has two Dwight-Lloyd machines that have developed remarkable capacity in the sintering of residues after leaching. The cinder is given a water leach that removes about one-half of the copper and the residue containing about 3% of sulphur is mixed with 6 to 8% of coke breeze and sintered, the sulphur content being reduced to about 0.11%. The Dwight-Lloyd machines developed so great a capacity that ordinarily only one is required, the tonnage averaging 140 long tons and having been as high as 220 tons in 24 hr. The sinter is sold as iron ore and at one blast furnace constitutes about 50% of the charge.

Company Reports

Natomas Consolidated

During 1913 the Natomas Consolidated of California, head office, San Francisco, Calif., according to its annual report earned only $107,841 above its bond interest without charging off any depreciation or bond discount. The net income from various sources amounted to $1,164,444 made up as follows: From gold-dredging department, $992,367; rock-crushing department, $73,945; water department, $17,949; miscellaneous discounts, etc., $470; interest on investments, $7500; interest on reclamation district warrants and bonds, $72,213. From these earnings a loss of $12,556 on the crop-growing business is deducted, leaving a balance of $1,151,888. Of this amount $980,534 was necessary for payment of bond interest and $63,513 for miscellaneous expenses, leaving a balance as stated. But, charging off the loss on dredge No. 7, which sank and had to be reconstructed, amounting to $129,394 indicates a loss of $21,553. There are also deferred charges standing on the books aggregating $1,105,506, none of which was apparently written off during the year. Current liabilities are $2,151,589 more than assets and there are bonds outstanding to the amount of $17,375,000. The outstanding capital stock amounts to $16,068,800. Judging from these facts and others given in the report the Natomas is far from being in a promising position. A statement of lands owned at the end of Dec. 31, 1913 follows:

	Acres		Acres
Irrigated lands	28,851	Water department....	5,056
Reclamation districts.	59,709	Rock crushing........	95
Gold-dredging department	9,502	Total acres.......	96,213

Considerable space is devoted in the report by the consulting engineer to previous errors in estimating the value of the dredging ground owned by the company. In 1909 when an additional bond issue was being floated for the purpose of completing the dredging fleet and other work, it was estimated that the net profit from dredging operations would exceed $20,000,000. After two years' dredging it was evident that this estimate was too high and 300 new bore holes were put down. Based upon the evidence obtained from these holes, and excluding lands the value of which was more for agricultural purposes than dredging, the present holdings of 4157 acres of remaining tested lands were valued at $20,615,000 gross on Jan. 1, 1913. It was estimated that a profit of $10,661,000 should be made from this output. With additional borings in 1913 and after deducting the year's profit, the total profit still remaining is estimated to be $10,250,000 from a gross output of $19,661,000. This estimated net profit is equal to about 52.3% of the gross output. During the last two years, only 46.8% net profit has been realized. On the basis of 46.8% the remaining profit would be about $9,200,000. Actual dredging costs have been: In 1909, 4.016c. per cu.yd.; 1910, 5.124c.; 1911, 3.193c.; 1912, 4.463c.; 1913, 5.354c. It seems that Natomas has also underestimated quite a number of items from time to time. A statement shows that the costs of four new dredges and the repairs of those which sank exceeded the estimated cost of five new dredges which it originally intended to add to the fleet. The dredging profits were only 73.5% of the amount estimated for 1913. The gross value of the output was overestimated by 0.19c. per cu.yd., and the actual cost of dredging was underestimated by 1.24c. per cu.yd. In the Feather River division the average gross output exceeded the estimate by 1.26c. per cu.yd., but the actual costs exceeded the estimate by 0.64c. per cu.yd. The reduction of costs with the 15-cu.ft. buckets, against the 9-cu.ft. bucket dredges, should theoretically be about 12% in every department except power. The following tabulation shows that this was not the case.

Natomas Consolidated of Calif., 1913	No. 8 Dredge 15 Cu.Ft.	No. 9 Dredge 15 Cu.Ft.	No. 5 Dredge 9 Cu.Ft.	No. 6 Dredge 9 Cu.Ft.	No. 10 Dredge 9 Cu.Ft.
Total book cost per cu.yd., incl. all 1913 charges...............	6.54c.	6.69c.	11.05c.	8.71c.	5.15c.
Less power per cu.yd.	1.49c.	1.30c.	0.97c.	0.98c.	1.06c.
Total cost less power	5.05c.	5 39c.	10.08c.	7.73c.	4.09c.
Deduct cost of reconstructing Nos. 5 and 6, per cu.yd.............	.....	.....	6.41	3.65	....
Comparative cost per cu.yd., excluding power and reconstruction cost........................	5.05c.	5.39c.	3.67c.	4.08c.	4.09c
Cu.yd. dug per hr., dredged	273.1	322.9	250.7	229.1	359.7
Per cent. of time worked, not counting reconstruction time....	80.61	84.03	80.29	84 69	78 82
Total material repair cost........	$45,473	$71,101	$82,181	$67,322	$50,056
			Including reconstruction.		

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Copper Queen Smelting Operations

The following data were taken from the 1913 report of Phelps, Dodge & Co., and relate to smelting operations of the Copper Queen at Douglas, Ariz. There were 1,034,357 tons of copper-bearing ores treated which yielded 134,513,330 lb. of bullion from which 133,410,582 lb. of copper, 1,870,162 oz. of silver and 31,141 oz. of gold were produced. The percentage of various ores treated was: Copper Queen ore, 67%; Copper Queen slag, 9.4%; Moctezuma concentrates, 13.5%; ore to converter, 3.6%; and other custom ores, 6.5 per cent.

The blast furnaces treated 1,013,767 tons of charge, of which 822,283 tons were raw ore, 9249 tons of calcined material from roasters, 2125 tons of slimes, and 180,110 raw material and produced 102,630 tons of calcines. The shrinkage was 16.6%. Flue dust produced was 5.2% of tons of secondaries or returns from furnaces and converters. Flue dust produced was 39,748 tons, or 3.92% of the charge, against 5.90% in 1912 and 7.59% in 1911. An average of 8.08 furnaces were operated and 343.5 tons of charge were smelted per furnace day, using 125,280 tons of coke or 12.4% per ton of charge. The matte fall was 18.79% compared with 20.97% in 1912. Experiments on dust losses from the large steel stack showed a loss of 2286 lb. of copper per day compared with 14,310 lb. in 1909 with practically the same number of furnaces and converters in operation. Roasters and reverberatory losses are not included in this figure

An average of 5.97 roasters per day were operated in the reverberatory department, treating 123,099 tons of the charge. The composition of the charge was: 97% concentrates, 1.3% ore and 1.7% foreign flue dust.

An average of 1.71 reverberatory furnaces were operated per day, smelting 179,958 tons, or 289.6 tons per furnace day. Material smelted consisted of 93,196 tons of calcined material, 37,806 tons of furnace flue dust, 830 tons of converter flue dust, 44,041 tons of screenings from Bisbee ore, used as fettling, 3720 tons of barren quartz and 365 tons of secondaries. Oil consumption was 0.9 bbl. per ton of charge; of this 34.57% was charged to steam and credited to reverberatories. In a new furnace completed in 1913 part of the lining is of magnesite instead of silica brick.

Operations were conducted on basic-lined converters, treating 206,493 tons of matte and producing 67,256,665 tons of bullion from an average of 6.5 stands per operating day.

In the sampling department 12,378 samples were made and 318,507 tons of ore handled. This is equivalent to about one sample for every 25.8 tons of ore handled. The laboratory made 101,455 determinations for the smeltery or about one for every 10.2 tons of copper-bearing material treated. The power plant developed an average of 4595.8 hp. per day at a cost of $54.844 per hp.-year. Employees and tonnages handled are summarized in the following table:

Sampling	70		318,507	4550
Unloading ore, flux and supplies	36		......	....
Blast furnaces	255		1,013,767	3960
Reverberatory roasters	69		123,099	4400
Reverberatory furnaces			179,958	
Converting	311	Matte	206,493	664
Mechanical	221		......	....
Power plant	30		......	.
Office, engineering and laboratory	40		......	....
Total	1039	men, or about one for every 995 tons of copper-bearing material treated during the year.		

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Alaska United

The report for 1913 of the Alaska United Gold Mining Co., Douglas Island, Alaska, shows a combined profit of $385,065 from the operations of the Ready Bullion and the 700-Ft. claims and sundry profits. This profit is exclusive of $30,050 depreciation of property and plant charged off. Dividends aggregating $111,460 were paid. A total of 448,127 tons of ore were milled from the two claims, having an average yield of $2.22 per ton. The average cost was $1.45 per ton, leaving an average working profit of 88c., from which a loss of 2c. must be deducted for loss in subsidiary accounts, leaving a profit of 86c. on both operations. The following table gives a summary of detailed costs on both claims, exclusive of miscellaneous income and losses:

	Ready Bullion Claim	700-ft. Claim
Tons ore milled	222,992	225,135
Feet of development	3997	2783
Mining	$1.0323	$1.0582
Milling	0.2670	0.2255
Sulphuret expense	0.1052	0.0880
Offices	0.0131	0.0129
Legal expenses	0.0088	0.0087
Taxes	0.0103	0.0102
Bullion charges	0.0100	0.0102
Construction costs	0.0045	0.0309
Total operating charges	$1.4512	$1.4446
Profit on ore	0.8121	0.9159
Net yield of ore per ton	$2.2933	$2.3605

The average cost of development on the Ready Bullion claim was $13.40 per ft., and on the 700-Ft. claim $11.92 per ft. The average cost of stoping per ton stoped was 70.3c. and 61.6c., respectively; of tramming per ton trammed, 10.5c. and 14.2c.; of hoisting per ton hoisted, 15.2c. and 13.2c.; and of pumping, 5.2c. and 1.3c. per ton treated. Ore reserves are estimated to contain 1,708,662 tons of $2.91 ore on the Ready Bullion and 1,281,475 tons of $2.46 ore on the 700-Ft. claim. In the Ready Bullion mill, 1 lb. of chrome steel in the shoes crushed 2.6 tons of ore, and 1 lb. of iron in the dies, 5.29 tons. In the 700-Ft. claim mill, 1 lb. of chrome steel in the shoes crushed 2.35 tons of ore, and 1 lb. of iron in the dies, 4.68 tons. Total dividends to date amount to $1,576,750. The average yield of the ore from the two claims has been about $2.10 per ton.

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Alaska Mexican

The 1913 report of the Alaska Mexican Gold Mining Co., Douglas Island, Alaska, shows a profit of $171,797 from treating 227,112 tons of ore yielding $2.1562 per ton. This profit is exclusive of depreciation written off to the amount of $21,552. Dividends aggregating $180,000 were paid. The following is a summary of costs as grouped under general headings:

	Per ton milled
Mining	$0.9070
Milling	0.2510
Sulphuret expense	0.0923
Offices	0.0260
Offices	0.260
Legal expenses	0.0132
Taxes	0.0123
Bullion charges	0.0081
Construction	0.0348
Losses on sundry accounts	0.0829
Total operating cost	$1.4276
Operating profit	0.7564
Total	$2.1840
Less miscellaneous earnings	0.0278
Net yield of ore per ton	$2.1562

Development work totaled 2464 ft. and 138,217 tons of the ore milled came from mine stopes. The average cost of development per foot was $15.75; of stoping per ton of ore stoped, 81c.; of tramming per ton trammed, 15c.; of hoisting per ton hoisted, 8.1c.; of pumping per ton milled, 1.3c. The total mining cost consisted of 55.1c. for labor, 15.1c. for supplies, and 20.5c. for subsidiary accounts. Ore reserves are estimated to contain 816,882 tons averaging $2.53 per ton. Of this tonnage 385,943 tons are broken in stopes. The average grade of ore milled to date is $3.12 per ton. In the mill 1 lb. of chrome steel in the shoes crushed 2.62 tons of ore and 1 lb. of iron in the dies crushed 5.38 tons of ore.

At a point on the main east drift of the Ready Bullion mine of the Alaska United Gold Mining Co. and 1321 ft. from the east line of the Mexican mine, a concrete bulkhead was built so that in case of a fire or flood the bulkhead could be closed, thus preventing water or gases going from one mine to another. The bulkhead is hitched 2.5 ft. into the solid rock and it is 12 ft. thick and built of solid reinforced concrete. In the center is an opening 2 ft. wide which will be closed automatically from either side by a cast-iron door in case of a pressure of water. The expense of this work was divided between the three mines of the group.

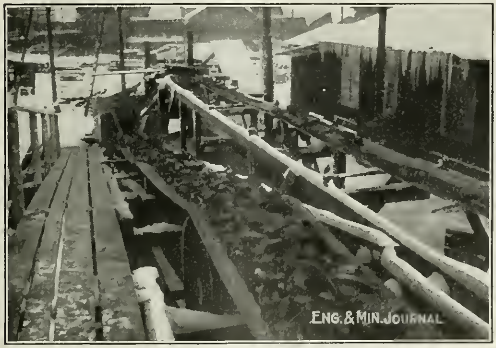
Mining & Metallurgical Machinery

Sandvik Steel-Band Conveyor

The endless steel bands made by the Sandviken Iron & Steel Works, Sandviken, Sweden, for conveying purposes were described in the JOURNAL, Sept. 3, 1910. They are now being introduced into England by Messrs. S. A. Edwards & Co., of Birmingham.

It is obvious that the use of a hard wearing surface such as steel, tends to a greatly prolonged life of a conveyor. The use of steel in this way, however, imposes certain necessary restrictions which involve some modifications in design as compared with ordinary band conveyors.

The belt is made of hardened flexible steel, and it is therefore especially suitable for carrying material of a hard, cutting, gritty or hot nature, although the maximum temperature at which material may be projected on such a conveyor, is 212° F. The first cost is low, the belt in itself being cheaper than good textile belts, and the idlers and other accessories being simpler in construction.



STEEL-BELT CONVEYOR HANDLING BROKEN AND LUMP MATERIAL

A special construction of the head pulleys, idlers, etc., is necessary. The steel band requires in ordinary cases head pulleys of at least 40 in. diameter and on account of its rigidity it can never be troughed. It must be protected from sharp bends and any external damage caused by hammering, chafing or pressing of the belt. It is dangerous to allow small, hard particles to stick to the face of the head pulleys, as an accumulation will cause at each revolution a depression in the steel band, and in this way in course of time, gives it a convex form that makes it unfitted for carrying material.

The usual widths of band adopted are 9 in., 11 in. and 14½ in. In order to obtain a width of more than 14½ in., three bands are put together in such a way that they cover one another without any joint; the middle band overlaps the two others by about 3¾ in. on each side, and is given a little less tension than the two others in order to secure a perfectly tight fit of the bands. Moreover, as the greatest part of the load comes on the middle band, this distribution of weight assists in pressing the middle band down against the two others.

The maximum inclination at which the Sandvik conveyor will work satisfactorily depends of course on the material that is to be carried, but in general is 14°. A conveyor of this type has, it is claimed, a capacity from 50% to more than 70% of the capacity of a troughed textile belt-conveyor, the figure depending on the class of material which has to be handled. For ore in lumps, however, the capacity is about the same with the two kinds of conveyors. The illustration shows a steel-band conveyor handling lump material as it would ore.

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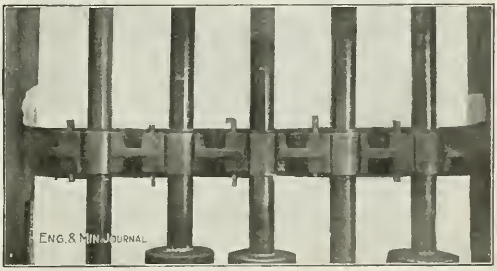
New Battery-Stem Guide

The accompanying photograph illustrates the "Little Wonder" battery-stem guide, first introduced in the Yellow Aster mill, at Randsburg, Calif. This guide was designed by J. A. Little, mill superintendent for the Yellow Aster.

The guide frame, which may be either of special-grade iron or of cast steel, is a permanent fixture. There are only eight nuts used in the frame for the battery of five stem guides. These are used to hold the frame to the girt. The only wearing part in the entire structure is the bushing, which may be made of cast iron or cast steel, and can be renewed at small cost.



STAMP-STEM GUIDES AT THE YELLOW ASTER MILL

The bushings are made in single pieces or in halves, as desirable. They are 6 in. long and cylindrical in shape, and cannot stick in the frame, as is the case with tapered bushings. They are made with a shoulder, which prevents them from dropping through the frame. The guide frames are made with pockets in which gibs are placed. The bushing is placed with the shoulder resting on the frame and the key is driven lightly behind the gib. This holds the bushing with a tight grip, but causes no extra strain on the frame. The back of the keyway is a curved surface on the frame, and requires no machining.

The key is 1¾ in. distant from the stem, giving ample room for the use of a light hammer when necessary to remove the key. This arrangement prevents the stem being battered with the hammer, as is the case in the removal of many other stem guides. The rigidity of the guide frame insures perfect alignment of the stems.

These guides have been in use on two 5-stamp batteries in the Yellow Aster 100-stamp mill for 8 months. In that time there have been no alterations, repairs, or losses of time. As other stamp guides in use break or wear out, the "Little Wonder" is substituted. They have been given a thorough comparative test with other designs and found to be really superior in performance and in economy of cost.

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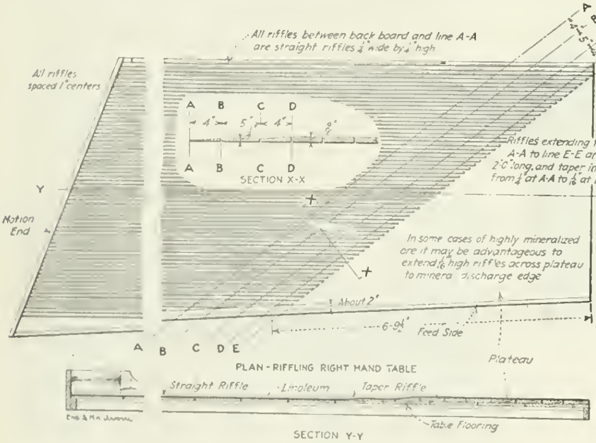
Increased-Capacity Device for Concentrators

A new device for concentrating tables has been patented by the Deister brothers, of the Deister Machine Co., and is known as the Deister plateau and riffle. The improvement consists essentially of an incline and elevated portion, which is added under the linoleum at the end, or discharge of the table, and may be applied either to Wilfley or Deister machines. It crosses the tables on a slant, starting 24 in. from the ore-discharge end and coming out on the upper side under the feed box, 7 ft. from the end of the table. It will be seen from this that the feed box can be made 10 ft. long if desired, in place of the usual short box employed on Wilfley machines. The accompanying drawing showing a plan of a Wilfley table, with the sectional views, explains the device satisfactorily. Where the increase in the table height begins, 4 in. is devoted to an inclined rise, and then there are 5 in. of plateau, or level surface, $\frac{1}{4}$ in. above the previous table plane. In the next 4 in. there is another rise of $\frac{5}{16}$ in., the balance of the surface from there to the end of the table being level again.


All riffles between back board and line A-A are straight riffles ¼" wide by ¼" high
All riffles spaced 1" centers
A B C D
4" 5" 4"
A B C D
SECTION X-X
Riffles extending from line A-A to line E-E are ¼" wide, 2'0" long, and taper in thickness from ¼" at A-A to 1/16" at E-E
Y
Y
Motion End
In some cases of highly mineralized ore it may be advantageous to extend 1/16" high riffles across plateau to mineral discharge edge
About 2'
6-9¼"
Feed Side
A B C D E
PLAN - RIFFLING RIGHT HAND TABLE
Plateau
Straight Riffle
Linoleum
Taper Riffle
Table Flooring
SECTION Y-Y
Eng. & Min. Journal

The Deister Plateau for Concentrators

The riffles, instead of being tapered, may be carried $\frac{1}{4}$ in. high, the height of the Wilfley riffles at the head of the table, straight across to the rise. The riffles are also placed closer together. According to the idea of the Deister brothers, this permits a heavy drawing motion through the deep riffles, allowing the handling of a great deal more material, and in order to clean the material thoroughly, the drawing force is opposed by the risers and plateau, where it is satisfactorily separated.

This device has been tried on a Wilfley table at the Hunter mill, at Mullan, Idaho. The result is said to be increased capacity and extraction. The machine is in operation beside another Wilfley of the same pattern, but not equipped with the plateau and riffle, and a careful record is being made of their operations, for comparison. The streak of ore on the old Wilfley is about 6 in. wide, while on the table equipped with the plateau and riffle it is about double that width. The record shows that the new idea has increased the grade of concentrates produced from 50% to 60% lead, and also produces about 15% more concentrates from the same feed than the old table. It uses less water by two gallons per minute. The separation between waste and ore is said to be very distinct. The handling capacity of the table is increased nearly 100%, it is claimed, by the use the device.

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Pulleys for Line Shafts

The question of the sort of pulleys to be used on line shafts, in mills and in other places around mines, is one of importance. Of the three kinds, wood, steel and cast iron, no doubt each has a field where the others could not be used, but it seems strange that the cast-iron pulley is still used to a large extent, for general purposes in the face of the many advantages of steel. The use of steel pulleys, however, has increased to such an extent in this country that two factories making them it is claimed are now turning out more than all the makers of cast-iron pulleys, combined.

The following information obtained from the Oneida Steel Pulley Co., Oneida, N. Y., throws some light, perhaps, on why steel pulleys have become popular:

(1) The weight of steel is about one-third that of cast iron, permitting a saving in freight charges.

(2) The power required to revolve a ton of pulley weight on a shaft, results in economy from the use of steel.

(3) Steel pulleys are easy to remove and install, no expensive staging and few men being required.

(4) Steel pulleys are carried in stock in trade centers near mines, eliminating possible delay in shipments.

(5) On an average, steel pulleys cost somewhat less than those of cast iron.

(6) Steel pulleys can be operated at much higher speed with safety.

(7) Steel pulleys will take sudden variations in the load without breaking, due to their greater tensile strength and their greater number of parts.

When compared to wood pulleys, the steel of the same weight are of greater strength. They are made in a variety of sizes, either straight face or with flanges, and can be built to transmit 750 hp. or even more.

Use of the Vertical Sinking Pump

By E. Mackay Heriot*

SYNOPSIS—For successful pumping results in shaft sinking loss of pumping time arising from necessity of hauling up pump when blasting, and lowering as shaft deepens, with concomitant necessity of lengthening pipes, must be reduced to a minimum. The article describes a pumping installation meeting these requirements, using electrically or steam-driven pumps

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The cost and time of sinking a shaft must depend in a great number of cases on the quantity of water encountered. If this be so, it will also depend on the efficiency of the pump work. By pump work is meant the whole pumping installation and operation. If the shaft is equipped with a Cornish pump, a bucket lift is used. This is well known to miners, but in out of the way places, where most mines are situated, prospectors' shafts are not fitted with such apparatus. In ordinary practice unwatering operations during sinking are either carried out by electrically or steam-driven vertical pumps. The electrically driven are easier to manipulate, because there is only one conduit of pipes, the rising main, whereas the steam pump needs three lines of pipes, the steam, exhaust and water pipes. Condensers cannot be used, because they make the water too hot, therefore the exhaust steam must be carried to the surface.

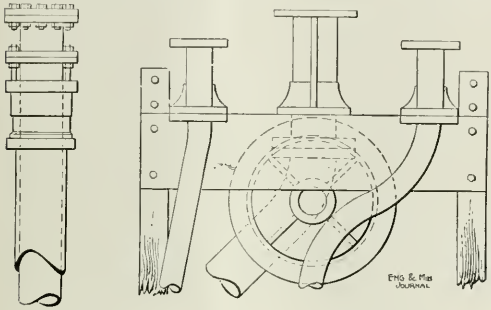

FIG. 1 FIG. 2

Slip or Telescopic Joint and Head of Pump Supporting Frame

Excess Pumping Capacity Desirable

In order to demonstrate the time that can be lost during the various pump operations, I will take a small shaft 3x2 = 6 square meters. This will make six tons of water for every lineal meter of shaft. If the inflow be 20 tons per hr., during a stoppage of one hour the water will rise over three meters.

When buying a pump one should remember that the capacity should be far above the actual inflow, and this for more than one reason. As a rule it is difficult to keep a pump working at its rated capacity. The plungers get furrowed quickly and the packings do not hold as well, thus reducing the working output. Furthermore, after blasting or any other stoppage, considerable water has entered the shaft and must be pumped out quickly, otherwise valuable time is lost. A pump with 30 tons per hr. capacity will take nearly two hours to get out the water of one hour's stop; thus three hours are lost.

Piping Connections and Difficulties in Making Them

Just before blasting, the pump is lifted up a few meters in order to safeguard it against any flying rock. If the piping were made fast in the shaft the connections would have to be unfastened before the lifting could take place. This is carried out in one-quarter of an hour, in which time the water rises one meter, or a little less. During joining, waiting for the smoke to rise and making connection, at least another 1¼ hr. are lost. The water is now 5m. deep in the shaft. Before the bottom is reached nearly four hours have been lost. It will be seen that with the 20 tons per hour it is practically impossible to use stiff pump connections when the pipes are made fast in the shaft.

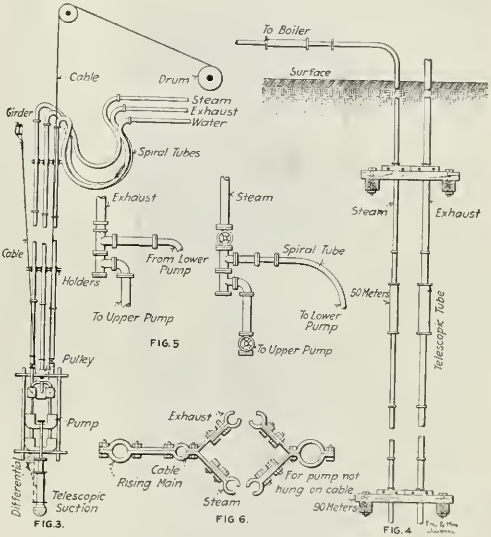

FIG. 3. FIG. 4 FIG. 5 FIG. 6.

Details of Sinking-Pump Fittings

A similar operation is putting in piping. With stiff connections this is tedious work because each pipe must be cut exactly to measure. In theory this may seem easy, but in practice it is difficult and sometimes impossible. If the pipes must be made fast in the shaft, spiral tubes will be a great help. These would then be connected to the pump. The disadvantage is that they are liable to be damaged by rock when blasting. By this method the pipes have to be changed underground, often enough in small shafts with water falling everywhere.

A rubber hose is generally used for the suction. This is not to be recommended, because when the pump has been sunk the end of the hose lies in a horizontal position. This is apt to let the retention-valve clap lie open and cause trouble. Wherever possible the sinking pumps should be so erected that the changing of pipes takes place at the surface. It should be possible to do any lowering or raising without unfastening any underground connections. Last, but not least, it should be possible to lower the pump without stopping it. It will be seen that such an installation must cause a minimum loss of time, and I propose to describe here how it can be made.

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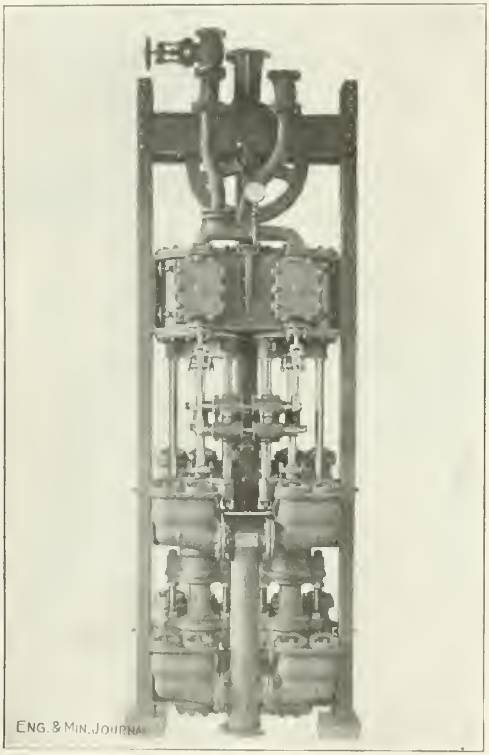
*Mining engineer, 19 Campden Hill Gardens, Kensington, London.

How to Install an Elastic Pumping Plant

I will take for the example the same conditions as before mentioned. A duplex, steam-driven, vertical sinking pump with a capacity of 750 liters per min. will suffice. The steam pipe leading to the pump will be 65mm. in diameter, the exhaust 80mm. and the delivery 150mm. The pump is so constructed that the pipes are connected directly to the pump. This is of the utmost importance and I would draw special attention to it. With ordinary makes of sinking pumps the weight of the pipes cannot rest on the flanges of the inlets. However, with a pump constructed inside a steel frame where the pipe connections are strengthened and rest on the upper part of the frame, it may be done. The water pipes must be light. A special spiral-wound steel pipe without rivets gives excellent service. All pipes are fitted with flanges because it is difficult to repair leaky threaded joints. A leakage at any flange is easily stopped. The joint is loosened and the column above lifted by the aid of a winch or differential pulley at surface. The defective gasket is then taken out and replaced. For such work in shafts special gaskets are made with wire handles. This allows quick repairs; the hands are not burnt by the hot pipes.



Type of Steam Driven Sinking Pump

Every 10m. the pipes are held fast by flat holders. Their construction is shown in Fig. 6. They grasp firmly the rising main, but the cable can run free. The steam and exhaust are held fairly fast, but may move to allow for expansion.

It will be well to say a few words regarding the expansion of the pipes in the shaft. For the system of pumping I am describing compensation pipes are not used, but when the columns are held fast in the shaft and connected to the pump with spiral tubes a compensation pipe is necessary both for the steam and the exhaust. These should be placed half way up the shaft. For the steam piping another is used at surface. The piping in the shaft is secured just above the pump, and at every 10 or 15m. rests are placed, but these must be made to allow for movement of expansion. The conduits are held firmly above the compensation pipes. The so called compensation pipes are, in other words, telescopic tubes. They work in and out as the pipes expand and contract. In a shaft 100m. deep the telescope should be drawn out a half meter before letting in the steam. Great care must be taken in letting the steam in gradually. Each conduit of pipes is fitted at surface with a 5-m. long spiral tube, made of bronze or steel. Rubber hose is used for the rising main, but the spiral tube stands more wear.

With an installation of this kind the rose can be sunk 6m. without stopping the pump. The telescopic pipe will allow 1½m. and the spiral tubes 4½m.

All Piping Connections Made at Surface

During the blasting operations pump and pipes are raised without unfastening a connection. Changing pipes is done at surface. This does away with hastily made and uncomfortable platforms underground. Any one who has had to change pipes in drenching cold water and burning steam will appreciate the installation I have described here.

At surface one hour before the changing, each new pipe is examined, together with the necessary bolts, keys and gaskets. In this way the work can be arranged so that it can be done with a minimum loss of time. Electric sinking pumps throw to great heights; steam pumps are also made for 200-m. lifts, but as a rule only for 100m. When water has to be raised over 100m. two pumps are used, one of which is anchored fast in the shaft. The sketch, Fig. 5, shows the steam connections from one pump to the other. If water has to be lifted over 200m., steam should not be used, unless a permanent installation be made.

When buying pumps one should order spare valves, pistons, rod and plunger, order all pipe connections and spiral tubes, and see that the pump is fitted with a telescopic tube for suction, a pulley for the cable, and built solidly in a frame. The steam, exhaust and water inlets should be strengthened and built up on the crosspiece of the frame. It is also well to have a good supply of packing on hand, because as soon as the plunger is worn the packing will have to be renewed at intervals.

The Prospector

By T. M. C.

George Wharton James, in Chapter 20 of his work, entitled, "The Wonders of the Colorado Desert," gives an extremely vivid picture of a certain type of prospector, following this description with the common-sense advice given by one of a different type. We think this is rather interesting material:

"And in the dry times what will not a man drink? Oh, you city dwellers, who must have distilled water and Apollinaris and Shasta and iced drinks, just think once of the poor prospector at an alkali pool! Stagnant, dirty, full of filth, a standing place for animals and fearful night creatures, bitter, salt—yet that is all he can get. It is lukewarm and sickening. And what encourages him through all these trials? He 'hopes' to strike it rich. He has what the phrenologist would term a well developed organ of hope. He is imaginative. He sees visions. He dreams dreams. He doesn't look like an idealist; his hands are horny, his nails untrimmed and black-bordered, his hair and beard unkempt, and if he ever shaved no one would now know it. His eyes seem ever bent downward to the earth, and his lips are as thick and sensuous as his eyes are dull and heavy.

"Yet he is a dreamer. He can see in these inhospitable barren plains or these dreary, sandy deserts or these rough and rugged slopes, pockets of the precious metals. He can see his pick discovering them, and then, in succession, the shaft, the drift, the stope, the bonanza, the mill, the bricks of precious metal and the hoard at the bank. He sees his wife in silks, satins and diamonds, riding in her carriage drawn by fiery horses driven by livered coachmen; or himself in an automobile with a French chauffeur. He sees a brownstone front with lackeys innumerable, and a table covered with finest linen set forth with cut glass and silver and loaded with every delicacy the markets afford. Who sits at the head there? Who moves about in this lordly mansion, smoking 25c. cigars and giving orders with consciousness of power and right? Who saunters into the library to meet distinguished guests or to greet the flower of society in the parlor or drawing room? It is he, the dreamer, the prospector, the burro driver, the eater of flapjacks and bacon, the sleeper under the stars, the shelterless wretch of the storm.

"Ah! there is an allurement in these dreams that exercises such a power of fascination over minds as renders weak the bewitching enchantment of a Lorelei or the singing of the sirens.

"Once let a man yield and his course of life is cut out for the whole of his days. Should he strike it rich his dreams will come true. He sees the Clark mines of the Verde at Jerome. He remembers the Copper Queen, the Anaconda, the Comstock.

"But, alas, should he be taken ill! Who is there out in that forsaken place to care for him? He tries his simple remedies, in his extremity tries herbs the Indians have shown him how to use. He is too weak to gather wood, to go for water, to light a fire. He grows weaker day by day. Now and again he faints, and the hours fly past and he wakens, parched with fever and the deadly glare of the unsympathetic sun. His burro wanders off forgotten, the rats and other vermin come and watch. The timid lizards even approach nearer. The cottontails look on with great, brown, liquid eyes, and even the dread of the desert, the rattlesnake, comes and coils upon his breast, starting with surprise when the yet alive wretch makes some meaningless movement in his pain. The hours pass. The darkness of night follows the brilliancy of the day. Still he lies, but he moves not. The lizards run over his face and he makes no stir, the rats gnaw at his flour sack and he hears them not. There is a flapping of wings heard above, and a great black, bald-headed bird with hideous beak and great, bleary eyes swoops down upon him, and dreams and dreamer are at an end.

* * * * *

"I once asked an old and experienced prospector what advice he had to offer to those who thought of going on to the desert in search of the precious metals. His immediate response was, 'Tell them to stay at home.' He then continued: 'To be a good prospector a man must be well prepared in a variety of ways. He must be able quickly to determine the general character of the country over which he passes, hence he must have some knowledge of dynamics, general geology, mineralogy and chemistry. He must have nerve and backbone, for danger is his constant companion, yet he must be most cautious, for foolhardiness is quickly rebuked on the desert. One day of risk, going without water, or attempting to go too far, may have fatal results. In wandering into these ranges alone, one should always put up small monuments—just a few stones piled together—to show the way back to the nearest water hole, for many a man has lost his life through being unable to get back to where he last watered. The fact of the matter is, there are very few men qualified to be prospectors, and that is the reason so few, comparatively, succeed. With most of them it is pure good luck. If they strike anything it just happens so. The major part of the men now out had far better be at home.'"

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Greenway & Lowry Flotation Patent

Henry H. Greenway and A. H. T. Lowry, of Australia, have been granted a patent (U. S. Pat. 1,102,738) for the flotation separation of various metallic sulphides by means of a chromium salt and a frothing agent. A differential separation of sulphides is claimed to be obtained by digesting the ore with a salt of chromium, such as sodium or potassium bichromate, agitating with an emulsifying agent, such as eucalyptus oil, and removing the sulphides in the form of a froth or scum. The patent cites the separation of a lead-zinc slime, using a 1% solution of sodium bichromate and one pound of eucalyptus oil per ton of material treated. A test on molybdenum ore containing 15% molybdenite and 25% pyrite gave a concentrate containing 93% molybdenite and 4.9 pyrite: the pulp was agitated at 120 deg. F. with 0.25% sodium-bichromate solution and eucalyptus oil in the proportion of one pound per ton of ore treated. Tests of copper ore are also cited but most of the claims in the patent are for zinc-lead sulphide separation.

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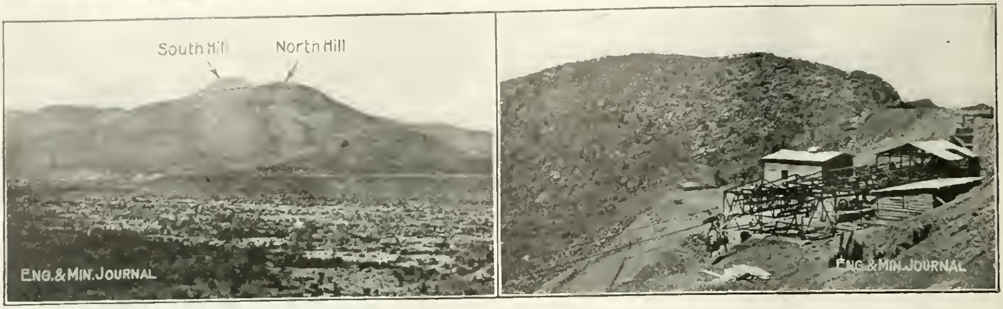
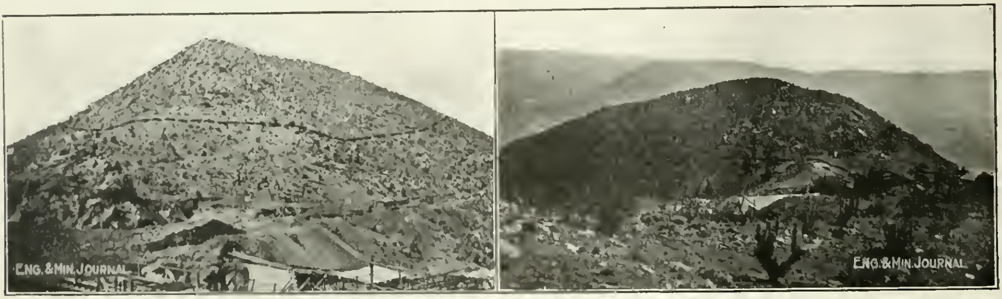
The United States Produces More Asbestos Manufactures than any other country, but only 1100 tons of asbestos per year, according to the U. S. Geological Survey. There are two producers in Georgia and one in Arizona. In 1911 there were 7604 tons produced. The difference is due to closing the Crysotile Asbestos Corporation's mill (Vermont).

The Tofo Iron Mines in Chile



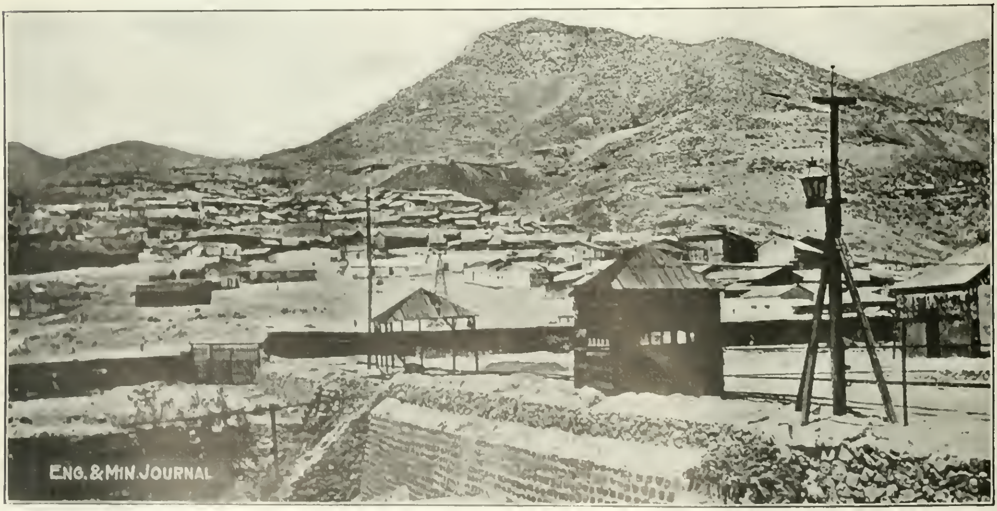
Tofo from the Southeast, and Tramway Built by French Company

These, the largest iron-ore deposits in Chile, were worked by a French company prior to 1912 when they were purchased by Bethlehem Steel Co. interests.



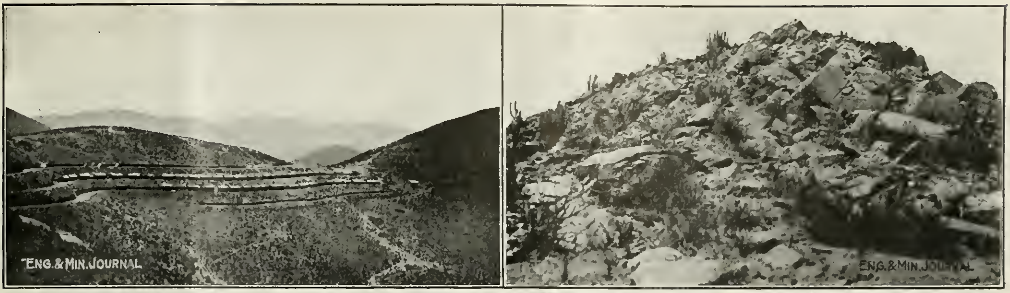
South Hill from the North and North Hill from the South

The dotted lines indicate the lower limits of the ore.



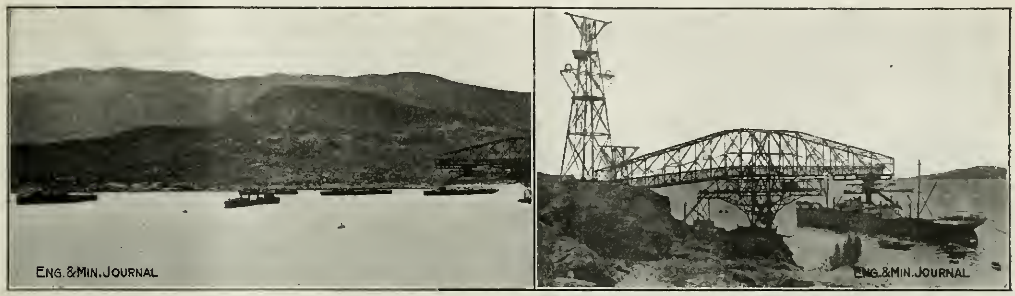
La Higuera, in the Province of Coquimbo

The town, once an important copper-mining center, is four miles from Tofo.



Laborers' Village, and Ore on the Top of South Hill

The village was built in the spring of 1913. Tofo ore will be brought to South Bethlehem, Penn., via the Panama Canal.



Cruz Grande, the Shipping Port Five Miles from the Mines

The tramway of 500 tons daily capacity was built by the French company and is still in operation.

Argueros, an Old Silver Camp in the Tofo Region

The ore deposits resemble in general character those at Cobalt, Ontario.

A Copper Mine near Tofo and Town of Marquesa

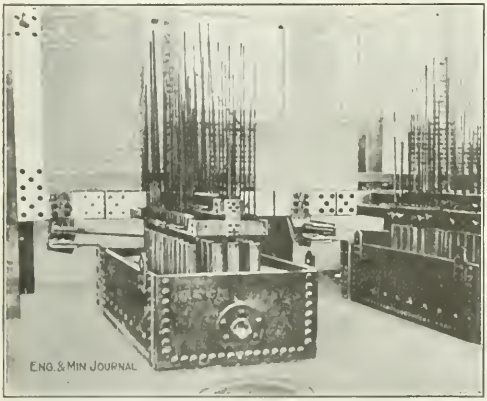
The mine is 15 miles from Tofo. Agriculture in irrigated valleys like those at Marquesa is of great importance to the Chilean mining industry.

Aluminum Furnace

The accompanying illustration is that of a modern furnace for the production of aluminum by electrolysis of alumina, Al_2O_3, dissolved in a bath of molten cryolite, Na_3AlF_6. It consists of a low rectangular carbon-lined crucible, into the interior of which are suspended a number of carbon electrodes.

The usual dimensions of these furnaces are from 6.5 to 13 ft. in length, by 4 to 5 ft. width, and 2 to 2.25 ft. in depth. The exterior is formed of iron plates reinforced by angle irons. The crucibles rest on masonry supports, and are either stationary, or arranged to be inclined at will, in order to tap.

To diminish the loss of heat by radiation, there may be interposed between the walls of the crucible and the carbon lining some refractory material, that is a poor heat conductor. The carbon bottom is connected with the negative pole of the dynamo, which constitutes it the cathode, where the metal separated by electrolytic action is deposited.



ELECTRIC ALUMINUM FURNACE

The interior lining of the crucible should always be well made and present no discontinuity, because the liquid aluminum would thus come in contact with the refractory lining or the iron of the casing, and rapidly absorb silicon or iron.

To obtain the most economical use of the current it is necessary that the connection between the carbon bottom and the electrical conductor be as nearly perfect as possible. This is accomplished by making the connection with the steel shell, or (in those cases where the refractory layer is interposed) with bars of iron buried in the carbon lining.

The electrodes are made of carbon as pure as can be obtained, inasmuch as all the impurities they contain are accumulated in the metal. Petroleum coke containing less than 1.5% of ash is used for this purpose. Graphite, which contains only an infinitesimal amount of ash, seems to be admirably adapted, but its high price stands in the road.

To put one of these furnaces into operation, current is first passed through it empty, circuit being completed by placing pieces of carbon between the electrodes and the carbon lining. Cryolite is added little by little, until the electrodes are submerged in the liquid bath, when the current is allowed to pass at normal voltage, 8 volts.

Breaking in is a delicate operation requiring two days, after which the procedure consists in feeding alumina, replenishing the cryolite which is slowly decomposed and volatilized, and at intervals tapping the furnace to collect the metallic aluminum. The electrodes are consumed by oxidation, and are adjusted mechanically, or by hand in order to maintain the distance between their extremities and the cathode lining at from 2 to 2.5 inches.

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Calumet & Hecla Ventilation and Temperatures*

The temperature in the deeper workings of the conglomerates of the Calumet & Hecla and of the Tamarack is higher than in any of the other mines. The temperature varies with the depth and with the season, but the temperature of the amygdaloid mines is universally low. The average temperature of the air in the bottom part of the Calumet & Hecla conglomerate is about 80°. The highest temperature ever found in that formation was in the rock and was 87°. Rock temperature was obtained by drilling a long hole in the wall and putting in a low-registering thermometer, sealing the hole and leaving the instrument for a period of weeks or months. The temperature of the amygdaloids will vary from 55° to 70°, being higher in the lower levels of the Tamarack than at any other mine in the district. A long series of tests of air temperature at the Tamarack gave a maximum of 89° in October, 1909, on the 39th level. The average air temperature in the bottom level is from 82° to 84°.

The mines all have natural ventilation, which is so effective as to require control in winter, doors being placed over the shaft to retard the descending current of cold air. There is no artificial ventilation other than the compressed air used in drilling. Mr. MacNaughton gave as his opinion that no advantage could be had by artificial ventilation, since the only real difficulty encountered was that of gas clinging in moist muck after blasting, for which fan ventilation would of course be no remedy.

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Reducibility of Iron Ore

L. Mathesius, in *Stahl u. Eisen*, 1914, XXXIV, 866-873 (abstr. in J. S. C. I., June 30, 1911), reports that various raw and calcined ores and briquettes were heated for five hours in a current of coal gas at 450° to 900° C., and the amounts of metallic iron and ferrous oxide formed determined. Calcined spathose ore was easily reduced; the reducibility of other ores was smaller and roughly proportional to their porosity. The FeO content of magnetite was hardly affected by the treatment, the ferric oxide being more easily reduced. Ore and flue-dust briquettes were much more easily reduced than ores, over 80% of the iron being reduced to metal at 900° C. Sintering caused an increase in ferrous oxide and decrease in the reduction to metal.

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*From testimony given by Manager James MacNaughton before the Congressional Committee investigating the miners' strike in the copper country.

Correspondence and Discussion

The Longmaid Process of Copper Extraction

Having read in the JOURNAL of May 30, with much interest, the very scientific article by Arthur Carpenter on chloridizing the Sudbury silver ores by the Longmaid process, and being the son of the inventor and acquainted with the various processes connected with the original patents, I send you a few remarks thereon, in order to correct some errors in regard to dates of those inventions.

Longmaid in the 1830's was manager of an extensive mine of copper pyrites in the west of England, which produced for many years a quantity of ore too low in copper for the smelters of that date. This ore was piled up in dumps in the hope that some process might be introduced for rendering it available. During a rainy season my father visited the mine and found streams of deep-green liquor flowing from the said dumps. On testing the liquor, he found it contained a commercially valuable percentage of copper. He at once came to the conclusion that some process might be worked out which would render the copper rapidly soluble instead of slowly as effected by the weather. He first tried plain roasting and leaching, which was only partially successful, but he found by adding salt before roasting that the copper could be rendered completely soluble. He secured a patent for manufacturing sulphate of soda and recovered the copper by this process, and various other substances as byproducts, most notably the sulphate of soda for the manufacture of soda ash. This patent was dated 1842.

In the early '40 s, with the aid of some friends, he built a works in St. Helen's, Lancashire, where they manufactured an average of 52 tons of dry soda ash per week, besides various quantities of byproducts. The chlorination was generally over 99%. The roasting department of the works consisted of six reverberatory furnaces, each 65 ft. long by 12-ft. span in the clear, and 12 furnaces 96 ft. long by 15-ft. span in the clear. The roasted ore was leached in large tanks 40 ft. square and the solutions were made as concentrated as possible. These liquors were then run into tanks with scrap iron, and the copper, together with the silver and gold, recovered in what they called "copper mud." This copper precipitate was then oxidized in a reverberatory furnace and treated with sulphuric acid. The liquors were concentrated and then crystallized, producing a good commercial bluestone. The residue from this operation consisted of iron scale from the scrap iron used for precipitating the copper and silver, and a small quantity of undissolved copper. The sulphate of soda solutions from the lixiviation were, after being freed from copper, partially evaporated and then run into reverberatory furnaces on burnt lime and slack coal and converted into black ash, from which the soda was leached in the ordinary way and evaporated to dryness, the product being soda ash or alkali, used for soap and glass-making and other manufactures. The residue from the bluestone manufactured, which was rich in silver, with some gold, was sold to lead smelters.

These operations having been brought to a successful condition, the company having paid 12% dividends, attention was turned to the utilization of the other constituents of the ore and salt. In the first place, the residue of the ore, consisting of iron oxide and gangue, was carefully levigated and the finest portion consisting of iron oxide, after being dried, was ground with oil and made an excellent paint of great durability.

About 1846, Longmaid took out other patents, one for converting a part of this levigated iron oxide into black paint. The process consisted of mixing it with coal tar in pugmills and then putting the mixture into large retorts, closed with a tight cover, except a small hole for the escape of the gases. The retorts were then placed in a furnace by means of a crane and after being kept at a dull-red heat until no more gas was seen to escape, they were lifted out and allowed to cool for several days. By this means the iron oxide was converted into magnetic oxide, and, with a certain percentage of carbon from the decomposition of the coal tar, made a black paint of fine quality and great durability.

Henderson's patent process was entirely different from the Longmaid processes. I visited a small works built by Henderson to carry out his process at Flint, North Wales. He first roasted the ore with salt and then attempted to volatilize the copper chloride by a high temperature, but was entirely unsuccessful, only a small portion of the copper being thus recovered. During these experiments, some of the roasted ore and salt fell into water and it was noticed that much of the copper was soluble. His investigations on this subject led finally to Henderson's pirating the Longmaid patents, and as a result of a suit in chancery, Henderson was restrained from using the process and Longmaid's claim to priority was fully confirmed.

In 1851, Longmaid exhibited the various products of his patents at the great international exhibition and was awarded a council medal, being the only Englishman who obtained a first-class certificate in the manufacturing-chemical class. I have both the medal and the certificate now in my possession.

Another branch of the process was the manufacture of bleaching powder. The quantity made was about eight tons per week. This process consisted of roasting the ore in the large reverberatory furnaces until the charges had reached the fourth bed, at which point the sulphur and chlorine had entirely changed places, the sulphur being oxidized and combined with the sodium of the salt and the chlorine being combined with the iron in the form of iron chloride. The charges were then withdrawn and transferred to a muffle furnace, where the mixed ore and salt from the roasting furnaces was submitted to a higher temperature and dry air blown through it. By this means the iron was completely oxidized and the chlorine evolved was conveyed into a chamber where slacked lime was laid on shelves which absorbed the ch'orine and produced bleaching powder of a fine quality.

The extra demand of these works on the Cornish and

Irish pyrites soon exhausted the supply and no other material could be obtained suitable for the Longmaid processes, so the St. Helen's works were consequently closed; for it must be remembered that the importation of Spanish and other pyrites had not been introduced in the English market at that date. Henderson did not start his operations until the Spanish sulphur trade had reached large proportions and the burnt pyrites in the various sulphuric-acid works had become a drug on the market.

The statement that the processes were first employed upon the cupriferous pyrites of Spain, etc., is incorrect, for it was not employed with those ores until all accumulations of such ores in and about the mines of Cornwall and the west of England had been worked up and the St. Helen's works had been closed. I consider that these facts fully confirm the priority of the Longmaid process.

John Longmaid.

Helena, Mont., July 3, 1914.

American Engineers and the Mexican Situation

The editorial "American Engineers and the Mexican Situation," in the Journal of June 27, is deserving of comment. That "mining districts all over the world are flooded with applications, personal and by letter, for employment . . . from men who have been forced to leave Mexico" is indeed true, and I dare say no mining district has been so flooded with the same as the Southwest.

"Those that have been forced to leave Mexico have not faced the situation with composure" is a broad statement, and I think unwarranted. The average engineer from Mexico is an analyst; his conception of the present situation is based on first-hand observations, covering a period of from one to five years, probably in several districts.

That some few should place the profession in a wrong light by such a statement as you quote is regrettable; for you would be surprised to know the number of younger engineers who are looking upon their sojourn in the States during these troubled times as an opportunity to acquire experience or to perfect themselves in the work they were doing or expect to do upon returning to Mexico.

They do not look upon Mexico as a land to be exploited and abandoned. The resources are unlimited and their development depends first of all upon the American engineer. He is anxious to return, but you will find that his attitude toward Washington is not as you suggest. He knows the Mexican people and he knows their ways, and possibly if his stay in the States is sufficiently prolonged, he may come to know the merits of grape juice ever *pulque* and *aqua miel*.

One from Mexico.

Morenci, Ariz., June 30, 1914.

What Becomes of All the Mining Engineers

In the Journal of May 30, 1914, I note some comments made by J. I. Blair on "What Becomes of All the Mining Engineers?" from which I must infer that Mr. Blair's observations have been somewhat unfortunate. In looking over the report of the largest nonferrous metallurgical company in the world I find in the list of directors at least three names of graduates of mining schools; on the executive committee there are the names of three mining engineers; and among the names of those in charge of various departments there are at least three other names. This company has several mines in Mexico and of the 12 superintendents, nine are technical graduates. I believe it would be safe to say that 40% of all the American force employed at these mines are technical graduates. At one of the larger properties among a list of 40 men employed as shift bosses, foremen, engineers, etc., during the past three years, 14 were technical graduates. The general manager and assistant general manager, in charge of all these mines are technical graduates; and the entire general staff, with the exception of the two secretaries, are technical graduates.

It must be admitted that not all of the graduates of engineering schools become prominent as engineers, nor, indeed, do all of them follow the profession for which they studied. There is a process of elimination which starts from the day these men leave college and continues throughout their lives. Many are physically unfit to follow mining engineering; many find other occupations more lucrative; and a large number continue in minor positions simply because they have not proved to be better men than those occupying the better positions. The man who finds time to mourn over the hard luck he has encountered and to berate his superior officers had better try some other occupation, because it is necessary to employ all the time that a man has at his disposal in qualifying himself for the more important positions.

S. F. Shaw.

New York, June 16, 1914.

Erroneous Results from Angle-Hole Drilling

It was with considerable interest that I read Mr. Glass' article in the Journal of July 4. He states that vertical churn drilling is much more reliable than angle churn drilling or angle diamond drilling, and cites as an example a piece of property which was abandoned after prospecting with angle holes, but on which by subsequent drilling with vertical holes, a rich orebody was proved. In each case the vertical holes yielded richer samples than the angle holes. Now it was only natural to assume that the angle drilling was absolutely unreliable. Mr. Glass neglected to state whether the property has since been developed, and we are left in doubt as to which drilling was correct, the "angle" or the "vertical."

There have been several thousand vertical churn-drill holes put down in this camp, and upon sinking on, or drifting to them, it was found that in every instance the drill hole had intimated a richer deposit than really existed. It has consequently become the custom to regard the "metallic" value of the samples as representing the percentage of "ore" in place. Thus, if the drill cuttings assay 10% metallic zinc (15% blende), the prospector will not expect to find over 10% blende or approximately 6.6% metallic zinc.

In conclusion, is it not just as possible that the samples from the vertical drilling were enriched from one cause or another, as that the samples from the angle drilling were decreased in value due to the addition of disintegrated quartz?

Nelson B. Gatch.

Granby, Mo., July 9, 1914.

Editorials

The Situation in the Metal Markets

The radical decline in the consumption of metals in the United States during the last year has put the producers in an uncomfortable, even awkward, position. In the main, production has been maintained at an undiminished rate. In many cases a restriction of production increases cost per unit of product to such an extent that the result is not relished, while the large units of plant of today makes a complete shutdown a step that is not to be taken lightly. In the production of steel, however, the present practice of putting the pig iron hot into the steel mill and so on through into the finishing mills adds so much labor to the crude material, and the difficulty and cost of stocking up such products are so great that we note more shutdowns of steel plants than of copper, lead or spelter smelteries. The decrease in the mining of iron ore and the production of pig iron during the last year has been considerable.

In copper, on the other hand, there has been no decrease in production. Probably there will never be any decrease in the production of this metal, until the important mines begin to show signs of exhaustion, unless there should be a very low price, lower than any one now contemplates, prevailing for a very long period. The production of copper under present conditions is more or less independent of demand. If the latter underruns the production, there is a piling up of stock; if it overruns it, there is a sharp elevation in price. Lately the former condition has prevailed, and we have witnessed a gradual accumulation of stock, but the statistical position was so good to begin with that the accumulation has not yet become burdensome. The copper market is better off than any other in that it is international, and consequently broad. However, each of the producers is desirous of selling copper all the time and averse to carrying stock out of proportion to his production, and the price for the metal is therefore depressed.

The situation in spelter is the most awkward. Here the smelters have accumulated a stock greater than ever known before in the history of the United States, and they claim, probably with reason, that it has cost them upward of 5c. per lb. They cannot sell it for that, and are averse to taking a loss, although the needs of some of the weaker producers compels them to do so, and their pressure depresses the market. However, many of the big producers are financially strong, the cost of carrying stock is relatively low, and they hold on patiently, waiting for the better day to come. Europe also being overstocked with spelter, there is no relief for America in that direction.

In lead the situation is quite different, the European supply having been materially cut off by the cessation of lead exports from Mexico. This has kept the European market at a relatively high level and has permitted a considerable exportation of lead from the United States, which has bolstered up our market. There is a convention among the producers of lead in Europe, which looks rather jealously upon the introduction of uncontrolled supplies, and the exportation of American lead has been conducted rather quietly, but little being said about it in the market reports. In the aggregate it has amounted to more than is commonly supposed. If it had not been for this the price of lead in the United States would surely have fallen to a much lower level. Lead producers may well bear this in mind at some subsequent date, when the condition may be reversed.

Lead Poisoning in the Smelting and Refining of Lead

The Department of Labor has lately issued a noteworthy bulletin on the subject of lead poisoning in the lead-smelting industry of the United States, its author being Dr. Alice Hamilton, who is a well known sociological investigator, associated with Hull House, in Chicago. We are not wont to look for a treatise upon any branch of the metallurgical industry from the hands of a woman, but Doctor Hamilton is an exceptional woman, and having availed herself of good technical advice, none of our smelters and refiners can find fault with her for any lack of grasp of her subject, although much of what she says is unpalatable. Indeed, much of what she tells the smelters and refiners will be real information to them about their own business. They will be foolish if they do not take some profit from it.

We have always known that the workers in our smelteries and refineries suffered from lead poisoning, but a good many of us had no doubt dismissed the subject with the *a priori* assurance that in our modern works the danger was much less than it used to be, and probably was of no great consequence. It is therefore a shock to learn from Doctor Hamilton that in 1912, out of 7400 men employed in 19 American works there were at least 1769 cases of lead poisoning, while in Great Britain in the same year there were only 56 cases out of 2404 men similarly employed. This mere statement is a sufficiently serious indictment, without going further into statistical details. It may be added merely that in Great Britain there are effective laws for the amelioration of the trouble and official inspection of the smelteries and refineries. In the United States there are not.

It has been the common notion that the preventive of lead poisoning is cleanliness on the part of the men, and such companies as have given attention to the matter have provided bathing facilities and have complained of the difficulty of getting the men to make use of them. Indeed, one of the leading manufacturers of white lead has paid its employees for bathing, so much per bath. While personal cleanliness is important, both among white-lead makers and lead smelters, particularly the former, Doctor Hamilton shows conclusively that the danger in the smelteries and refineries is especially from lead dust and smoke, and the chief offender in the matter of cleanliness is the employer, not the employee. Some of her strictures respecting existing works are severe. Thus, she notes of one large Western smeltery, not mentioned by name, "The feed floor is decidedly bad, almost all the furnace doors are leaking, one quite shockingly. The charges were dry and the feeders raised a good deal of dust." Of another, "This was in a worse condition than any other feed floor visited, frightfully smoky and smelling strongly of garlic. The feed doors in the floor are large, about 4x10 ft., and only partially closed by ragged, broken pieces of iron which are not nearly large enough to cover the ends. Every furnace was leaking and one was simply belching forth fumes."

Among the processes of lead smelting Doctor Hamilton rates smelting in the ore hearth as distinctly the most dangerous. The exposure to lead fume is great and the work is unusually fatiguing, while physical fatigue is notoriously one of the predisposing causes to plumbism. Next to smelting in the ore hearth, the cleaning of dust chambers and baghouses is the most dangerous work. Work around the blast furnaces is dangerous, but the converter house where leady matte is blown is worse. The Huntington-Heberlein department is severely censured. When the H.-H. process was first introduced, an improvement of sanitary conditions was regarded as one of its advantages, but that appears to have been wholly a mistake. However, the Dwight & Lloyd sinterers were a real improvement in this respect, although even they may be operated in an unsanitary way.

The conclusion to be drawn from all of this is that the lead poisoning from which our smelters and refiners suffer so severely may be greatly reduced. The experience in Europe is by itself a sufficient warrant for this. Even the perilous ore hearth may be employed with a fair degree of safety, as shown at Gailitz, in Austria, where there is a rate of lead poisoning so low that it can be explained only by the short working day and the fact that the physician in charge suspends from furnace work all men who have lost appetite and puts them on out-door work. In the United States, according to Doctor Hamilton, "there is not one plant in which no fumes are allowed to escape, not one in which there is a complete system of hoods and exhaust ventilation. Nor is there one plant which is kept as free from dust as it might be." The statistics show the price that is paid for the carelessness. Unfortunately, that price is apparently paid by the workmen themselves, from whose wages is generally deducted a monthly medical fee, while of course the consequential damages of sickness to themselves are borne by themselves. Obviously, this is not as it should be. It is the duty of the companies to remedy the evil primarily by preventing it. As has been the result of many similar reforms the outcome of this will, we say "will" since there is no doubt of its being in view of the attention that has been called to it, will be the economic benefit of the companies themselves.

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Workmen's Compensation in New York

The new Workmen's Compensation law of the State of New York is now in effect and claims are coming up for settlement under its terms. The first to be decided in favor of the claimant was to indemnify the widow and orphan of a workman who fell from the new Equitable building, now in course of construction.

The New York law is a fair one in many respects. It is limited to regular, vocational employments and excludes casual employment from its terms. Also it gives the employer the right to insure himself if he sees fit, and thus makes it directly to his interest to prevent accidents, which, of course, is the cheapest way out. However, the New York law is extraordinarily liberal in its compensation to widows, so much so that it has been computed that the killing of a married man may cost an employer upward of $40,000.

A natural result of this is the putting of the services of married men at a discount, simply because some employers cannot afford to take the chance. This has led to a protest to the Governor by the State Federation of Labor, which also objects to the physical examination to which some employers are subjecting their men.

These developments illustrate the complexity of settling a relatively simple social question, respecting the principle of which everybody is agreed.

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Huerta at last has gone, but he was so late in his going that prophets have become numb and nobody ventures to predict the next development in the Mexican situation. In the meanwhile, affairs in the north of Mexico appear to have settled sufficiently to permit the American Smelting & Refining Co. to resume operations at Chihuahua. In Sonora, however, there has been new trouble at Cananea, and the mines are closed, the company resisting an exorbitant demand for increased wages, but later reports indicate that things have been adjusted. According to press dispatches, some I. W. W. agitators started in to make trouble at Chihuahua, but Villa told them to get out or he would shoot them, which ended the matter. We have read in the newspapers that Señor Villa has been offered engagements in several American cities.

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Notwithstanding the flourishing reports recently made, there seems to be doubt about the real value of the platinum deposits in Westphalia. According to German papers, new stock in the company is being offered for sale in rather an underhand way. Complaint is made that the position of the company is not clearly defined financially, and that the promised mining explorations and metallurgical experiments are not being carried out. A point of some importance is that the Compagnie Industrielle du Platine, of Paris, which had been carrying on some negotiations for a share in the German company, has withdrawn after an examination made by its own engineers.

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It is reported from London that the negotiations recently in progress have resulted in an agreement to which the De Beers Company, the Premier Diamond Co. and the German Diamond Co. are parties, which will continue the control of the diamond trade with the London syndicate. This will obviate the possibility of an open break between the De Beers and the Premier companies, which at one time seemed quite probable, when the old agreement expires this year. Doubtless there will be some regulation of the output or at least of the offers for sale.

BY THE WAY

In a recent issue of that readable little paper, the *du Pont Magazine,* it is stated that tamping ought always to be used in blasting; the authors of U. S. Bureau of Mines Bulletin 57, Messrs. Brunton and Davis, rather look with disfavor on the use of tamping in tunnel work. Again the doctors disagree.

⁂

A man who attempted to enter the house of a miner in the Joplin region recently, met with a severe reception. The local paper says: "Mrs. S—— fired at him from the window and the bullet struck him between the fence corner and the front gate." Burglars and tramps will do well to avoid the Joplin country. A wound "between the fence corner and the front gate" sounds pretty serious.

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It takes about six weeks to convert Calumet & Hecla copper into cash, according to James MacNaughton, manager of the company, testifying before the Congressional Committee investigating the late strike in the Copper Country. If the copper contains arsenic and has to pass through the electrolytic process, the transformation into cash occupies, perhaps, 10 to 12 weeks.

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That the examining mining engineer is kept in training by his work was exemplified in the recent 200-mile canoe race from Mont Laurier to Ste. Rose, Quebec. Jas. G. Ross, consulting mining engineer, of the Milton Hersey Co., Montreal, with his partner, T. M. Paplineau, representing the Cartierville Canoe Club, Montreal, came in second. The winners were two Gowganda prospectors, R. Gamble and F. Thompson, representing the Rideau Aquatic Club, of Ottawa. The course down the Lievre and Ottawa Rivers was covered in 40 hr. paddling and portaging, the elapsed time from start to finish being 60 hr.

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The following is from the New York *Sun* of July 16:

> Col. Michael J. Reagan, as chief mediator of the State Board of Mediation and Arbitration, went to Flushing, L. I., yesterday, in the effort to settle a strike of building mechanics on the new high-school building there, which he acknowledged is one of the most difficult propositions he ever undertook. The trouble is over a dispute among the unions of bricklayers, plumbers and electrical workers as to which had the right to cut the holes in the cement floors for the standpipes and electric wires. The work was first given to the plumbers, and electrical workers and the bricklayers were ordered on strike. To settle the dispute the work was then given to the bricklayers, and the plumbers, electrical workers and men in other trades who supported them went on strike. To give the work to the plumbers and electrical workers would mean another strike of the bricklayers, and as the latter are not in the American Federation of Labor no ruling from that body would have any effect.

Are such operations in restraint of trade?

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Sir William Crookes has been conducting a research to prepare a glass which will cut off the rays from highly heated molten glass that damage the eyes of the workmen, without obscuring too much light or materially affecting colors of objects seen through spectacles made of the glass. Sir William's investigations led him to the conclusion that the eye trouble knows as glass-workers' cataract is ascribable principally to the heat rays. A great variety of glasses was tested. In general, the more the heat rays are absorbed the more the light rays are cut off. Thus, one glass, sage-green in color, absorbed 98% of the heat rays, but let through only 27.6% of the light rays. On the other hand, a certain glass, practically colorless, passed 99% of the light rays while absorbing 27% of the heat rays. It would be interesting to know to what extent metallurgical workers experience eye trouble analogous to that of the glass-workers.

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The examination of Mr. Jones by the Senate's Committee on Banking and Currency manifests that some of the reverend senators like to feed on piffle. Thus, from the testimony:

> Senator Hitchcock—You think this is not a combination in restraint of trade or in control of trade, the New Jersey Zinc Co.?
>
> Mr. Jones—I do not.
>
> Q. It has 85%, you say, of the zinc trade of the country?
>
> A. Of the oxide of zinc.
>
> Q. Well, is there any other concern that controls a larger percentage of the products it manufactures?
>
> A. No, sir. . . . I will say frankly that mine is the whole business. There is no artificial combination of units to eliminate competition. It has not been attempted at all, and has not been accomplished, but that mine constitutes a natural monopoly.
>
> Q. How would you go to work in destroying the zinc monopoly?
>
> A. I do not believe it is destructive, because I do not believe it is a monopoly in that sense.

Now, any schoolboy might tell the august senator that the way to destroy the zinc-oxide monopoly, or near-monopoly, would be to induce more concerns to enter into competition with it, as the Sherwin-Williams Paint Co. did some years ago. If the inducements be not sufficiently attractive to lead anybody else so to risk his money, let the constitutional provisions safeguarding property be abolished and then let the Franklin mine be confiscated. What else is there to do?

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A correspondent who has had much experience on both sides of the Atlantic writes us as follows: "Comparing the characteristics of the American mine superintendent and his English confrere, why is it that the former seems to organize his work so as to give him apparently any amount of spare time whereas the latter usually wears a worried look and is always in a hurry? I have visited the superintendents of many American mines quite unexpectedly and have invariably found them courteous to a degree that is almost embarrassing. They invariably find time to show a visitor all he wants to see, or hand him over to the heads of the various departments who, in their turn, appear to have ample leisure to reply to all questions, intelligent or otherwise (all inquirers consider their questions intelligent and I am no exception). The English mine manager on the contrary is obviously anxious to be polite but is generally too busy to give his visitor more than a few moments and then hands him over to a very junior assistant who does his best but lacks the experience and knowledge of detail necessary to explain the various points. Presumably the difference is due partly to superior organization and delegation of work on the American side, and partly to Englishmen setting themselves daily chores which have to be got through, leaving no time for any business outside the daily routine."

PERSONALS

Donald Gillis recently left Anaconda, Mont., on his return to Mexico.

E. J. Carlyle sailed from New York on the "Aquitania," July 21, on his way to Siberia.

C. A. Burdick has returned to New York from a four months' professional trip in the Southwest.

R. E. Cranston has just gone to Cripple Creek from New York on professional business and is still in Colorado.

W. B. Mangan is manager of the Timber Butte Milling Co., of Butte, Mont., and W. N. Rossberg is the superintendent.

Hon. R. W. Brock, deputy minister of Mines of Canada, was in New York this week, and sailed for England July 21 on business.

S. Pearson, of the British firm of S. Pearson & Son, who have extensive oil interests in Mexico, is looking over the Canadian oil fields.

John Landers, vice-president of the Mexican Mining Co., and president of the Union Mining Co., expects to visit Virginia City soon.

S. B. Patterson, Jr., superintendent of mines for the Spanish-American Iron Co., Mayari, Oriente Province, Cuba, has returned to his post after a month's visit in the States.

Fred H. Nye, of Denver, recently with the Sutton, Steele & Steele Co. has assumed position of general superintendent of the Northwestern Zinc Company, Galena, Illinois.

David H Ladd of Houghton, Mich., returned last week from a trip abroad which lasted four months. He visited copper consumers in Austria, Germany, France and England.

R. R. Heap, who has been superintendent of the Lennan Zinc and Lead Co. and Miami Zinc & Lead Co., at Miami, Okla., has given up his positions there and has gone to Mexico.

Harry J. Wolf, of Denver, Colo., recently completed mine examination in Gilpin and Clear Creek counties in Colorado, and has gone to the state of Washington, to investigate properties near Oroville.

William H. Warren, recently superintendent of the rail mill department of the Illinois Steel Co., has been appointed general superintendent of the steel mills of the Brier Hill Steel Co., Youngstown, Ohio.

H. L. Slosson, Jr., president of the Mexican Mining Co., has returned to San Francisco from a visit to New York where he had been for several months on professional business connected with Comstock affairs.

Stopford Brunton, of the Canadian Geological Survey, is at Cobalt, Ont., testing specimens of ore with a view of discovering minerals possessing radio-activity. He will continue the search for radium in the Porcupine and Kirkland Lake fields.

Hermann J. Reiling, president of the French Gulch Dredging Co., Breckenridge, Colo., and his chemist W. C. Cracy, were injured recently by an explosion resulting from a mistake in placing about 10 oz. of metallic sodium in water containing gold amalgam. Most of the injury was around the faces of these gentlemen.

Maurice H. Hare, president of the Idaho Placer Mining Co., has been missing from his office at Spokane, Wash., since June 22, and no trace of him has been found. He left his business affairs in excellent shape, and the only cause for his disappearance is the fact that he had been suffering from nervous trouble. He had lived in Idaho and in Spokane for 25 years past and has many friends.

OBITUARY

Murdock Lloyd, engineer of the Tough Oakes Mine, Kirkland Lake, Ont., aged 45, was so badly scalded by the explosion of the boiler, at which he was working on July 11 that he died the following day. He was formerly a resident of Aurora, Ont., but for the past few years had been living at Haileybury.

The fate of W. H. Marston, engaged as an assayer at the Hollinger Mines, Porcupine, Ont., who disappeared in September, 1913, is now known. His body has been found in the bush between Porcupine and Schumaker, only about [illegible] miles from home, and though much decomposed was identified by the clothing. There was a bullet hole in the top of the skull. An inquest held at Porcupine resulted in the verdict of "Death from a gunshot wound."

J. Wheeler Hardley died at his residence in Brooklyn, N. Y., July 21, aged 66 years. He had been in failing health for some months, and finally submitted to an operation, from which he failed to rally. He had been connected with the Atlantic, the Mohawk, the Wolverine—the whole group of Stanton copper companies—some 25 years, at first as cashier and confidential clerk and for over 15 years as a director and secretary. He was thoroughly familiar with the copper market and the New York or selling end of the business, and was much esteemed by his associates.

Edward C. Limbach, superintendent of the American Girl mines at Ogilby, Calif., at 1 p.m., on June 15, slipped and fell upon the drive-belt of one of the Hardinge mills, passing around the pulley on the countershaft. He died two hours later. Mr. Limbach was a graduate of the Colorado School of Mines in the class of '95, and followed the profession in Colorado and Montana and later in Loomis, Wash., where his family are living. He was a man of charming personality, always well liked by his associates in school and in the field, honest, upright and fair.

Francis C. Robbins died at his residence in Los Angeles, Calif., of pneumonia, June 28. He was born in Portland, Oregon, 1856. He was prominently identified with Eureka, Nevada, mining and smelting industries from 1877 until the later eighties; subsequently going to Leadville, Colo., as general manager of the New Elkhorn Mining Co. In 1898 he went to Phœnix, B. C., and was active in the development of the Boundary District; later going into the East Kootenay country as general manager of the McKenzie & Mann interests in that region. In 1902 he moved to Los Angeles, Calif., and engaged in general practice until the time of his death. Mr. Robbins was a member of the Executive Committee of the Los Angeles Section of the American Institute of Mining Engineers. A man highly esteemed in his profession and much loved by those favored with his friendship.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

DECARBURIZING METALS. J. E. Bucher, Providence, R. I. (Brit. No. 4667 of 1913.)

DRILL. John Thomas Curnow, Palatka, Mich. (U. S. No. 1,095,085; Apr. 28, 1914.)

DRILL-BIT-ROTATING DEVICE. George H. Gilman and Lee A. Knights, Claremont, N. H., assignors, by mesne assignments, to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,103,002; July 7, 1914.)

ELECTRIC SHAFT FURNACE—Improvements in or Relating to. W. N. Crofts, Oberlin, Ohio. (Brit. No. 18,073 of 1913.)

FLOTATION PROCESS—Ore Concentration. Henry Howard Greenway, Clare, South Australia, and Alfred Henry Piper Lowry, Prahran, Victoria, Australia. (U. S. No. 1,102,738; July 7, 1914.)

IRON—Improvements in or Relating to the Manufacture of Iron and Other Metals. A. E. Bourcoud, London, Eng. (Brit. No. 12,960 of 1913.)

OPEN-HEARTH FURNACE. Kurt Albert, Wiesbaden, Germany. (U. S. No. 13,763; July 7, 1914.)

ORE CAR—Hopper-Ore-Car Construction. John M. Rohlfing, St. Louis, Mo., assignor to American Car & Foundry Co., St. Louis, Mo. (U. S. No. 1,097,945; May 26, 1914.)

ORE COOLER. Robert W. Hanington, Denver, Colo. (U. S. No. 1,101,433; June 23, 1914.)

ORE FEEDER. Thomas G. Worthington and Herman O. Langstaff, Oatman, Ariz. (U. S. No. 1,098,206; May 26, 1914.)

ORE REDUCTION—Process of Reducing and Separating the Metals from Their Ores. John M. McCormack, Reno, Nev., assignor to Gertrude A. McCormack, David R. Williams, James Constable and Ellsworth L. Brown, Reno, Nev. (U. S. No. 1,099,388; June 9, 1914.)

ORE WASHING—Improvements in or Relating to Apparatus for Washing Ore. H. A. Brackelsberg, Hagen, Germany. (Brit. No. 13,987 of 1913.)

PRECIPITATION—Metal-Precipitating Device. Frank A. Ross, Spokane, Wash., assignor to Chalmers & Williams, Inc., Chicago Heights, Ill. (U. S. No. 1,101,569; June 30, 1914.)

ROASTING—Ore-Roasting Furnace. William F. Murphy, Iowa City, Iowa. (U. S. No. 1,099,309; June 9, 1914.)

ROASTING—Shaft for Roasting Furnaces. Edward J. Fowler, San Francisco, Calif., assignor to General Chemical Co., New York, N. Y. (U. S. No. 1,100,426; June 16, 1914.)

SCREEN—Self-Cleaning Screen. Fritz Oscar Stromborg, Seattle, Wash. (U. S. No. 1,100,793; June 23, 1914.)

SINTERING—Calcining, Desulphurizing, Agglomerating, and Sintering Ores and Like Materials. Francis D. Weeks, Salida, Colo., assignor, by mesne assignments, to Dwight & Lloyd Sintering Co., New York, N. Y.

Editorial Correspondence

SAN FRANCISCO—July 15

The Northern California and Southern Oregon Mining Congress, held at Ashland, Ore., in July was not well attended and the display of minerals was not equal to exhibits at former sessions. The next meeting will be held at Etna Mills, Siskiyou County, Calif. The following officers were elected for the ensuing year: James Logan, of Grants Pass, Ore., president; George Metcalf, of Kennett, O. A. Jillson, of Shasta County and G. A. Reichman, of Fort Jones, vice-presidents: G. F. Hellmuth, of Etna Mills, secretary; J. W. Newman, of Redding, treasurer. The congress held at Ashland was not lacking in interest nor in contributions of papers and speeches. The members of the congress are no less interested in its affairs, or in the mining industry than they have been in the past, but it appears that hitherto there has been a disposition to make a holiday of the meetings, and it has been somewhat difficult to impress upon the members the importance of advancing the mining industry along some special line. At the session held in Redding in 1913, the congress did some excellent work in the appointment of a committee to visit the so called smoke belt, which committee reported adversely to the complaints of the farmers. But before that session of the congress met the members were not greatly interested in the matter and it was only by the quiet, careful work of a few members that this valuable work was accomplished. A larger interest in these sessions of the congress would undoubtedly be created by the selection in advance of a special subject for investigation and discussion. Such subject should be of vital interest to the entire mining region represented by the membership.

Natomas Consolidated of California has mailed to the bondholders, stockholders and creditors a letter prepared by the reorganization committee, urging the depositing of their holdings under the terms of an agreement previously submitted. This letter was accompanied by a letter from the general manager, Mr. Oliver. The estimated net income for the balance of 1914 is given as follows: Gold dredging, $700,000; rock crushing, $48,000; land receipts, crops, etc., $55,000. Total, $803,000. But Mr. Oliver shows that while the properties of the company are extremely valuable, embracing dredging lands, rock crushing plants, agricultural lands, and water rights, the principal asset is in the reclamation products and orchard lands, comprising about 60,000 acres on the Sacramento, Feather and Bear Rivers, and 20,000 acres of orchard lands on the American River. It is to these lands, Mr. Oliver states, that the bondholders must look for their security and reimbursement. The status of the reclamation work on June 30, 1914, was that there remained only 21.3% of the levee along the Sacramento River, 32.1% of the east side levee and 59.6% of the cross-canal levee yet to be completed; and that 31% of all the levee system is yet to be built. Beside the necessity for completing the reclamation it is urged by the letter that money is required to discharge obligations to the holders of the following underlying bonds: Natoma Development Co., $400,000; Natoma Land & Mining Co., $345,000; Clark & Cox Farms Co., $98,000. Total, $843,000. The total amount owing for lands purchased and partly paid for, including interest, is $489,000. The principal items which must be paid by Jan. 1, 1915, include purchase-price installments, underlying bonds, insurance, taxes, notes, reclamation work, etc., amounting to $1,332,236. Natomas Consolidated has done a vast amount of gold dredging and recovered a large amount of gold. It was the first company in the United States to build an all-steel dredge, and has now three steel dredges in operation and seven wooden boats in Natoma field and three wooden boats in Oroville field. A great deal of fuss has been made about the destruction of agricultural lands by the gold dredging industry, but Natomas Consolidated has put the earnings of the dredges on the American and Feather Rivers back into reclamation of the dredged lands and purchase of other agricultural lands. While there is sufficient ground in the Natoma field for several years further work for the dredges, the ultimate benefit to be derived from the gold-dredging operations of the Natomas Consolidated will accrue to the agricultural and horticultural industries of the State.

DENVER—July 16

Strike of Trainmen on the Cripple Creek Lines that seriously threatened activities in the district was settled July 13 at a conference between officials and employees of the roads. The trainmen resumed duties promptly. Every employee will be reinstated with the exception of the central figure in the controversy, Charles D. Robinson, conductor, who secured a position with one of the mining companies and withdrew his demands.

History of Cave Basin Mining District in Notheastern La Plata County is contained in a private letter from the discoverer, as follows: "Last fall (1913) Sam L. Dowell opened a body of copper-silver ore in what is known as the Dowell mine. From this claim he made several shipments to the American Smelting & Refining Co.'s plant at Durango, the best lot running about $95 per ton, the lowest, $24 per ton. Ore occurs as replacement of limestone above Cambrian quartzite. The Dowell mine is under option to C. L. Young, Jr., of Durango, Colo., who is driving a crosscut adit 135-ft. to reach the same orebody at greater depth. Until about 50 ft. more be driven, the success of his project cannot be known. Two miles north of the Dowell mine is the Mary Murphy mine, from which ore has been shipped running as high as $134 per ton, the values being silver-copper, as in the Dowell. Nearly midway between these two properties Mr. Dowell is now working a new claim known as the Red Cloud, and he believes he will have a similar orebody, as he has the same formations and indications."

The New Smelting Plant of the Western Zinc Mining & Reducing Co. at Leadville went into service July 11. Erection has been under the personal supervision of Vice-President E. J. Jones and General Manager A. B. Augustine, both experienced zinc smelters from the Eastern fields. Preliminary experiments on Leadville zinc ores were conducted at Coffeyville, Kan., by Mr. Augustine. The process as installed cannot handle sulphide ore. Lead ore is not desired and ore carrying above ½% lead is declined. The sole product of this plant is intended to be zinc oxide in pigment form. The sampler building contains usual crushers, rolls, screens and elevators, the ore being reduced to ¼-in. mesh and stored in bins of 200 tons capacity. At present, ore is trammed the short distance from bins to the furnace building, but with the addition of another unit, mechanical conveyors will be installed. There are eight furnaces in the block. Charges consist of 2 parts of crushed ore and 1 part anthracite slack. The charges are placed upon grates of perforated cast iron, through which air under pressure of 4 to 5 oz. is forced from below and maintains the proper oxidizing atmosphere. Gaseous products pass through a long combustion chamber and into a 4-ft. flue, 680 ft. long, being drawn by a large exhauster at the terminal. From the exhauster, the fumes enter the battery of 288 bags which are periodically shaken by hand. Daily capacity of the works is between 50 and 60 tons of crude ore. Present schedule for purchase of zinc carbonate ore is $3.50 per ton carrying 16% zinc, with a 25c. variation for each per cent. up or down.

BUTTE—July 15

Butte Miner's Union No. 1, the old union, has served notice on the city of Butte through its attorney, Peter Breen, that suit for $138,291 is to be instituted against the city for damages done upon the Union hall on Miners' Union day, June 13, and again on June 23. For the damage alleged to have been done on Miners' Union day, the claim is for $68,291, and for the dynamiting of the hall on June 23, $70,000 is asked. The notice states that the damages sustained were caused by the neglect of the city to protect properly, or at all, or to attempt to protect, the personal and property rights of the complainant. Acting Mayor Smith and the assistant city attorney, N. W. Davis, state that the city will fight the damage suit to the last ditch. One of their defenses will be that the miners destroyed their own property. Another, that the officers of the Miners' Union and the Federation were primarily responsible for the trouble. With regard to dynamiting the hall, the city will advance the claim that the shooting done by the Federation officers and representatives, in which Bruneau was injured and Noy killed, aroused the indignation of the rebelling members of the Federation, and led to the dynamiting.

HOUGHTON—July 18

Calumet & Hecla at the present time is employing a larger working force than ever before in its history, and is also paying higher wages. Several of the subsidaries are not only showing a larger rock tonnage, but are breaking all previous records in the yield of copper and in the earnings, notwithstanding the low price of copper.

The Moyer Trial Has Been Postponed to the September term of the circuit court, at L'Anse, Baraga County, Mich., and will be tried, if at all, during the latter part of September or about the first of October. There is a strong local sentiment in favor of dropping the case entirely because of the expense involved; in fact, Special Prosecutor George E. Nichols, who has had charge of the case so far, is one of the few persons who is still in favor of trying the case. It is his opinion, in view of the fact that the county has already spent so much in the preparation of the case for trial, that it ought to be carried through. There seems to be an idea among some, also, that the mining companies are not anxious to try the case. It is estimted that the cost of the trial would be between $15,000 and $20,000, and is is quite likely that the mining companies consider that the expense of the strike has been large enough already.

MARQUETTE—July 18

Signs of Improvement in the Iron Trade are noted in the Lake Superior region, although these signs are not so prominent as desired. The tendency toward betterment is noted particularly on the Menominee and Gogebic ranges. Here, while production is still well below the normal, shipments are increasing. Ore is moving from Iron River more freely than heretofore this season. Gradually the surplus ore is being reduced.

The Improvement Has Not Yet Extended to the Marquette. Stockpiles are growing at a season of the year when normally ore is being sent out at a rapid rate. This is raising apprehension of still further curtailment. In the Ishpeming field, only the Cleveland Cliffs is working anywhere near capacity, and its shipments to date have been small. Some of the men recently laid off when the Steel Corporation closed its Hard Ore mine are leaving the district, having been unsuccessful in obtaining employment. It is considered unlikely that the Hard Ore will be reonened for a year at least.

The Mining Properties at Ironwood, metropolis of the Gogebic range, are valued this year at a total of $24,258,826, according to the assessor's rolls, as against $22,699,579 a year ago. The increase is $1,559,247. The Ironwood mines are operated by Hayes Bros. of California, holding the Ashland; Ferdinand Schlesinger of Milwaukee, holding the Newport, and the United States Steel Corporation, holding the Norrie group. The Pabst of the Norrie group is listed by the assessor at $7,311,000; the Newport at $7,232,557.

An Assessment of $3 Per Share Has Been Levied on the Huron Iron Mining Co., formerly operator of the Youngs mine at Iron River and now a defunct concern, whose affairs are in the bankruptcy court for adjudication. The levy will net approximately $45,000. The assessment was agreed to by the principal stockholders, chiefly Ohio men, for the purpose of paying debts. At the time the Youngs mine was purchased from G. W. Youngs of Iron River for a purported consideration of $500,000, it was agreed, it is claimed, that the property would revert to the original interests if royalty on the ore produced was not paid. Whether such reversion will take place is to be determined by the United States Court of Appeals at Cincinnati. The tangle involving the Huron company is one of a series affecting several Menominee range mining concerns in which the same interests are associated. The Groveland Mining Co., controlled by the Lake Erie Ore Co.; the McDonald Mining Co. and the Youngs Mining Co. are all concerned one way or another, and much complication exists. The Youngs and the Groveland, the latter near Iron Mountain, are considered valuable and promising mines. Neither is in operation, pending the outcome of the existing litigation, and the McDonald, at Crystal Falls, is idle also.

Conditions in the Crystal Falls Field are not so encouraging. Big stockpiles are in evidence and in some instances they continue to grow. Corrigan, McKinney & Co. have been shipping most of the ore to date, and it appears likely that the stockpiles at both the Tobin and the Dunn mines will be wholly removed this season. Most of the Corrigan-McKinney group, however, continues in idleness as heretofore. At the Bristol property of Oglebay, Norton & Co. the big stockpile is still intact, and the mine is idle while repairs and other dead work are in progress. The Bristol product is a desirable ore for furnace use, and it will be surprising if the stockpile is not largely reduced before the close of navigation. Shipping from the Traders property at Iron Mountain, operated by the Republic Iron & Steel Co., has been hampered since the resumption of mining in the spring, due to the stripping work under way at the same time. This is now practically completed, and it is expected the daily uutput of 500 tons will be doubled. More stripping has been done than was first intended. The original contract was for the removal of 15,000 to 20,000 cu.yd. This has been enlarged so that the overburden excavated approximates 70,000 cu.yd. In some places 40 ft. of ground covered the orebody.

ISHPEMING—July 18

Quinnesec Hydro-Electric Plant built by the Steel Corporation at Quinnesec Falls of the Menominee River, and which was completed a few weeks ago, is now furnishing power for the operation of machinery at the Chapin mine at Iron Mountain. The first use of the electricity in this manner was in the operation of an underground pump at the Hamilton shaft. The service is being extended to other mechanical equipment as fast as installations can be made. Delivery of the machinery for the Indiana mine of the Thomas Furnace Co., of Milwaukee, has been retarded because of the delay of the railroad company in building the spur track. However, it is expected to have the equipment installed before the end of July. The machinery consists of engine, boilers, pumps and air compressor. The plant has been shipped to the Menominee range from the Baraboo field in Wisconsin. The Indiana, part of which was operated years ago on a small scale, has been explored the last few years and is expected to develop into a good-sized producer. The property is near Iron Mountain.

A New Chemical Plant Will be Started during the summer by the Lake Superior Iron & Chemical Co. The works will be built at the furnace at Ashland, Wis., and the plant will replace the one destroyed by fire several months ago. Its construction will provide work for the greater number of men thrown out of employment when the furnace recently suspended operations. The equipment of the plant will be modern. The capacity will be double that of the old works. The Zaremba company, of Buffalo, will erect the greater part of the plant. Contracts for other parts of the work have been awarded to the Vulcan Copper Works Co., of Cincinnati, and the Detroit (Mich.) Heating & Lighting Co. The Lake Superior Iron & Chemical Co.'s furnace at Newberry, Mich., was blown out the last of June. Operations at the retort plant had been suspended previously. Repairs will be made, and this will employ part of the working forces; 150 woodchoppers have, however, been laid off. The sawmill operated in connection with the furnace will continue in commission. The company's Manistique, Mich., plant has been shut down for the last fortnight and more. It will remain out of blast for an indefinite period. Extensive improvement work is planned, including the installation of the retort system of manufacturing chemicals. The Elk Rapids, Mich., plant of the company is in blast again. Part of the Newberry force has been transferred to that establishment. At Gladstone, the Kipling furnace of the Pioneer Iron Co. is again producing charcoal iron, after having been out of blast for several months, during which period much needed repairs were made.

CRYSTAL FALLS—July 18

Seven Miners Lost Their Lives at the Balkan mine, near Alpha, July 15, when a run of sand and water occurred on the first level. The men were engaged in putting up a raise, when the sand was encountered. Several of the men on the level were able to escape, but all of those who were near to the scene were caught. The ground was thought to be safe and it was not known that there was any sand in the vicinity. It was not long before the mine was filled with water to within 35 ft. of the collar of the shaft, and it will be weeks before the bodies can be recovered. Just how much sand entered the workings is not known. The accident is one of the worst that has taken place in the Lake Superior region for several years. The Balkan is worked by Pickands, Mather & Co., of Cleveland, and part of the property is to be operated as an openpit, while the other half will be mined by underground methods. Stripping is now in progress with a dragline excavator, and excellent progress is being made. The Balkan shaft is down 240 ft., but no mining has been done as yet, none of the drifts having reached the ore. The Balkan will be one of the largest properties in the Menominee region within a year or two.

DULUTH—July 17

Shipments from Hibbing Mines and from the assembling yards in that field of the Mesabi range approximate 2300 cars per 24 hr. The Great Northern is moving 1900 cars, of which 1050 cars are furnished by the Steel Corporation from properties it is operating under the Hill ore-lands lease.

SILVER CITY—July 17

Mining in Southwestern Grant County has taken a sudden spurt, especially in the Lordsburg, Steeple-Rock and Steins districts, where ore shipments are now larger than they have been in years and a large amount of development work is under way. It is understood that the Guggenheims have acquired property in the region of Lordsburg and will undertake extensive prospecting and developing. The 85 Mining Co. is shipping regularly to the smelters and negotiations are under way to construct a spur of the Southern Pacific R.R. from Lordsburg to the 85 mine. In the same region the Bonnie Mining Co., is preparing for larger operations in the near future and will install new mining equipment. The Carlisle mine at Steeple Rock, via Duncan, Ariz., is reported to have been purchased by George H. Utter, of Silver City, and preparations are being made for the re-opening of the entire Carlisle group. The property was at one time a large producer and ranked with the leading mines of the Southwest. Ore shipments will commence as soon as transportation facilities have been improved. There is a large quantity of commercially valuable ore on the dumps. The National Gold & Silver Mining Co. of Steins, is developing a body of high-grade gold, silver and copper ore, which is now from 12 to 18 in. wide. On account of scarcity of Mexican labor a 5-drill compressor, air drills and other mining equipment are being installed. The main shaft on the property is 300-ft. deep with between two to three miles of underground workings. There is a 50-ton mill on the ground which has been used principally in grinding up cobbings from shipping ore and also concentrating some of the low-grade ore. Shipments are made to El Paso smelting works.

JUNEAU—July 12

Contracts for the furnishing of Additional Equipment to the Treadwell group and Alaska Juneau companies, costing altogether more than $250,000, have been signed by Fred W Bradley, president of all four companies. Bids also have been asked for an electric hauling system and the contract will be let next month. The contract for the central steam plant for generating power for winter use by all companies was let to the General Electric Co. and Chas. C. Moore Co. The plant will have a capacity of 4000 hp., which, added to the 6000 hp. already installed at the Treadwell group, will give the companies 10,000 hp. for winter use and enable them to work at full capacity for the entire year. During the summer, power will be obtained from Nugget Creek, where the work of constructing a dam will be begun shortly. The plant will have a capacity of 12,000 hp. for about 9 months of the year, and during the other three the auxiliary steam plant will be used. An order for a 40-drill Ingersoll-Rand compressor has been placed and the big machine will be installed this summer. It will be driven by electricity and used for tunneling and other purposes in the Alaskan Juneau property. The Alaska Juneau was first developed by C. D. Lane with an opencut. Two years ago it was taken over by Bradley and others.

CORDOVA—July 2

A General Stimulation of Activity All Over Alaska since the passage of the Alaska Railroad bill is reported by Robert W. Baxter, vice-president of the Copper River & Northwestern, who says that there has been more freight going into the territory than ever before in its history.

The So-called Morgan-Guggenheim Syndicate, according to report, will spend a large sum in the purchase and development of mining properties in Alaska during the coming year These interests control and operate the Bonanza, Beatson and other copper properties. More than $600,000 will be expended on improvements on the Bonanza and Beatson mines this summer, and a number of properties on which the syndicate has options will be developed. If the developments justify the investment, at least $10,000,000 will be expended in purchases and in the installation of machinery. The "Syndicate" is one of the strongest combinations operating in the Northern territory, where it has investments of more thn $25,000,000. Its transportation plants include the Copper River & Northwestern Ry. and the Alaska Steamship Co., which has a fleet of about 16 freight and passenger ships in commission. Stephen Birch, general manager of the mining end of the syndicate's holdings, reached Seattle a few days ago from New York, where he has been conferring with his principals, and will leave for Cordova in a few days, taking a large field force. He will make a trip through the White River country, where a number of options have been secured, and will visit other properties which have been offered. In an interview in Seattle, Mr. Birch stated that the first work would be to build an aerial tram to the Jumbo mine, near Kennecott, and to increase the concentrating capacity of the Bonanza. The tramway will be about 12,000 ft. long and will be used to move the ore down to the plant. An aerial tram is now working on the Bonanza 15,000 ft. long. At the same time the power plant at the Beatson mines at Latouche will be increased and a concentrator with a capacity of 500 tons will be installed. "One of the next big fields to be developed," he said, "will be the head of the White River, about 90 miles from Kennecott."

TORONTO—July 18

Beaver Lake Gold Field, Saskatchewan, continues to attract prospectors. So far 850 claims have been filed, representing an acreage of 44,200 or 70 square miles. Staking is still going on and numerous rich finds are reported.

Canada Iron Corporation went into liquidation a few months ago. Proposed reorganization was formally approved at a recently held meeting of bondholders. The next step in the reorganization proceedings will be a meeting of the general creditors in Montreal on July 5. If the creditors give their consent to the plan, arrangements will be made to put it into effect at once. The resolution adopted by the bondholders provides for the cancellation of the existing trust deed and the acceptance by the first-mortgage bond holders of 6% debenture stock to be known as "B" debenture stock in a new company. The exchange will be on the basis of par for par. Prior to this security, will be an issue of "A" debenture stock of an authorized amount of £200,000, of which no less than £120,000, and no more than £140,000 will be subscribed for at 95 to provide the necessary cash for working capital. Preferred and common shares will also be created, the amounts to be determined after negotiations with the second bondholders, holders of secured notes and other creditors in the old corporation. The old preference and common stock will be wiped out but shareholders who subscribe to the "A" debenture issue will be given a bonus of common stock which in the event of the reorganization proving successful, will offer some chance of the old shareholders recouping part of their losses.

The Gradual Passing of La Rose is one of the outstanding features of the present situation in Cobalt. It is understood that the consulting engineer has recommended the closing down of some of the properties in the immediate future. This, the first mine to be developed in the Cobalt district, and at one time the most important producer in the camp, is practically worked out, and high officials of the company entertain only a slight hope for a continuance of its productiveness. The property was discovered in 1903 and subsequently purchased by the Timmins-McMartin-Dunlop Syndicate for a comparatively small sum. At that time, it was believed orebodies as rich as these would have only a short life, and the shipments, while of surprising richness, did not excite any great comment. After the syndicate had taken out ore to the value of $1,200,000, the property was sold in 1908 for $1,000,000 in cash, and the undertaking of the purchasers was to take up other stock from time to time. The various properties included La Rose, La Rose Extension, Princess, Violet, Silver Hill, Fisher Eplett and University. Subsequently, the famous Lawson property was included. In 1909, the present Montreal holders, acquired a large interest and the stock having a par value of $5 rose to $8.50 a share. It was soon found out, however, that the production was being forced and that it would be impossible to maintain the output. The bottom of the main La Rose vein had been reached and the Lawson had proved a great disappointment, the famous silver sidewalk carying its high values to a depth of only about 15 ft. The Montreal shareholders forced the hands of the New York owners and took over the management of the property, with D. Lorne McGibbon as president. The first act of Mr. McGibbon was to cut the dividend from 16% to 8%, and as a consequence the bottom fell out of the stock. Since that time the property has been worked in the best manner and everything possible has been done in the interests of the shareholders. The several properties have been aggressively developed, but with the exception of La Rose, Princess and Lawson, the production amounted to practically nothing. To date, however, the La Rose Consolidated, which embraced the various properties, has produced approximately 21,500,000 oz. of silver, for which was received $11,500,000, and the profit on which would be about $6,500,000, including the $1,200,000 taken out by the original owners. About $5,000,000 has been paid in dividends and the surplus in the treasury stands at about $1,500,000. While it is possible that other discoveries may be made, the aggressive policy of development carried out under competent management would seem to preclude the possibilities of any further discoveries of great importance. There is still, however, a large amount of low-grade ore in the mines and on the dumps which should yield a profit.

The Mining News

ARIZONA

Gila County

INTERNATIONAL SMELTING (Miami)—Considerable work now in progress at building site. Fume stack started Tuesday by Short company, of Chicago, steel stack erectors, to whom contract was let by Oscar Daniels company. "Bell" of stack now in place. Expected about six weeks will complete job. Stack erected in sections of 6 ft.; riveting must be finished as work progresses, since plates are always handled from top of structure. Stack will be brick lined for the first 100 ft. Erection of the bedding bins completed, steel for receiving bin being swung. Main building fast assuming shape should be erected in few more days. Stirling waste-heat boilers being installed, enormous amount of detail involved in this work and will probably be several weeks before installation is complete. Large shipment of Stirling boilers also received for power plant. Work resumed on cooling pond, expected concreting will begin in short time. Foundations for five 20-ft. Wedge mechanical roasters now being poured, also those for drier plant equipment. Foundations for engine-house machinery now complete.

INSPIRATION CONSOLIDATED (Miami)—Upper 400 ft. Main East shaft, Inspiration Consolidated, completed July 15; about 40 ft. remaining to be concreted in Main West shaft. Tearing out forms and false sets now in progress, as soon as all timbers are removed guides will be placed in one compartment to allow lowering timbers required for concreting lower 200 ft. Most difficult part of this work disposed of; remainder should be completed in record time. Fourth and last compressor foundation in compressor and hoist house poured during week, with walls and building foundations completed for mine transformer stations, surface concrete work at Inspiration will be finished. Carpenters erecting runways for various conveyors of crushing plant, storage bins and main transfer between the two. Total of 1500 ft. of conveyors will be used, all trippers self-propelled and self-reversible. Corrugating and carpenter work on concentrator building progressing at rapid rate, erection gang hurrying work to finish part of building over bins to avoid delaying work of finishing force. West end of concentrator bin partitioned off; as soon as riveted, will be used instead of low-line bin for storage bin for test mill. Another fine crusher, an Overstrom 36-in. grinder, being tried out at test mill. Principle is entirely new, depending for grinding action on impact alone, no direct crushing between metallic surfaces. Machine consists of impeller revolving at 1800 r.p.m. and annular die. Ore averaging 1½ in. diameter, is fed in top and hurled by centrifugal force against die with linear velocity about 18,000 ft. per min. Design of machine allows no choking, capacity limited only by power of driving motor and rate at which ore can be fed. Claimed machine now being tested will handle 40 tons per hr. Metals Recovery Co.'s pneumatic flotation machine been in continuous operation past week, seems to do good work. Different kinds of oil experimented with, little doubt it will prove efficient with proper conditions of feed and operation worked out.

CALIFORNIA

Amador County

FREMONT (Drytown)—Marko Veramenta was killed July 3 in shaft of Gover claim. With partner was doing repair work at 400-ft. level, was struck by ascending skip. Stated that in endeavor to get partner out of way was caught himself.

Calaveras County

MELONES (Melones)—New shoot of high-grade ore has been discovered on 800-ft. level.

ECONOMIC (Esmeralda)—New 20-stamp mill is ready to operate. Tunnel has been advanced beyond 800-ft. point in good milling ore

HEXTER (Mokelumne Hill)—Electric-power haulage is being installed for ore cars in 3000-ft. tunnel. It is said that pay gravel has been developed in large amount.

VICTOR LAND & MINERAL CO. (Angels Camp)—This is a new corporation organized at St. Louis by stockholders of Reiner Mining Co. to reopen Reiner mine, which has been in litigation for some time. Property is worth development, and present company states that no further work will be undertaken until money is in hand to pay cost.

Eldorado County

CALIFORNIA DIAMOND weighing ¾ carat reported found near Placerville by Frank Jones, while panning gold-bearing gravel.

RUBY CONSOLIDATED (Georgetown)—Seven properties, Aphrodite, Pluto, Proserpine, Wedge, Garfield, Garfield Extension and Little Gem have been bonded to a corporation formed by W. I. Smith and W. C. Green.

Inyo County

WILLSHIRE BISHOP CREEK (Bishop)—A new Starrett pump is being installed to unwater shaft below first level. Upper water has been bailed out. Reduction equipment, when mine starts again, will include present 10-stamp mill, a 16-ft. tube mill, 55-ton cyanide plant, Akins classifier and Portland filter. Machinery and material for these installations are on ground.

Mono County

LAKEVIEW (Masonic)—Stamp mill installed and crushing begun; 35 men employed.

NEW YORK (Masonic)—Reported bonded to J. D. Martin, San Francisco, and George G. Burris, Goldfield. Hoist installed and 200-ft. shaft being sunk.

Nevada County

OUSTOMAH GOLD MINING CO. (Grass Valley)—Company secured a superior court order restraining Grizzly Ridge Mining Co., which is operating in Oustomah mine under bond, from removing any property. There is a payment about due, and it is reported that Grizzly Ridge Co. attempted to remove some machinery and to clean mill plates. The outcome was that the lease which was held by the Grizzly Ridge Mining Co. reverted to the owner and the civil action was dismissed.

San Bernardino County

DALE DISTRICT is progressing since the Greenwater has been operating. Company is reported to have cleaned up $30,000 in June. New buildings have been added to camp. North extension of Supply group is being opened with good prospects. Ivanhoe will resume operations. Carlite group is being opened up.

PARADISE (Daggett)—It is reported that Denver men have taken over property on a purchase agreement and will build a cyanide plant, to be ready for operation in October.

ATOLIA MINING CO. (Atolia)—It is reported that leasing system recently adopted has given good returns to lessees. Five made from $200 to $1500 each, and others are reported to have cleaned up $1000 each in one month. Leasing system has been in practice in Randshurg district for several years. Whether tungsten mines will be successfully operated under lease is a problem yet to be solved.

Sierra County

KATE HARDY (Forest)—Mine attracted attention by rich bunches taken out past three years; now undergoing thorough underground exploration under direction Superintendent A. D. Grant. Two more shoots opened at depth, one showing coarse gold, other heavy arsenical sulphurets; concentrator to be added, additional equipment as development work expands.

SIERRA-GENEVA (Forest)—Property of 270 acres covering nearly mile of channel, promises to become one of most important drift mining enterprises in district. Much fine gold panned here by old-timers, but deposit was overlooked, owing to heavy growth of timber and to surface soil, until exposed a few years ago through shaft in Hardy Kate quartz mine on the east. Channel entirely below serpentine dike and crosses big Kate Hardy ledge from which rich surface pockets of gold undoubtedly fed the gravel. Old rich New Jersey claim adjoins on west and Mexico on south. Bedrock slate. Incline shaft to bottom channel on northern rim to get into dish of channel and work up-stream. M. W. Davis and seven associates, owners and operators.

Stanislaus County

CHURN DRILLING on Stanislaus River near Oak Dale reported in progress. Ground believed gold bearing. Further up river at La Grange dredging operations have been in progress several years.

Trinity County

TRINITY ASBESTOS MINING CO. (Carrville)—Construction work in progress, machinery still being hauled from Castella for asbestos treatment plant. Company contemplates railroad 1½ miles long to connect the several claims and haul lumber from saw mill; hand- or horse-tramming will be used until electric plant is completed, and then electric haulage; 46 men employed in construction and development.

Yuba County

GUGGENHEIM INTERESTS have resumed drilling dredging lands in Yuba Basin between Hammonton and old state dam. Reported drilling will also be done between dam and Park Bar bridge.

COLORADO

Lake County

WOLFTONE (Leadville)—Recent development exposed sufficient ore to maintain present heavy production at least two years.

VIRGINIUS (Leadville)—Angeli Travison, et al, have taken lease on this shaft of New Monarch company and will explore for orebody they discovered in adjoining property.

MOUNT CHAMPION (Leadville)—Manager Lucien Smith laid off most of miners in this Lackawanna Gulch property, explanation being no more ore will be produced until suitable mill be erected. Company leasing additional ground, intends to continue development.

Teller County

ELKTON (Victor)—Announcement made of 10-ft. vein carrying $30 ore on 1400-ft. level. Depth of find is important feature.

IDAHO

Cœur d'Alenes

STANISLAUS MINING & MILLING CO. (Kellogg)—This company formed to take over four claims adjoining the Bunker Hill & Sullivan, formerly known as Lincoln group.

BUNKER HILL & SULLIVAN (Kellogg)—Lessees in upper workings are seriously considering advisability of erecting concentrator near mouth of old Reid tunnel. Several have developed large amount of milling ore and figure that with mill at hand it could be treated at fair margin of profit. This would enable them to handle shipping ore more advantageously and cut down on transportation charges.

MAY DAY (Wardner)—Ore shipments begun from this group of copper claims on upper waters of North Fork River. Boats used in bringing ore down river a distance of 22 miles to railroad. Mine is two miles back from river and has good wagon-road connections. Boats can handle about two tons on down trip, are hauled back by horses; supplies for camp being brought back in boats. At present only one ton being brought down the river per trip owing to low stage of the water.

TWO MILE MINING CO.—(Osburn)—According to report, a strike of importance has been made in Two Mile group located many years and extensively developed, but no showing made to compare with that just disclosed. Tunnel started on little more than a stringer of quartz and talc. At a distance of 190 ft. another stringer came in. At this point shaft was started and about 2 ft. of what appears to be milling ore of fair grade discovered. This is substantial encouragement to all other development companies in district.

MICHIGAN

Iron

WICKWIRE (Iron River)—Orders received to place this property on full time and ship all ore mined this year and all in stock; 125 men added to payroll this week. Reported one or two other Iron River properties will increase production shortly.

BRISTOL (Crystal Falls)—No indication of immediate resumption here; no ore been shipped thus far and stockpile is large. Ore usually sells readily and management hopes to move enough before navigation closes to have stocking room so mining can be carried on next winter.

DEXTER (Ishpeming)—Cleveland-Cliffs has pumped all water from this old property, idle since 1896; examination of workings will be made at once. Probably diamond drill will be started underground to check up drilling done just pricr to time that mine shut down.

MONTANA

Cascade County

GREAT FALLS REDUCTION WORKS (Great Falls)—During recent visit of president B. B. Thayer and vice-president Kelly at Great Falls, it is reported plans were discussed for installation of new copper refinery to handle part of Anaconda product now going to Perth Amboy, N. J. Latter plant, crowded to its capacity, treating 20,000,000 lb. of blister turned out monthly by Anaconda. New plant if installed will cost about $700,000 and will be able to handle nine to ten million pounds copper per month.

Deer Lodge County

BUTTE-GEORGETOWN GOLD MINING COMPANY (Anaconda)—Under direction of expert operator placer ground near Georgetown will be tested by deep borings with Empire drill. Company has spent $40,000 in preliminary exploration work, will spend $5000 more this season for deep drilling operations to determine positively whether value of ground justifies purchase of dredging machinery for future exploration. Dr. F. L. St. Jean of Anaconda is resident manager.

Fergus County

MOCCASIN MOUNTAIN MINING CO. (Kendall)—Properties are being explored preparatory to commencing active operations. Site for a shaft has been selected and sinking will be commenced soon.

NORTH KENDALL MINING COMPANY (Kendall)—Large body low-grade gold ore opened at the North Kendall mine according to report, arrangements made to further develop deposit preliminary to active exploitation in near future.

Silver Bow County

HIGH ORE (Butte)—J. A. Leonard electrocuted on 1600-ft. level while doing repair work on two wires, one carrying 125 volts and one 250 volts. Exact manner of death unknown.

WASHOE PLANT (Anaconda)—Reverberatory furnace fitted with new pulverized-coal feeding system, has been running for week with great satisfaction.

BUTTE & SUPERIOR (Butte)—Due to labor disturbances and several holidays, June output was smallest of any month in a year. Concentrates amounted to 8600 tons, against about 10,000 tons in previous months, but running 1.1% higher than in May; average for June was 54.7%. Spelter output for the month was 9,500,000 lb.

BUTTE-BALLAKLAVA COPPER COMPANY (Butte)—Stoping on 1600 level started to exploit 6-ft. oreshoot recently encountered in face of drift, that level. Samples of ore ran 16.46% copper, 24 oz. silver, 14c. gold. Development work on level indicates continuation of oreshoot.

TUOLUMNE (Butte)—Company mining and shipping daily from 80 to 100 tons ore, carrying 4 to 5% copper. Because of sinking and other development work, mine is not quite paying expenses. Shaft is 35 ft. below the 2600-ft. level, will be continued short distance for sump. With station completed on 2600-ft. level, crosscutting will commence, expected that vein will be encountered between 250 and 300 ft. from the shaft.

BUTTE & GREAT FALLS MINING CO. (Butte)—At directors' meeting held July 10 decided to begin at once on plans for sinking to 500-ft. level. Necessary funds for this and other development work will be raised by assessment of 5c. per share on the stock which should bring in about $20,000. Churn-drilling from surface not having furnished desired information, plan of underground exploration, decided upon as more satisfactory. Power transmission line to mines, four miles north of Butte, will be put in immediately, buildings erected and machinery installed.

TIMBER BUTTE MILLING COMPANY (Butte) — Clark zinc concentrator on Timber Butte, recently started in operation, already made several shipments high-grade concentrates to Kansas smelters. Mill treats the zinc ores from Elm Orlu mine; present capacity, 500 tons per day. With millions tons ore in sight mill will probably soon be extended to capacity of 1000 tons, provided results continue satisfactory as at first. Process consists of table concentration and oil flotation according to Minerals Separation patents. Ore brought from mine to mill over company's electric railway by way of Butte, Anaconda & Pacific and Milwaukee & St. Paul.

BUTTE & LONDON (Butte)—Company added to holdings by purchase of Wall & Jackman lode claims in district west of Butte. Claims situated near Nettie mine of Anaconda comprise about 40 acres. Treasury stock given in payment. Water in property in East Butte practically lowered to the 1100-ft. level; preparations under way to lower the new electric pump for which concrete foundation is being built. Pump will have capacity of 1100 gal. per min. After installation sinking will be continued to 1600 level where Rainbow Development Co. will do large amount of development for 51% of Butte London stock.

BUTTE DULUTH (Butte)—July 7, new 1000-ton crushing plant, consisting of Blake breaker, C. I. W. rolls and Symons disk crushers was put in operation, has so far exceeded expectations. Company's energies are now directed toward completion of cell house, now in course of construction. Generator with capacity of 3600 amp. and 240 volts arrived and ready for installation. With cell house completed plant will have capacity of 1800 tons per day. Total handled by old plant during June was 3812 tons, giving 127,000 lb. copper, 85% electrolytic, 15% cement; total cost of production, 8¾c. per lb. With increased capacity, Superintendent Sherwood predicts material reduction in costs.

RAVEN COPPER COMPANY (Butte) — Understood that company's offer to sell Butte properties for $65,000 authorized by stockholders at recent meeting, will be taken up by Anaconda. Purchase price, added to the $35,000 cash on hand, equivalent to about 28c. for each of Raven shares outstanding. Effort to prevent sale being made by individual stockholders who claim property is valuable, being surrounded on all sides by large producers and because of orebodies awaiting extraction. Several years exploration work disclosed little commercial ore. Mine closed down about a year ago upon advice of qualified engineers. Raven also owns a six-sevenths interest in Snoozer claim in which large body of ore was developed in past years. This claimed by the Anaconda company as being contained in vein apexing on the Anaconda's La Platte claim. Further work on vein prevented by the Anaconda company's taking from Raven the use of Buffalo shaft through which Snoozer was worked. Raven stock then sold $8 per share.

DAVIS-DALY COPPER MINING COMPANY (Butte)—Output of company for month or more, practically nil; various rumors started concerning value of properties. Value of stock lately selling at about 60c. per share depressed. Recent exploration work in lower levels Hesperus and Belmont veins so far not encountered extensive bodies of commercial ore, but Hesperus vein has produced large bodies ore on 1400 level, likely may again in depth. Aside from prospective value of orebodies in Butte properties of company, been estimated that extensive land holdings in heart of Butte and equipment of company, if sold, would bring at least $840,000 or $1.40 per share. Besides Butte mines, company owns Hibernia and Great Republic claims, adjoining Nettie mine of Anaconda company in old silver district, three miles west of Anaconda hill. Nettie being unwatered by Anaconda to exploit extensive silver and zinc deposits known to exist; with this stage reached, value of the Davis-Daly holdings in section will be enhanced, may double present value company's assets.

NEVADA

Elko County

ELKO PRINCE (Gold Circle)—Mine being examined for English syndicate. Ore amenable to cyanide process; future plans include installation of 50-ton cyanide plant.

Esmeralda County

ATLANTA (Goldfield)—Order for one Smith-Valle 6½x15-in. triplex power pump and one 6-in. Platt high-lift, centrifugal pump placed with C. C. Moore & Co., San Francisco. Equipment will be installed in 1800-ft. shaft of Goldfield Merger Mines Co. to handle increased flow of water from long crosscut on 1750-ft. level of Atlanta.

DIAMONDFIELD MINING & MILLING CO. (Goldfield)—This lease on Goldfield Great Bend and Goldfield Daisy ground has completed addition of 20-ton cyanide plant to five-stamp mill; milling resumed. Stoping being done above east and west drifts on 75-ft. level; west drift being extended to connect with Diadem shaft on Great Bend property.

Humboldt County

JUNE PRODUCTION OF ROCHESTER is estimated at 1400 tons; value, $35,000.

ROCHESTER MINES CO. (Rochester)—Work on milling plant reported will commence in about 30 days.

SEVEN TROUGHS COALITION (Seven Troughs)—High-grade oreshoot, 10 in. wide, opened on 1150-ft. level for length of 190 ft. Sinking No. 4 winze resumed. Car of concentrates shipped to Hazen sampler gave returns of $383 per ton.

Lyon County

SMITH VALLEY MINES CO. (Yerington)—First shipment made to Thompson; regular shipments hereafter.

NEVADA-DOUGLAS (Ludwig)—Material for construction of leaching plant 125 to 150 tons capacity now at Ludwig. Plant will be built as soon as possible. First unit, 250 tons, of larger plant, will also be built soon, it is planned.

Mineral County

HIGH-GRADE ORE FROM NEW CAMP OF RAND has been shipped to Thompson smelting plant.

PINE GROVE MINING CO. (Pine Grove)—Mining discontinued for present; mill running on dump ore.

Nye County

I. W. W. TROUBLE reported in Tonopah. It is said that 30 Western Federation men, seeking to tear down placards put up by Industrial Workers in the union hall, proclaiming three miners' hotels "unfair," met resistance from the I. W. W. supporters. In melee one man drew revolver and fired. Jack Whiting, of Western Federation crowd, was shot in leg and fell. There was a rush for man who did shooting, which was quelled by the police, and man was hustled into jail. Industrial Workers been holding meetings for about three weeks; have effected organization among restaurant employees.

SUNSET (Rhyolite)—Foundation and framework of new mill completed.

BANNER TUNNEL (Telluride)—Crosscut tunnel now in 1500 ft. Columbia shaft 160 ft. deep; station is being cut at this point.

JIM BUTLER (Tonopah)—New hoisting plant being installed at Wandering Boy shaft. Drifting on south vein of Desert Queen shaft under way.

TONOPAH EXTENSION (Tonopah)—Murray vein oreshoot opened on 1020-ft. level 20 ft. wide. Drifting west in progress. On 950-ft. level, shoot has been drifted on 140 ft., face still in ore. On 1100-ft. level, crosscutting under way to find downward extension of oreshoot.

Storey County

CONSOLIDATED VIRGINIA (Virginia City)—Sale of 54,000 shares of delinquent stock has been postponed 10 days from July 7. Reason given is that settlement of north end companies' differences may have beneficial effect and induce stockholders to redeem stock.

YELLOW JACKET, CROWN POINT AND BELCHER (Virginia City)—Good progress in opening levels of these Gold Hill mines, recently unwatered. New cyanide plant nearing completion; expected that addition of this plant to mill will result in much better saving of gold.

NEW MEXICO

Bernalillo County

SANTA FE DREDGING CO. (Golden)—Company is preparing for operations by Aug. 1. Is building power plant and will install placer-mining machinery. It is estimated will work 6000 yd. of dirt per day.

Grant County

HARDSCRABBLE MINE (Pinos Altos)—J. T. Janes has completed retimbering and unwatering. Property becoming regular shipper to El Paso. Large quantity of ore now on dumps.

SILVER CELL MINE (Pinos Altos)—Property under lease to C. W. McSherry and R. H. Gudger, with F. E. Wilcox as superintendent. Drifting being done at 100-ft. level shows good chloride silver ore. Steam hoists in use and small smelting outfit is on property.

C. & O. MINING & MILLING CO. (Pinos Altos)—John Oglesby in shaft on Langston claim encountered high-grade gold ore. Shaft is on Pacific vein, which netted Bell & Wright, recent operators, $60,000. Ore occurs in small stringers and kidneys. Strike has caused much excitement in district.

Rio Arriba County

RIO CHAMA PLACER MINING CO. (Abiquiu)—Company has leased 1760 acres of dredging ground above Abiquiu; is said will put in steam shovel and later a dredge.

Otero County

HEMBRILLO COPPER MINING CO. (Tularosa)—Company is again active. Shaft is down 140 ft. and crosscut is being driven to main lode; it has been driven 1000 ft. already. Property is located in San Andres mountains, and a deposit of bismuth is reported to have been discovered near Hembrillo cañon.

Torrance County

MARYLAND-NEW MEXICO OIL & GAS CO. (Moriarity)—Company has filed incorporation papers. Intends to drill for oil in vicinity of Moriarity and Clark, Torrance County, and Stanley, Santa Fe County. Oil indications reported good where company contemplates drilling.

NEW YORK

GOLD EXCITEMENT—Some time ago local excitement was caused by report that party making general reconnaissance in field near Port Jervis was looking for gold. Now develops prospecting was for coal, not gold. Drill hole down 2000 ft., according to reports, but results not made public.

SOUTH DAKOTA

Lawrence County

WASP NO. 2 (Flatiron)—Regular monthly dividend of 1c. per share declared. Property running at full capacity, 500 tons daily.

NEW RELIANCE (Trojan)—Diamond drilling continued. Commencing first of month whole complement of 30 stamps put in commission.

ORO HONDO (Lead)—Three shifts employed in sinking three-compartment shaft. Present depth little over 1100 ft. Two pumps purchased from Homestake company, and no trouble experienced in handling water.

TITANIC (Carbonate)—Company thoroughly prospecting and sampling property with assay office established at mine. Work will require some time to complete. Company recently purchased Alhe fraction from Mrs. Ellen Holmes.

DEADWOOD ZINC & LEAD (Deadwood)—Lead City people headed by County Commissioner Thos. H. Moore, taken option on large block of stock, expect to put property on producing basis at early date. Ore carries zinc, lead, gold, silver, large percentage of pyrite.

HOMESTAKE (Lead)—Valuation of Homestake properties in Lawrence county, for taxation, for year 1914, fixed by county board of equalization at $16,864,571. Last year, after returns were raised by state tax commission value was $16,610,170. Recreation hall practically complete. Furniture for Hearst free library, which will be quartered in building, received. Nearly all other furnishings have arrived.

Pennington County

DAKOTA CONTINENTAL COPPER (Hill City)—Crosscutting still in progress from lowest level in main shaft. Management states no ore found as yet.

KEEP AGOING M. & M. CO. (Oroville)—Company will erect small test mill to crush ore extracted in shaft sinking. Shaft now 55 ft. deep; proposed to sink to 200-ft. point. Oreshoot not large, but carries good gold values.

UTAH

Juab County

EAGLE & BLUE BELL (Eureka)—Company declared sixth dividend, 5c. a share, or $44,657, making total $267,943.

GODIVA (Eureka)—Fairbairn Leasing Co. operating on the 600- and 1200-ft. levels; work on other levels undertaken soon.

MAY DAY (Eureka)—Development progressing on upper levels along vein from which lessees shipped high-grade ore early part of year.

TINTIC STANDARD (Eureka)—Winze from 1100-ft. level down 15 ft. shows mineralization. With greater depth attained drifting will start for richer part of vein to east. Second car of ore shipped recently from property.

VICTORIA (Eureka)—Small bunch gold-silver ore opened by drift on 1000 level, south of ground so far productive. On 1200 level northeast of shaft good showing in new ground also, and winze is being sunk below this level.

IRON BLOSSOM (Silver City)—In June marketed 80 cars ore, first six months present year output 462 cars, about 20,000 tons. Shipments from 400-, 500- and 600-ft. levels. New ore being opened. Quarterly dividend 10c. a share, or $100,000, be paid July 25.

MAMMOTH (Mammoth)—Closed down July 3 for few days to allow repairs to machinery. Shipments on company account from surface dumps, for some time forming large part of output, will, it is stated, be discontinued, although lessees will send out such ore from time to time.

Summit County

PARK CITY SHIPMENTS for week ending July 11, 2,295,130 lb.

GLENCOE (Park City)—In May, 75 to 100 tons of ore shipped. Stated that electric power is to be introduced.

SNAKE CREEK TUNNEL (Park City)—Tunnel in 8300 ft.; in May progress of 371 ft. was made; in June, shorter month, progress was 369 ft. Total length to be 14,300. Work being done by McIlwee company.

MINES OPERATING (Park City)—In June 12,000 to 15,000 oz. silver bullion produced. Treated daily 150 tons from old Ontario stope fillings, ore running about 10 oz. silver; extraction about 60%. New Holt-Dern roaster, soon to be installed, is estimated will make saving about $1 a ton.

DALY WEST (Park City)—Foundations hoist house, compressor, mill completed. Steel framework for hoist and machine shop up; that for the mill being finished rapidly as possible. Expected that mill will be in commission by autumn.

CANADA

Ontario

MOND NICKEL COMPANY states that the profits for the past year were £297,614.

DOME (South Porcupine)—During June 18,250 tons of ore milled, producing $83,421, an average value of $4.51.

MCINTYRE (Schumacher)—Mine in June treated 4300 tons averaging $10.65, shipped $45,795 in bullion. Unofficial statements, claiming 1,000,000 tons of developed ore, not to be relied upon.

NIPISSING (Cobalt)—Estimated net production for June, $183,558, as compared with $211,256 in May. Bullion from Nipissing and custom ore to estimated net value of $360,486 was shipped. Development at 900-ft. level proved disappointing.

HOLLINGER (Timmins)—Statement for four weeks ending June 17 shows gross profits $129,168. Mill treated 13,898 tons averaging $14.59 and made an extraction of 95.2%. Working costs, $4.57, highest figure for several months. Surplus now $859,225. Mine has paid $2,000,000 since commencement of dividends.

PORCUPINE CROWN (Timmin)—In effort to find extension of veins beyond faults, economic geologist has been employed. Mill only running six days a week and not attempting to do much more than make sufficient money for dividend requirements. Only about two years ore in reserve and strenuous efforts being made to develop new orebodies.

MEXICO

Hidalgo

SANTA GERTRUDIS (Pachuca)—H. C. Hoover, who followed A. M. Grenfell as chairman, has audited accounts of this and Camp Bird. Estimates are only $50,000 losses through Grenfell operations.

Sonora

CANANEA CONSOLIDATED (Cananea)—Company officials announced full guarantees of protection received from Constitutionalists and work to be resumed July 20. Col. P. Elias Calles said to have offered the 2500 strikers choice of working or fighting, and the 2500 chose working.

The Market Report

METAL MARKETS

NEW YORK—July 22

The metal markets generally have remained rather quiet and there are no marked changes to be noted. Price variations have been small.

Copper, Tin, Lead and Zinc

Copper—The market has been distinctly weak. The old asking prices have been no longer talked about. One of the leading producers reduced its asking price to 13⅝c., delivered, usual terms, but this simply met the actual market that previously existed and was immediately undercut by other sellers. In fact there was displayed during the last week a distinct pressure to sell from several first-hand quarters. In the early part of the week some considerable business was done at about 13⅜c., delivered, usual. terms, but in the latter part it appeared difficult to realize that price and further concessions were intimated. Sales reported for the week were both for domestic and foreign delivery. A noteworthy feature was several million-pound sales to domestic consumers for near-by delivery.

The average of the prices for electrolytic copper for the week was 13.258 cents.

The London market for standard copper has declined. Speculative sentiment was adversely affected both by the quietude of the copper market, as well as the war scare and political disturbances in Europe. On Thursday, July 16, standard spot was £61 2s. 6d., three months £61 11s. 3d. On Monday, July 20, spot was £61, and three months £61 8s. 9d. The market declined 10s. the next day, and on July 22 closed at £60 5s. for spot and £60 15s. for three months.

Base price of copper sheets is now 19c. per lb. for hot rolled and 20c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14¾@15c. per lb., carload lots at mill.

Exports of copper from New York for the week were 6850 long tons. Our special correspondent gives the exports from Baltimore at 2419 tons for the week.

Visible Supplies of Copper in Europe July 15 are reported as follows: Great Britain, 15,960; France, 5230; Rotterdam, 2900; Hamburg, 2930; Bremen, 1110; other ports, 600; total, 28,730 long tons, or 64,355,200 lb. This is an increase of 60 tons over June 30. In addition to the stocks given above, 930 tons are reported afloat from Chile and 3750 tons from Australia, making a total of 33,410 long tons.

Tin—American consumers entered the market freely during the latter part of last week. Consequently, large orders were placed by American dealers in the London market. A firmer tone developed, and quotations were advanced from day to day. At the beginning of this week, the cessation of American buying encouraged the London bear faction to become aggressive, and under their selling the market broke about £3. The close, however, is again firmer at £143 10c. for spot and £145 for three months, and about 31¾c. for July-August tin here.

Lead—The market is quiet but with somewhat more inquiry. Prices are a shade firmer and New York is quoted 3.90c.; St. Louis, 3.72½@3.77½ cents.

The London market is also somewhat firmer. Spanish lead is quoted £19 2s. 6d. and English lead £19 17s. 6d. per ton.

Exports from Baltimore for the week included 448,378 lb. lead to Liverpool and 1,121,153 to Bremen; 1,569,531 lb. lead in all.

Spelter—In the early part of the week some further round tonnages were sold at very low prices, but the improvement in the iron and steel business was later reflected in a somewhat better demand for spelter, both for early and distant shipment, and business was done at improved prices, a fairly large tonnage having been placed within the last two days at about 4.80c., St. Louis.

The London market is firm, good ordinaries being quoted £21 12s. 6d.; specials, £22 2s. 6d. per ton.

Base price of zinc sheets is $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—More inquiry is reported and business seems to be looking up, though there is little increase in actual sales. There is some pressure for business and prices do not advance. Quotations are 17.50@17.75c. per lb. for No. 1 ingots, New York.

The Aluminum Co. of America has taken title to a large plot of land at Edgewater, on the Hudson River opposite New York.

Antimony—Business is fair for the season and the tone of the market is better. Ordinary brands—Chinese, Hungarian, etc—hold at 5.40@5.70c. per lb. For Cookson's, 7.10@7.30c. per lb. is asked, with 6.80@7c for other special brands.

DAILY PRICES OF METALS

NEW YORK

			Copper	Tin	Lead		Zinc	
July	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Dts. per Lb.
16	4.8705	55⅛	13.30 @13.40	31¾	3.90	3.72½ @3.77½	4.87½ @4.90	4.72½ @4.75
17	4.8695	54⅜	13.25 @13.35	31⅞	3.90	3.72½ @3.77½	4.87½ @4.90	4.72½ @4.75
18	4.8685	54⅜	13.20 @13.30	32	3.90	3.72½ @3.77½	4.87½ @4.90	4.72½ @4.75
20	4.8700	54⅛	13.20 @13.25	32⅛	3.90	3.72½ @3.77½	4.90 @4.95	4.75 @4.80
21	4.8750	53⅜	13.20 @13.25	31⅝	3.90	3.72½ @3.77½	4.92½ @4.97½	4.77½ @4.82½
22	4.8770	53½	13.15 @13.25	31½	3.90	3.72½ @3.77½	4.92½ @4.97½	4.77½ @4.82½

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c

LONDON

		Copper				Tin		Lead		Zinc	
		Spot									
July	Silver	£ per Ton	Cts per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
16	25⅜	61⅛	13.28	61 9/16	65¼	143½	145	19⅛	4.16	21½	4.67
17	25 5/16	61 5/16	13.32	61¾	65½	144½	146	19	4.13	21½	4.67
18	25 5/16	.							....		..
20	24 13/16	61	13.25	61 7/16	65¼	145¼	147½	19	4.13	21½	4.67
21	24 9/16	60½	13.14	60 15/16	65	143¾	144½	19¼	4.18	21⅝	4.70
22	24¾	60¼	13.09	60¾	65	143½	145	19⅛	4.16	21⅝	4.70

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26¼c = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Quicksilver—With moderate demand prices are rather easier. New York quotation is $36.50 per flask of 75 lb., with 52@54c. per lb. for jobbing lots. San Francisco, $36 per flask, with about $2 less quoted for export. London price has been reduced 5s. and is now £6 15s. per flask, with £6 12s. 6d. quoted by second hands.

Minor Metals—Quotations for **Bismuth** are $1.80 per lb. for imported, $1.72 for metal from native ores—**Cadmium**, 750 marks per 100 kg.—81c. per lb.—at works in Germany—**Magnesium**, $1.50 per lb., New York—**Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, and $5 per lb. for small quantities.

Gold, Silver and Platinum

Gold—The demand for gold has subsided to some extent and there is no longer urgency in it, although European banks are still accumulating the metal. No premiums were paid on the open market in London, and the price remained at 77s. 9d. per oz. for bars; 76s. 4d. per oz. for American coin. No more gold has been taken in New York for export.

Platinum—The market does not seem to have been affected by fluctuations abroad. It continues quiet and steady. Dealers ask $43@44 per oz. for refined platinum and $46@51 per oz. for hard metal.

Our Russian correspondent writes, under date of July 8, that demand has been light, but prices are not changed. Quotations are 9.50 rubles per zolotnik a tEkaterinburg, for crude metal, 83% platinum; at St. Petersburg, 36,400@36,500 rubles per pood for the same grade. Both prices are equal to $35.72 per oz. Development and prospecting work in the Urals are on a larger scale than ever before. There is complaint of a scarcity of miners, many men having gone to work on the new railroads.

According to "Metall und Erz," the Compagnie Industrielle du Platine of Paris, which has taken an option on a share of the Westphalian platinum deposits, has dropped all negotiations after having an examination made by its own engineers.

Silver—The market declined sharply this week on selling by China hanks and lack of demand from India. Tendency continues uncertain, depending on China. After such a rapid fall some reaction is natural and the market closes steady and slightly higher at 24⅝d. in London.

Shipments of silver from London to the East, Jan. 1 to July 9, as reported by Messrs. Pixley & Abell.

	1913	1914	Changes
India	£4,044,000	£3,026,000	D. £118,000
China	417,000	40,000	D. 377,000
Total	£4,461,000	£3,966,000	D. £495,000

The total imports of silver in Great Britain for the six months ended June 30 were 47,297,160 oz., or 15,160,506 oz. less than in the first half of 1913. Exports were this year 58,151,955 oz., or 10,854,195 oz. more than the receipts. Stocks in London are estimated at 4,400,000 oz., or 11,400,000 oz. less than at the opening of the year.

Coined Silver in the United States, July 1, as estimated by the Treasury Department: Silver dollars held in Treasury against silver certificates outstanding, $490,850,000; Treasury current balances, $4,670,087; in circulation, $70,314,176; total standard dollars, $565,831,263. Subsidiary coins were $182,315,863, making a total of $748,150,126 coined silver, face value.

Gold and Silver Movement in the United States six months ended June 30, as reported by the Department of Commerce:

	Gold		Silver	
	1913	1914	1913	1914
Exports	$63,734,616	$83,374,535	$33,321,778	$22,510,170
Imports	27,909,595	30,743,422	18,131,679	12,590,464
Excess, exports	$35,825,021	$52,631,113	$15,190,099	$9,919,706

Merchandise exports this year were valued at $1,046,890,622; imports, $981,159,605; excess of exports, $65,731,017. Adding excess of gold and silver gives $128,281,836 as the total export balance.

Zinc and Lead Ore Markets

JOPLIN, MO.—July 18

Blende sold as high as $41.50, the assay base price being $38@39 and the metal base $36.50@38 per ton of 60% zinc. Calamine is $20@22 per ton of 40% zinc. The average selling price of all grades of zinc is $36.30 per ton. Lead sold as high as $17.75 on a base of $46 per ton of 80% metal content, and the average selling pprice of all grades of lead is $46.20 per ton.

The closing down of several mines tonight should offer some resistance to the declining ore market. In fact, offerings were stronger on all except the choicest grades of blende and calamine.

SHIPMENTS WEEK ENDED JULY 18

	Blende	Calamine	Lead	Values
Totals this week	10,052,030	1,020,090	1,693,510	$240,160
Totals 29 weeks	297,520,990	21,748,900	51,040,190	7,287,675

Blende value, the week, $190,660; 29 weeks, $5,819,810.

Calamine value, the week, $10,370; 29 weeks, $246,205.

Lead value, the week, $39,130; 29 weeks, $1,221,665.

PLATTEVILLE, WIS.—July 18

The base price paid this week for 60% zinc ore was $39 per ton. The base price paid for 80% lead ore was $46@47 per ton.

SHIPMENTS WEEK ENDED JULY 18

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,205,560	73,100	330,000
Year	83,309,480	2,935,710	21,749,930

Shipped during week to separating plants, 2,854,500 lb.

IRON TRADE REVIEW

NEW YORK—July 22

Business in iron and steel is still improving. New orders are coming in increased quantity. Most people are accepting the fact that prospects are improving.

More orders for rails are coming to the mills, including some which have been held up for a good while. Structural steel is a little slow, but some large contracts are under negotiations.

Steel production in the United States in 1913 is reported by the American Iron & Steel Association in long tons: Bessemer, 9,545,706; acid openhearth, 1,255,305; basic openhearth, 20,344,626; crucible and electric, 155,237; total, 31,300,874 tons, an increase of 49,571 tons, or 0.15% over 1912. New figures include all steel ingots nd direct castings.

United States Foreign Trade in Iron and Steel, five months ended May 31, is valued by the Department of Commerce as follows:

	1913	1914	Changes
Exports	$130,293,504	$93,437,847	D. $36,855,657
Imports	14,499,566	14,119,482	D. 380,084
Excess, exports	$115,793,938	$79,318,365	D. $36,475,573

There was a decrease of 28.3% in exports this year, as compared with 1913; and a decrease of 0.3% in imperts.

PITTSBURGH—July 21

The leading mills in the Central West, excepting the Chicago district, and including such concerns as Carnegie, Cambria, Republic and Jones & Laughlin, have announced as effective July 21 an advance of $1 a ton in bars, plates and shapes, to 1.15c., Pittsburgh. As to shapes and bars the advance seems to be general in the territory tributary to Pittsburgh, but as to plates there are many small mills to be heard from, and they may not advance at once.

For some time past the Chicago market has been on a basis of its own, at not over 15c. per 100 lb. over the Pittsburgh market, when the freight is 18c., and while the advance at Pittsburgh may tend to stiffen the Chicago market it does not directly involve an advance in the West.

Whether the advance will be effective in the East depends upon the action of the eastern mills. In making their advance the western Pennsylvania and Ohio mills recognized that at the start they would be giving up part of their markets, east and west, but they are content to do this and hope to gain in specifications on existing contracts at 1.10c. what they may lose in prompt business in remote territory.

An advance in wire products of $1 a ton was announced by the American Steel & Wire Co. on Saturday, effective July 20, making smooth fence wire 1.35c., wire nails $1.55, base, galvanized fence wire, 1.75c and galvanized barb wire 1.95c. The independent mills immediately advanced their prices.

Apart from these price advances the market has shown no important developments. Bookings of prompt orders in finished steel have been nearly as heavy thus far this month as in June, and thus compare favorably with the average of the first six months of the year. Contracting, on the other hand, has been heavier this month than at any time since January. The steel market has evidently rounded a turn, but progress is expected to be slow. Steel production is unchanged, at close to 65% of the full capacity.

Pig Iron—The market is quiet and unsatisfactory. Production is so small that stocks are not accumulating to any extent. We quote: Bessemer, $14; basic, malleable and No. 2 foundry, $13; forge, $12.50@12.75, at Valley furnaces, 90c. higher delivered, Pittsburgh.

Ferromanganese—The market continues very quiet, with German quoted at $37 and English at $38, Baltimore.

Steel—The market is quiet and prices are unchanged at $19 for billets and $19.50 for sheet bars, f.o.b maker's mill, Youngstown, and $19.50 for billets and $20 for sheet bars, f.o.b. maker's mill, Pittsburgh. The local mills have hopes that the market will shortly advance 50c., and some are already quoting on the advanced basis.

IRON ORE

Imports and Exports of Iron Ore in the United States five months ended May 31, long tons:

	1913	1914	Changes
Imports	895,084	520,399	D. 374,685
Exports	121,102	159,034	I. 37,962

Imports of manganese ore for the five months were 182,170 tons in 1913, and 112,622 in 1914; decrease, 69,548 tons this year.

Imports of Iron Ore in Great Britain six months ended June 30, were 4,022,620 long tons in 1913, and 3,060,639 in 1914; decrease this year, 961,981 tons. Imports of manganese ore were 350,079 tons in 1913, and 244,465 in 1914; decrease, 105,614 tons.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 264,605 short tons; shipments, 237,107 tons. Production in the Greensburg and Upper Connellsville district was 37,626 tons.

Connellsville Coke—There are freer offerings of prompt furnace coke and at slightly lower prices in the case of some odd lots. There has been a little turnover at $1.75. There is no interest in contract furnace coke on the part of furnaces now operating, as those not covered can buy spot coke without difficulty. It develops that some of the recent sales at $1.75 were for August delivery as well as July. Three or four furnacemen with idle furnaces have been sounding the market on the proposition that they would blow in and make up some stocks of pig iron if they could get coke cheap enough, as they find they can buy Lake Superior ore at low figures, lower than at any time for 10 years. We quote, prompt furnace, $1.75; contract furnace, $1.85@2; prompt foundry, $2.25@2.35; contract foundry, $2.35@2.50, per net ton at ovens.

Exports and Imports of Fuel in the United States five months ended May 31, in long tons:

	Exports		Imports	
	1913	1914	1913	1914
Anthracite	1,647,265	1,439,212	12	4,291
Bituminous	6,140,317	4,563,867	633,853	577,173
Coke	418,476	305,932	27,802	38,197
Bunker coal	3,048,493	3,165,503	.....	.....
Total	11,254,551	9,474,514	661,667	619,661

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The greater part of the trade, both imports and exports, is with Canada.

Pennsylvania R.R. Coal and Coke Tonnage on all lines east of Pittsburgh and Erie six months ended June 30, in short tons:

	1913	1914	Changes
Anthracite	95,418,231	5,654,277	I. 236,046
Bitumious	24,282,419	23,555,182	D. 727,237
Coke	7,386,908	5,227,885	D.2,159,023
Total	37,087,558	34,437,344	D.2,650,214

The total decrease this year was 7.1%. The larger part of the loss was in coke.

SAULT STE. MARIE CANAL

Freight passing through the Sault Ste. Marie canals for the season to July 1 is officially reported as follows: East bound, 11,596,306; west bound, 5,254,411; total, 16,850,717 short tons. This is a decrease of 8,544,646 tons, or 33.6%, from last year. The total number of vessel passages was 5795, showing an average cargo of 2908 tons. Mineral freights included in the totals were, in net tons, except salt:

	1913	1914	Changes
Anthracite	1,004,028	702,339	D. 301,689
Bituminous coal	5,492,001	4,038,690	D. 1,453,311
Iron ore	15,270,994	9,113,190	D. 6,157,804
Pig and manufactured iron	145,195	102,419	D. 42,776
Copper	33,532	18,287	D. 15,245
Building stone	273	....	D. 273
Salt, bbl	265,279	343,194	I. 77,915

Iron ore was 54.1%, and coal 28.3% of the total freight reported this year.

CHEMICALS

NEW YORK—July 22

The general market shows the effect of midsummer. It is quiet.

Arsenic—Demand is not large, but since the producers agreed to maintain prices there is no change. Current quotation is $3 per 100 lb. for both spot and futures.

Copper Sulphate—Business is steady and moderately active. Quotations are unchanged, $4.50 per 100 lb. being named for carload lots and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade in this article is light, as usual at this season. Prices are steady, 2.10c. per lb. being asked for spot, and 2.07½c. for futures after July.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded

	February	March	April	May	June
Alaska shipments	1,803,579	2,069,960	1.279.537	585,387	1,114,758
Anaconda	21,300,000	23,800,000	22,900,000	23,500,000	23,800,000
Arizona, Ltd.	3,062,000	3,286,000	3,570,000	3,092,000	3,742,000
Copper Queen	6,987,366	7,637,042	7,562,723	8,388,203	7,613,719
Calumet & Ariz.	5,596,850	5,875,000	5 450,000	5,495,000	4,630,000
Chino	5,642,426	5,399,814	5,926,591	5,496,875	....
Detroit	1,814,214	1,973,725	1,790,926	2,105,034	2,129.100
East Butte	1,193,960	1,546,180	1,178,000	1,179,762	1.215.323
Giroux	90,017	287,980	45,948	429,553	....
Mason Valley	1,254,000	1,250,000	862,000	916,000	....
Mammoth	1,400,000	1,800,000	1,850,000	1,750,000	1,725,000
Nevada Con.	4,588,243	5,218,257	4,880,043	4,959,589	4,483,175
Ohio	582,000	597,520	610,518	625,000	....
Old Dominion	3,066,000	2,997,000	2,779,000	3,302,000	2,937,000
Ray	5,432,000	6,036,908	6,089,362	6,300,847	6,039,710
Shannon	903,761	1,082,000	1,012,000	1,056,000	....
South Utah	333.874	406,381	247,641	55,394	....
Tennessee	1,232,812	1,262,184	1,370,800	1,336,950	....
United Verde*	2,700,000	3,100,000	3,000,000	3,100,000	....
Utah Copper Co.	9,207,111	12,323,493	12,739,757	13,208,483	....
Lake Superior*	8,500,000	11,000,000	13,000,000	12,500,000	16,000,000
Non-rep. mines*	7 600,000	8,200,000	8,000,000	8,200,000	....
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	....
Total prod.	96,790,213	109,649,444	108,644,846	110,082,077	....
Imp., bars, etc.	19.918.448	22,676.605	17,043,191	19,081,487	....
Total blister	116,708,661	132,326,049	125,688,037	129,163.564	....
Imp. ore & matte.	9,713,164	7,029,646	10,400,122	10,586,506	....
Total Amer.	126,421,825	139,355,695	136,088,159	139,750,070	....
Miami†	3,316,482	3,361,100	3,130,772	3,347,000	3,124,750
Shattuck-Arizona	1,134.480	1,136,458	1,386,594	1,353,043	1,225.987
Brit. Col. Cos.:					
Granby	1,661,212	1,775,852	1,692,102	1,669,334	....
Mexican Cos.:					
Boleo†	1,984,080	2,535,680	2,204,720	2,213,120	2,204,720
Cananea	2,688,000	4,260,000	2,632,000	2,222,000	....
Moctezuma	2,642,543	2,882,884	2,654,926	2,834,616	3,370,800
Other Foreign:					
Braden, Chile	2,362,000	1,810,000	2,720,000	2,480,000	741,440
Cape Cop., S. Af.	459,200	660,800	468,160	582,400	732,480
Kyshtim, Russia.	1,534,400	....	....	....	....
Spassky, Russia.	902,720	896,000	904,960	907,200	....
Exports from					
Chile	6,720,000	6,944,000	9,072,000	7,616,000	7,840,000
Australia	7,952,000	8,176,000	7,168,000	8,400,000	5,712,000
Arrivals–Europe‡	18,354,560	17,572,800	17,299,520	13,558,720	19,040,000

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡ Does not include the arrivals from the United States, Australia or Chile.

COPPER STATISTICS

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	....	....	....
VII, '13	138,074,602	58,904,192	78,480,071	52,814,606	77,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr., '13	1,622,450,829	767.261,760	869,062.784	....	....	.. ...
I, 1914	131.770.274	47,956,955	87.955.501	91,438.867	53,918,800	145.355,667
II	122,561.007	47,586,657	83.899,183	87.296,685	50,108,800	137,405.485
III	145,651,982	69,852,349	89.562.166	78,371,852	47.376.000	125,747,852
IV	151,500.531	63.427,633	82.345,216	64,609,319	46,435,200	111.044,519
V	142,308,287	55,592,170	72,710,477	70,337,001	52,371,200	122,708,201
VI	141,345,571	46,227,353	73,350,196	84,342,641	61,062,400	145,405,041
VII	....	....	....	106,110,663	64,220,800	170,331,463

Note—Visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev.	Aug. 10	Aug. 31	$0.03
Aurora-Sampson, Ida	July 18	Aug. 18	0.002
Challenge Cons., Nev	July 21	Aug. 11	0.05
D. & M., Utah	July 11	July 31	0.05
Emerald, Utah	July 15	Aug. 18	0.0033
Enterprise, Ida	July 31	Aug. 17	0.002
Evergreen, Utah.	July 23	Aug. 22	0.01
Federal-Ely, Nev.	July 20	Aug. 21	0.005
Four Timbers, Wash	July 29	Aug. 29	0.0015
Hamburg-American, Ida post'd	...	Aug. 6	0.001
Holy Terror, Ida	July 15	Aug. 15	0.0005
Idaho-Nevada, Ida	July 7	Aug. 1	0.001
Jack Waite, Ida.	July 21	Aug. 18	0.01
Moonlight, Ida...	July 13	Aug. 20	0.005
Nabob, Ida	July 20	Aug. 17	0.005
New Hope, Ida..	July 13	Aug. 13	0.002
North Star, Ida.	July 10	Aug. 8	0.0015
Old Evergreen, Utah	July 23	Aug. 22	0.01
Oreano, Ida.	July 24	Aug. 24	0.002
Paymaster, Ida.	July 15	Aug. 12	0.002
Reeds Peak, Utah.	July 6	Aug. 10	0.005
Santaquin King, Utah	July 11	July 27	0.0025
Silver Pick, Nev.	June 22	July 27	0.01
Smuggler, Utah.	July 11	Aug. 11	0.005
Spider, Utah....	July 21	Aug. 18	0.0025
Sunrise, Ida..	July 14	Aug. 24	0.002
Sunset, Ida	July 10	Aug. 1	0.002
Utah-United, Utah	July 6	July 27	0.01
Wasatch-Utah, Utah.	July 13	Aug. 17	0.01
West Century, Utah	Aug. 2	Aug. 24	0.005

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.612	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26.788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	58.175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25.948
July	60.654	58.721		27.919	27.074	
August	61.606	59.293		28.375	27.335	
September	63.078	60.640		29.088	27.986	
October	63.471	60.793		29.299	28.083	
November	62.792	58.995		29.012	27.263	
December	63.365	57.760		29.320	26.720	
Year	60.835	59.791		28.042	27.576	

New York quotations cents per ounce troy, fine silver, London, pence per ounce, sterling silver 0.925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	71.741	64.304	77.750	69.488
February	14.971	14.491	65.519	65.259	71.575	70.188
March	14.713	14.131	65.329	64.276	70.658	69.170
April	15.291	14.211	68.111	64.717	74.273	69.313
May	15.436	13.996	68.807	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14.190		64.166		69.416	....
August	15.400		69.200		74.313	....
September	16.328		73.125		78.614	....
October	16.337		73.383		79.250	....
November	15.182		68.275		73.825	
December	14.224		65.223		69.583	
Year	15.269		68.335		73.740	

New York, cents per pound London, pounds sterling per long ton

TIN

Month	New York		London	
	1913	1914	1913	1913
January	[illegible]	[illegible]	[illegible]	171.905
February	[illegible]	[illegible]	220.140	181.556
March	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	150.702
June	[illegible]	[illegible]	[illegible]	138.321
July	[illegible]		[illegible]	
August	[illegible]		[illegible]	
September	[illegible]		[illegible]	
October	[illegible]		[illegible]	
November	[illegible]		[illegible]	
December	[illegible]		[illegible]	
Av. year	[illegible]		[illegible]	

New York in cents per pound London in pounds sterling per long ton

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4.048	4.175	3.937	16.550	19.606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3.688	17.597	18.225
May	4.342	3.900	4.226	3.808	18.923	18.503
June	4.325	3.900	4.190	3.810	20.226	19.411
July	4.353		4.223		20.038	...
August	4.624		4.550		20.406	...
September	4.698		4.579		20.648	...
October	4.402		4.253		20.302	......
November	4.293		4.146		19.334	...
December	4.047		3.929	.....	17.798	...
Year	4.370		4.238	.....	18.743	

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5.228	25.338	21.413
March	6.078	5.250	5.926	5.100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5.074	5.256	4.924	24.583	21.393
June	5.124	5.000	4.974	4.850	22.143	21.345
July	5.278		5.128		20.592	......
August	5.658		5.508		20.706	.....
September	5.694		5.444		21.148	......
October	5.340		5.188		20.614	.....
November	5.229		5.083		20.581	.....
December	5.156		5.004		21.214	..
Year	5.648		5.504	.....	22.746	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14.94	$17.35	$13.23	$18.59	$13.90
February	18.15	15.06	17.22	14.12	18.13	14.09
March	18.15	15.07	16.96	13.94	17.53	14.18
April	17.90	14.90	16.71	13.90	16.40	14.10
May	17.68	14.90	15.80	13.90	15.40	14.23
June	17.14	14.90	15.40	13.90	15.10	13.97
July	16.31		15.13		14.74	....
August	16.63		15.00		14.88	..
September	16.65		15.04		14.93	....
October	16.60		14.61		14.80	...
November	16.03		13.91		14.40	....
December	15.71		13.71		14.28	.....
Year	$17.09		$15.57	...	$15.77	

STOCK QUOTATIONS

COLO SPRINGS July 21	
Name of Comp.	Bid.
Acacia	.02¼
Cripple Cr'k Con	.006
C. K. & N	.06½
Doctor Jack Pot	.05¾
Elkton Con.	.47
El Paso	1.45
Findlay	.009
Gold Dollar	.03
Gold Sovereign	01
Golden Cycle	1.00
Isabella	10
Jack Pot	.05
Jennie Sample	03
Jerry Johnson	02½
Lexington	004
Old Gold	01
Mary McKinney	52
Pharmacist	009
Portland	1.09
Vindicator	1.00

SALT LAKE July 17	
Name of Comp.	Bid.
Beck Tunnel	03½
Black Jack	.05
Cedar Talisman	‡.00½
Colorado Mining	11½
Crown Point	‡01½
Daly-Judge	5.00
Gold Chain	09
Grand Central	74
Iron Blossom	1.27½
Little Bell	13
Lower Mammoth	.00½
Mason Valley	2.12½
May Day	06½
Opohongo	‡01
Prince Con	18
Silver King Coal'n.	2.92½
Silver King Cons	1.77½
Sioux Con.	02
Uncle Sam	04
Yankee	02¼

TORONTO July 21			
Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	00½	Foley O'Brien	28
Coniagas	7.00	Hollinger	18.35
Peterson Lake	34½	Imperial	.01½
Right of Way	03	Jupiter	05½
T. & Hudson Bay	35.00	Pearl Lake	.02½
Timiskaming	13	Porcu. Gold	.05
Wettlaufer-Lor	06	Preston E. D.	01½
Big Dome	8.95	Rea	20
Crown Chartered	‡00½	Swastika	01
Dome Exten.	.08¼	West Dome	05

SAN FRANCISCO July 21			
Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.06	Belmont	6.30
Belcher	.28	Jim Butler	1.00
Best & Belcher	.04	MacNamara	.01
Caledonia	.54	Midway	.18
Challenge Con.	.08	Mont. Tonopah	.55
Chollar	.02	North Star	.22
Confidence	‡.22	West End Con.	.65
Con. Virginia	.14	Atlanta	.14
Crown Point (Nev.)	.31	Booth	.04
Gould & Curry	.03	C.O.D. Con	.02
Hale & Norcross	.05	Comb. Frac.	.04
Mexican	.45	Jumbo Extension	.18
Occidental	.75	Pitts.-Silver Peak	.30
Ophir	.13	Round Mountain	.36
Overman	.23	Sandstorm Kendall	.05
Potosi	.01	Silver Pick	.05
Savage	.05	Argonaut	‡3.00
Sierra Nevada	.05	Brunswick Con	1.50
Union Con	.09	Central Eureka	.12
Yellow Jacket	.39	So. Eureka	1.37

N. Y. EXCH. July 21	
Name of Comp.	Clg.
Amalgamated	69¾
Am.Sm.&Ref.,com	66¼
Am. Sm. & Ref., pf.	103¾
Am. Sm. Sec., pf. B.	81¾
Anaconda	31½
Batopilas Min.	1
Bethlehem Steel, pf.	84½
Chino	40¾
Colo. Fuel & Iron	25¾
Federal M. & S., pf.	33
Great Nor., ore., ctf.	30½
Guggen. Exp.	53½
Homestake	113
Inspiration Con.	18¾
Mex. Petroleum	65½
Miami Copper	22¾
Nat'l Lead, com.	43
National Lead, pf.	106½
Nev. Consol	13¾
Ontario Min	2½
Phelps Dodge	175
Quicksilver, pf.	1¾
Ray Con.	20¾
Republic I&S, com.	22
Republic I&S, pf.	84½
SlossSheff'd, com	27
Sloss Sheffield, pf.	84½
Tennessee Copper	33½
Utah Copper	56¾
U. S. Steel, com	61¼
U. S. Steel, pf.	109¾

N. Y. CURB July 21	
Name of Comp.	Clg.
Beaver Con.	.24
Big Four	05
Boston Montana	‡9¾
Braden Copper	7¾
B. C. Copper	1¾
Buffalo Mines	1¼
Can. Cop. Corpn.	2
Can. G. & S.	.08½
Caribou	.48
Chambers Ferland	.14
Con. Ariz. Sm.	50
Cons. Nev.-Utah	¾
Coppermines Cons	1¾
Davis-Daly	‡58
Diam'field-Daisy	04
Ely Con.	05
Florence	33
Gold Hill Con	‡7/16
Goldfield Con.	1¾
Greene Cananea	32
Kerr Lake	5¼
La Rose	¾
McKinley-Dar-Sa.	54
Mines of Am.	3
Mother Lode	‡26
Nevada Hills	30
New Utah Bingham	‡¾
Nipissing Mines	5¾
Ohio Copper	¾
Oro	.08½
Puebla S. & R.	2¼
Stand'd Oil of N.J.	403
Stand'd Silver Lead	1¾
Stewart	1 5/16
Tonopah	6¾
Tonopah Ex.	2¼
Tonopah Merger	32
Tularosa	5/16
West End Ex	03
Yukon Gold	2 5/16

LONDON July 10	
Name of Comp.	Clg.
Camp Bird	£0 8s 0d
El Oro	0 13 3
Esperanza	0 15 0
Mexico Mines	4 17 6
Oroville	0 11 3
Santa Gert'dis	0 12 6
Stratton's	‡0 0 6
Tomboy	1 1 10½

BOSTON EXCH July 21	
Name of Comp.	Clg.
Adventure	1¼
Ahmeek	268
Alaska Gold M.	27¼
Algomah	.95
Allouez	39½
Am. Zinc	14¾
Ariz. Com., ctfs.	4¾
Bonanza	.51
Butte-Ballaklava	2¼
Butte & Superior	36¾
Calumet & Ariz.	65¾
Calumet & Hecla	402
Centennial	16½
Cliff	1
Copper Range	35¾
Daly West	2
East Butte	9¾
Franklin	4
Granby	78¼
Hancock	13½
Helvetia	.30
Indiana	3½
Island Cr'k, com.	48
Island Cr'k, pfd.	88
Isle Royale	19½
Keweenaw	3¼
Lake	6
La Salle	3
Mass.	4¾
Mayflower	5¼
Michigan	.69
Mohawk	45
New Arcadian	4½
New Idria Quick	‡3½
North Butte	24¾
North Lake	1¼
Ojibway	.90
Old Colony	4½
Old Dominion	49½
Osceola	76
Quincy	55¾
Santa Fe	1¾
Shannon	5
Shattuck-Ariz.	22¾
Superior	27
Superior & Bost.	1¾
Tamarack	33
Trinity	3¼
Tuolumne	35
U. S. Smelting	35¾
U. S. Smelt'g, pf.	46¾
Utah Apex	1½
Utah Con.	10¼
Victoria	2
Winona	2¾
Wolverine	39
Wyandot	50

BOSTON CURB July 21	
Name of Comp.	Bid.
Bingham Mines	04½
Boston & Corbin	.28
Boston Ely	25
Butte & Lon'n Dev.	27
Calaveras	1 5/16
Calumet-Corbin	.12
Chief Cons.	83
Corbin	.90
Cortez	.32
Crown Reserve	1 3/16
Eagle & Blue Bell	.90
First Nat. Cop.	1¾
Houghton Copper	2
Majestic	19
Mexican Metals	.21
Nevada-Douglas	1¼
New Baltic	1¾
Oneco	.55
Raven Copper	12
Smokey Dev.	.15
So. Lake	3¼
S. W. Miami	‡1
Tonopah Victor	.36
Trethewey	17
United Verde Ext.	.75

‡Last Quotations.

The Engineering and Mining Journal

VOLUME 98 AUGUST 1, 1914 NUMBER 5

Stoping Methods at the Golden Cross Mine

By Andrew W. Newberry*

SYNOPSIS—At the Golden Cross in Imperial County, Calif., development and stoping are conducted under the unfavorable condition of flat dips and vertical faulting at right angles to the strike. Workings are dry, however, and orebodies of good width. Depletion of ore reserves by previous operation prohibits elaborate methods of mining. Simple but ingenious scheme worked out for handling material on the flat dips, using fixed steel chutes. Development involves "dip raises" and "crosscut raises." Costs of drifting, raising and stoping.

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The Golden Cross mine, along with its neighbors, the Golden Crown and Golden Queen, is situated in the arid region of southeastern California, 15 miles northwest of Yuma. All three mines were operated extensively in the past, and produced a large tonnage of medium-grade ore from which only a fair extraction was made. All are accessible, but the Golden Cross was selected by the present operators after careful sampling of the group, and has produced steadily since Oct. 1, 1913, the rate at present being about 90 tons per day. Some of the surface arrangements are illustrated in Figs. 1, 2 and 3, furnished by D. Hanson, assayer at the Golden Cross.

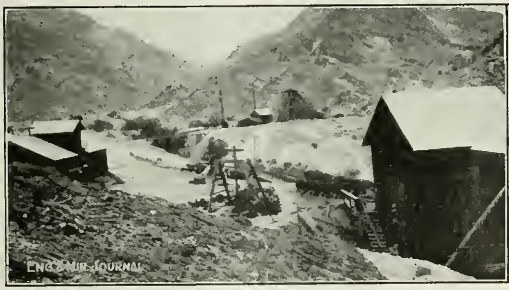

Fig. 1. Surface Plant

Crusher building on right in foreground. Outcropping aplite dike behind headframe

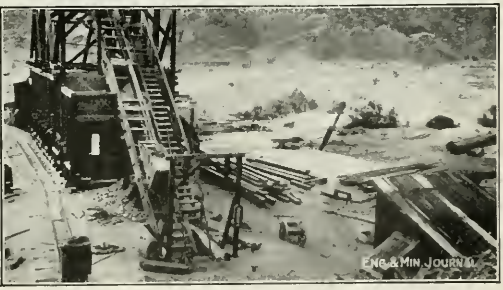

Fig. 2. Collar of Incline

Skip and 200-ton bin

General Geology

The country rock is a gray mica-schist stained brown at the surface and outcropping in the low hills known as the Chocolate Range. The schist has been extensively intruded by aplite, which is locally known as pegmatite, although the latter term is strictly applicable only to the larger dikes. The beds have a fairly uniform dip, varying from 32° near the surface to 24° at a depth of about 1000 ft. The deposition of the ore followed certain layers which were subsequently faulted so as to give the impression of separate and distinct oreshoots, whereas in reality only one shoot of ore has been definitely proved. The aplite intrusions already mentioned are later than ore deposition, and the faulting, which affects both the dikes and mineralized strata, is later than both. The principal fault planes are nearly vertical and approximately perpendicular to the strike. Hence they cut the orebody (assuming that there was originally only one mineralized bed) into blocks which are fairly continuous on the dip. Displacements up to 150 ft. have been noted in connection with the stronger faults. Between two of the more important faults or between one of them and the end of the oreshoot, step faults, roughly parallel to the major fault, are not uncommon. These show displacements up to 12 ft. with little or no fault breccia, so that their exact position is often difficult to determine until the ore is found on both sides. As the ore is similar in appearance to the altered or silicified country rock, close sampling is necessary. The occurrence of step faults and their relation to the major fault is illustrated in Fig. 4, which is a section along the strike and perpendicular to the dip of part of the orebody looking upward on the dip. The manner in which it is taken is shown in Fig. 6.

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METHOD OF DEVELOPMENT

The main incline, through which the mine was originally opened, is 1250 ft. in depth on a dip of 30°. Although the bottom is approximately at sea level, the sump is dry. Stations and 20-ton ore pockets are located at 100-ft. intervals along this shaft, which with depth passes out of the ore zone at its western extremity. Most of the mining is now carried on below the 600-ft. level, where the shaft lies wholly in the country rock and where the strata have an average dip of 26°. Assuming this dip and an average thickness of 10 ft. for the oreshoots below the 600-ft. level, which is a close approximation, the level interval in the stopes, or the distance between haulage drifts on the dip, figures out at 113 ft., the additional 13 ft. being accounted for by the difference between the 30° dip of the shaft and the 26° dip of the oreshoots.

At the time that present operations were begun, most of the levels had encountered the ore, and maps and models has been made which greatly facilitated the driving of new drifts and the extension of those which had not yet reached the ore. Referring to Figs. 4, 5 and 6, which are typical of a level where further drifting was necessary to cut the oreshoot; section *C* is first developed by drifting along the foot wall; the foot and hanging of sections *A* and *B* are then determined by "crosscut raises" driven perpendicular to the bedding and sampled by means of the stoping drill, as described in the JOURNAL, Apr. 4, 1914, under the title, "Drill Hole Samples in Raising."

FIG. 3. MILL AND BELT CONVEYOR, LOOKING NORTHWEST

Section *D*, having been proved on the level immediately above, is developed by a branch drift or crosscut from the haulage level in question. This is best driven from *C*, giving opportunity to raise at *P* and possibly also at *Q* and mine the upper part of *D* through these raises. It would also be possible to crosscut from *A* and shorten the tram, but this would not permit mining through *P* and *Q*.

Section *A*, which, on the level in question, is of greater importance than *B* or *C*, is developed in the same manner as soon as the foot wall of the orebody has been definitely determined by the crosscut raise. That portion of section *B* which lies below the crosscut raise, would ordinarily be left as a pillar until *A* and *C* are stoped out. The upper part of *B* is stoped along with *A* and *C*, the broken ore going to a chute which is built in the crosscut raise, except that portion to the right of *MN*, which is handled most economically through stope *C*, provided the face of the latter stope is kept somewhat in advance of *B*, as stoping proceeds up the dip. The manner of this development is shown in plan and section, Figs. 4, 5 and 6.

None of the fractional oreshoots left by previous operations is sufficiently large to warrant the installation of mechanical appliances for ore handling, such as shaking chutes or gravity planes, in the stopes themselves. Nor is the grade of the ore, which runs on an average from $7 to $10, high enough to justify such means. The dip of the beds is too flat to permit the broken ore to slide by gravity even on steel chutes set at the dip angle, and is too steep for wheelbarrow work. Various combinations of wheelbarrow and fixed chute were tried and the method described under the head of "stoping" was finally evolved, with minor alterations to fit special cases.

DIP RAISES

In the upper part of the mine where the dip of the formation exceeds 30°, it has been found expedient to connect two levels, through the orebody, by means of at least one 6x8-ft. "dip raise," the name locally applied to a raise which follows throughout its extent the dip of the strata. The principal object of such a connection is to afford ventilation. Of the various methods tried for the handling of broken material on a flat dip, the fixed steel chute was found most satisfactory and has been adopted throughout the mine. The dry ore with a considerable proportion of fines is found to slide best on a dip of 32°. At 30°, the fines have a tendency to hang up and block the chute, while at 34° the slide is so rapid that many of the larger pieces jump out. The ideal arrangement for long chutes was found to be a dip of 34° for the first 10 ft., flattening gradually to 31°, an average of about 32°. This arrangement, for obvious reasons, is only approximated in practice. With dips as flat as 30°, the raise is begun at the foot wall of the ore on the lower level and terminated close to the hanging wall on the upper level, giving an average inclination of 32° without breaking into the wall rock.

NO RAISES WHERE THE DIP IS UNDER 30°

Where the dip of the beds is less than 30°, and this is the condition under which most of the present operations are carried on, dip raises from level to level would have added considerably to the cost of mining. The scheme followed is to carry up the stope the full thickness of the ore for a distance of 60 to 70 ft., placing the chutes as shown in Fig. 8, and keeping them up to within shoveling distance of the face. When the stope has been advanced to this point, it is necessary either to install some means of forced ventilation, which is done in case the orebody is not developed on the level next above; or better, to drive a dip raise along the foot wall to hole into the drift on the upper level, which is the plan followed wherever possible. Such a raise is kept as small as is consistent with proper breaking, about 4½x6½ ft. The broken ore is handled in wheelbarrows which are run up on temporary ore fills and dumped into the chute. As the raise is advanced, successive cuts parallel to *EF*, Fig. 8, are taken off the hanging wall to provide head room, part of the broken ore being left as a temporary fill. In this way the wheelbarrow runway is flattened somewhat and the handling of the muck from the dip raise is facilitated.

Taking section *C*, of Figs. 4, 5 and 6, as an example, stoping is begun at one end and a 4-ft. cut taken off the same height as the drift, using a one-man piston machine, the holes being pointed approximately up the dip. Fig. 7 illustrates the manner in which this first cut is made. After the first cut, the piston machine is replaced by a stoper and the ore next the hanging broken on 2x12-in. boards laid on the track level. The face is then carried upward on the dip full width with a series of cuts similar to the first except that the stoper is used. These latter cuts are somewhat shallower than the first, averaging about 3 ft. 3 in. When the face has been advanced 10 ft. over the full stoping length, a pair of 10x10-in. stulls is placed as shown at *R*, Fig. 8. These stulls are set 5 ft. 10 in. center to center and as near the middle of the stope as possible, allowing for the pitch of the oreshoot. Other stulls, usually 8x8 in., are placed at intervals along the strike where needed. Pillars are left only in exceptional cases.

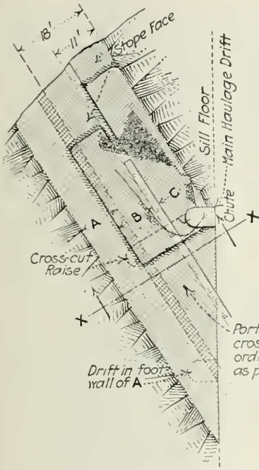

FIG. 6 - SECTION Y-Y

PLAN AND SECTIONS, SHOWING RELATIONS OF RAISES, DRIFTS, CROSSCUTS AND STOPES

TELESCOPING CHUTES

When the stope face has been advanced four rounds (about 14 ft.), the bulk of the broken material no longer falls on the track. A steel chute *W*, Fig. 9, then serves for loading cars. The lower end of the chute rests on the edge of the car and the upper end is either supported by blocks to give the necessary inclination or suspended from a plug in the hanging by means of a clevis. In this way the trammer can load his own car. After the next cut has been made, the chute *V*, Fig. 9, is brought in and bolted inside of *W* with four ½-in. bolts. As the face is advanced, the chute is extended until the two parts overlap only 25 in., giving a total length of 17 ft. 11 in. Only one or two telescope chutes are used in a stope as they are readily moved from place to place.

The details of construction are shown in Fig. 9. Sheets of No. 10 tank steel 30 in. wide by 10 ft. long are bent cold and drilled with $\frac{5}{16}$-in. and ½-in. holes, spaced as shown. A chute similar to type *W*, but with the ½-in. holes drilled at each end only, is used for the fixed chutes referred to under dip raises. As only one, or at most two, stopes are brought in at one time, four of the inner chutes *V* answer for the whole mine and the bulk of the sheets are made up in form *W*.

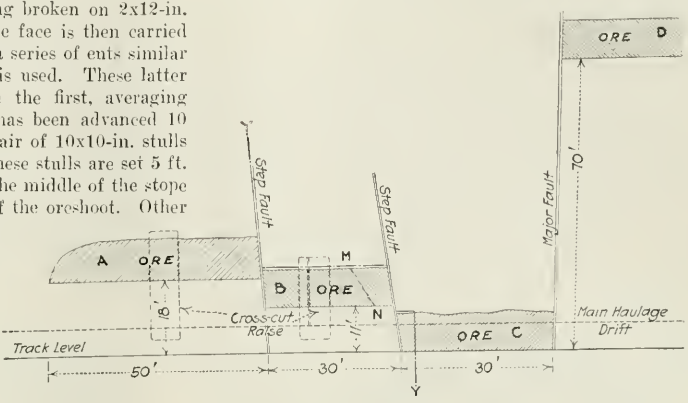

FIG. 4 - SECTION X-X

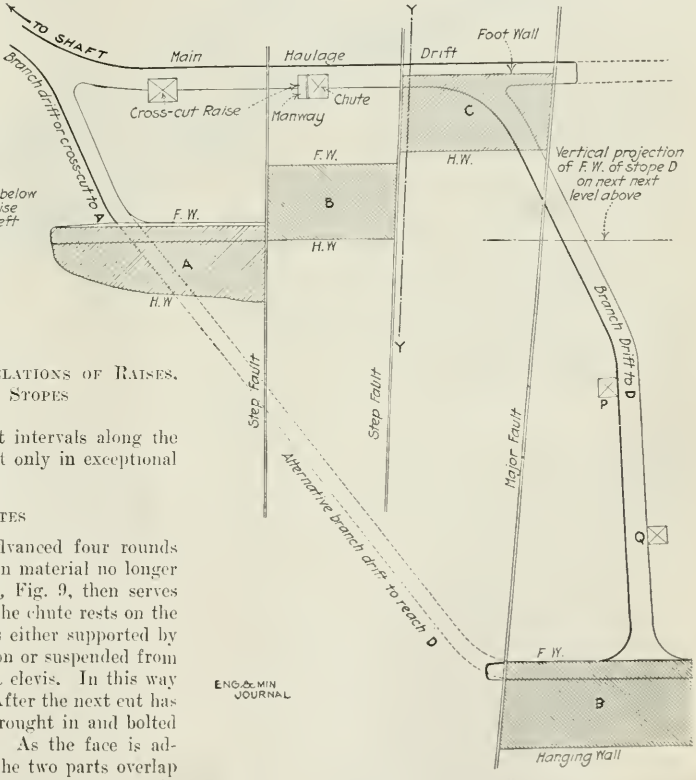

FIG. 5 - PLAN OF MAIN HAULAGE LEVEL

Stoping Method

While the broken ore is being loaded by means of telescope chutes, the two 10x10-in. stulls *R*, Fig. 8, are tied with a 6x8-in. crosspiece and long bolt, and a shoveling platform *S* is constructed of 2-in. planking inclined downward toward the track on an angle of 10°. This is next covered with two sheets of tank steel of the same dimensions as that used for the chutes. As soon as the face has advanced too far to be reached by the telescope chute extended, the latter is done away with, and other pairs of stulls, *U*, Fig. 8, are placed, roughly in line with *R*, and spaced 9 ft. 9 in. center to center on the dip; 8x8-in. timber is used in all stulls except *R*. The pairs of stulls *U* are connected with 4x6-in. tiepieces, resting on 2x6-in. blocks nailed to the stulls, and turned so that the 6-in. surface in each case carries the two steel chutes *TT*, which are butt-connected at these points; the chutes being set at a steeper angle than the foot wall, the 9-ft. 9-in. spacing of the stulls accommodates nicely the 10-ft. chute lengths; 40-penny nails, driven through the $\frac{5}{16}$-in. holes in the ends of each chute, hold the latter in place, and the straps shown in Fig. 9 are bolted, like fish plates, both inside and outside for greater solidity. A drop of 18 in. is allowed between the lower end of the fixed chute *T* and the platform *S*, Fig. 8. The two lower chutes are set up at an angle of 31° with the horizontal, the next two at 32°, and the fifth and last at 34 degrees.

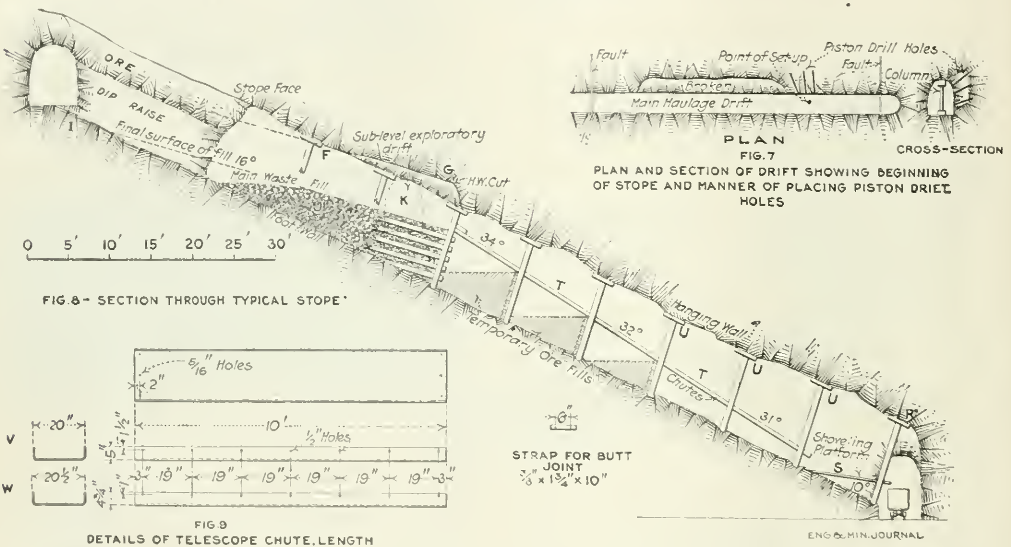

FIG. 7
PLAN AND SECTION OF DRIFT SHOWING BEGINNING OF STOPE AND MANNER OF PLACING PISTON DRILL HOLES

FIG. 8 – SECTION THROUGH TYPICAL STOPE

STRAP FOR BUTT JOINT ⅜" x 1¾" x 10"

FIG. 9
DETAILS OF TELESCOPE CHUTE, LENGTH EXTENDED 17'-11"

Beginning of Stope, Stope Section and Details of Steel Chute

As the difference between chute and foot wall increases, shoveling becomes more difficult. Moreover, when the face has advanced beyond the reach of the telescope chute, a considerable proportion of the broken ore, say 60% on a stoping length of 35 ft., must be brought to the fixed chute in wheelbarrows. The latter difficulty suggests the installation of shoveling platform and chutes in duplicate, but there is no saving on the stoping length assumed. The plan followed when the chute has reached a height of 4 ft. above the foot wall, is to lag against the stulls the full length of the stope and allow the broken ore to lie where it falls until a temporary fill is completed as shown in Fig. 8. This serves as a wheelbarrow runway for moving the ore from the ends of the stope. When a stope has been finished, these fills are mucked out.

The amount of ore tied up in this way is not large until the stope has been advanced 60 to 70 ft., and at this point, the method is varied somewhat. Stoping proper is stopped until the dip raise above mentioned has holed through. As the drills are operated only on the day shift, and the average daily advance is 2.5 ft., this requires about three weeks. Meanwhile, the ore over the raise is slabbed off as described under dip raises, to provide head room, and a narrow fill is made in the space later occupied by the main waste fill, as shown.

While the dip raise is in progress, some exploratory work is undertaken beyond the lateral stoping limits. This generally takes the form of two sublevel drifts *K*, Fig. 8, one at each end of the stope, driven from a point a little above the middle. Such work furnishes material for the main waste fill, which is built up from the ends of the stope toward the dip raise until it encounters the central ore fill. The latter is then mucked out and a cut *FGH* made in the hanging wall about 3.5 ft. wide to provide head room for the dumping of wheelbarrows in the upper part of the stope. Holes, 12 to 14 in number, drilled with the stoper, suffice for the hanging-wall cut, and the waste produced fills the space previously occupied by the last temporary ore fill, the width of which is limited by that of the dip raise.

As soon as the dip raise holes into the next level, stoping is begun again, breaking toward the raise. Fig. 8 illustrates this last phase. It shows the stope face advanced about 25 ft. along what was previously dip raise, with 20 ft. still to be broken. The main waste fill is almost completed, its final surface being the dotted line *IJ*. Waste for this part of the fill may be obtained most cheaply from development on the upper level. The final surface, inclined at 16° with the horizontal, affords easy wheelbarrow grade from any part of the stope.

The aplite dikes which are often present in the oreshoot constitute a further source of waste. This material, where reasonably hard and unaltered, may be easily sorted from the broken ore, and used for permanent filling in place of the temporary ore fills.

COSTS

In driving the main-haulage drifts an average advance of 2.8 ft. per machine shift is maintained. Seven- and eight-hole rounds are employed, using 23 to 30 sticks of du Pont blasting gelatin, depending on the hardness of the ground. Piston-machine men earn $3.50 per 8-hr. shift; timbermen and trackmen, $3.50; and trammers, $2.50. Muckers and trammers and most of the machinemen are Mexicans. Faces are mucked out on the night shift, affording a clean set-up. Tunnel sets are seldom needed. The cost per foot of drift or crosscut averages about $4.64, distributed as in Table I:

TABLE I. DRIFTING COST PER FOOT

Labor, breaking	$1.25
Labor, mucking and tramming	0.90
Labor, track and pipe	0.08
Labor, blacksmith	0.22
Explosive	0.80
Track (rails, ties, etc.)	0.30
Pipe and fittings (1½ in.)	0.10
Candles and lubricating oil	0.09
Power and water	0.64
Drill repairs	0.05
Blacksmith coal and drill steel	0.06
Superintendence	0.15

The power charges of Tables I, II and III are figured as follows

Average charge against mine for power and water, Jan. 1, 1914 to Apr. 1, 1914, per day, $16.

Machine drills operated, daily average: Piston machines, drifting and stoping, 5; stopers, raising, 3; stopers, stoping, 3.

Charging power to stopers and piston machines in the ratio 2/3 to 1:

Five piston machines use $\frac{5 \times 1}{9}$ = 56% of the total + $8.96.

Three stopers raising use $\frac{3 \times \frac{2}{3}}{9}$ = 22% of total = $3.52.

Three stopers stoping use $\frac{3 \times \frac{2}{3}}{9}$ = 22% of total = $3.52.

Five piston machines at 2.8 ft. per machine will drive 14 ft. per shift. $8.96 ÷ 14 = $0.64 per ft.

Three stopers, raising at 2.5 ft. will drive 7.5 ft. per shift. $3.52 ÷ 7.5 = $0.47 per ft.

Three stopers, stoping at 17.5 tons, will break 52.5 tons per shift. $3.52 ÷ 52.5 = $0.07 per ton.

Assuming that 250 ft. of drifting is necessary for the development of the blocks *A*, *B* and *C*, aggregating 10,000 tons of ore of which 90% is recoverable, the development cost per ton for drifts and crosscuts only, comes to 15c. Adding to this 3c. per ton as the cost of crosscut raises and sublevel exploration work, 18c. per ton is obtained as a fair estimate of development costs on a block of this size.

Where the dip raise is not driven until the stope has been advanced over half the level interval, its cost properly falls under the head of extraction. In case the dip raise is driven through from one level to the next before stoping is begun, as is done in the more steeply dipping portions of the mine, its cost belongs to development. The cost per foot of long dip-raises averages only a little higher than that of drifts and crosscuts. Its distribution, however, as shown in Table II, varies in some respects from Table I. Stoping-machine miners earn $3 and $3.50, an average of about $3.20 per 8-hr. shift. Shovelers earn $2.25 and $2.50, an average of about $2.40. The advance per shift has already been given as 2.5 ft. Six- to nine-hole rounds are broken with from 20 to 28 sticks of powder, making the explosive cost about the same as in drifting. Steel chutes are less expensive than track and require about the same amount of labor in placing. Power per drill shift for Leyner Type A and Ingersoll-Rand MC 51 stopers is taken at two-thirds the piston-machine power cost. The principal difference is the shoveling item, covering the cost of mucking from the face into the chutes. This work cannot always be completed on the night shift even with forced ventilation. An average cost per foot for 100-ft. dip raises is about $5.40, distributed as follows:

TABLE II. DIP RAISE COST PER FOOT

Labor, breaking	$1.28
Labor, shoveling at the face	0.96
Labor, loading cars and tramming	0.93
Labor, steel chutes and pipe	0.08
Labor, blacksmith	0.24
Explosives	0.80
Chutes	0.17
Pipe and fittings (1¼ in. and 1 in.)	0.07
Candles and lubricating oil	0.12
Power and water	0.47
Drill repairs	0.05
Blacksmith coal and drill steel	0.06
Superintendence	0.17

Adding the cost of two 100-ft. dip raises to the development previously assumed increases the development cost on the 9000 tons recoverable by 12c. per ton, giving a total of 30c. The dip-raise cost is entirely offset on dips greater than 30°, by saving in extraction, since one round out of each cut in stoping is in effect a dip-raise round, and the work is carried on under better conditions.

Allowing for the initial round of each cut or lift in stope advance, the average break per machine shift is a piece of ground 3 ft. 3 in. by 7 ft. by 10 ft., or 17.5 tons. An average round is nine 3½-ft. holes with 30 sticks of powder. The average cost of extraction per ton for the typical stope illustrated in Fig. 8 is about $1.07, distributed as follows:

TABLE III. STOPING COSTS PER TON

Labor, breaking	$0.18
Labor, shoveling at face	0.26
Labor, loading cars and tramming	0.14
Labor, timbering	0.07
Labor, blacksmith	0.04
Explosive	0.14
Timber	0.09
Chutes	0.01
Pipe and fittings	0.00
Candles and lubricating oil	0.03
Power and water	0.07
Drill repairs	0.01
Blacksmith coal and drill steel	0.01
Superintendence	0.02

These tables cover breaking and tramming costs only. No account is taken of hoisting, sampling, assaying, office expense or depreciation. The item of superintendence covers only the foreman's wages.

Conical-Drum Hoist on the Marquette

The Nordberg company of Milwaukee is now erecting machinery at No. 3 shaft of the Breitung Hematite mine, Negaunee, Mich. The equipment includes one conical-drum and one cylindrical-drum hoist, a compressor and an electric-generator set. The conical-drum hoist is of the first-motion, corliss type, with 20x60-in. cylinders. The large diameter of the drum is 14 ft. and the small diameter 7 ft., the total length of face being 11 ft. 10 in. This type of hoist is uncommon on the Michigan iron ranges, and the installation is therefore of interest. The hoist will handle two Kimberley skips, each having a capacity of 7 tons of ore.

The Isabella Mine

A model mine, although one that is still to produce its first ton of ore, is the Isabella property of the Cascade Mining Co., in the Cascade district, five miles south of Negaunee, Mich. Ground was broken at the site of the shaft in September, 1912. Preparatory work has been in progress ever since, and the miners have still to penetrate the orebody. This should take place in August. The mine is being developed on the strength of discoveries made by exploration with the diamond drill. The company is controlled by the E. J. Longyear interests. F. P. Snyder, of Minneapolis, is president of the company, and O. B. Warren, of Hibbing, Minn., is general manager.

The mine is down to a depth of 750 ft., with a sublevel at the 600-ft. mark. Drifting to the ore is in progress. The shaft has five compartments and is 17 ft. 8 in. by 11 ft. inside. It is lined with steel and concrete from top to bottom. It is sunk in the diorite footwall all the way. The headframe will be of steel, 110 ft. high. The contract for its erection has been awarded to the American Bridge Co.

A pumping station, lined with steel and concrete, has been constructed at the 700-ft. level, below which is a 50-ft. sump. The station is equipped with two Prescott pumps with a combined capacity of 1200 gal. per min. Opposite the station, and across the shaft, is an ore pocket with a capacity of 50 tons. The mine is being provided with its permanent surface equipment, including an engine house and a boiler house, each of fireproof material; a hoisting plant and an additional air compressor have been ordered. The boilers are four in number, with room for a fifth. The stack is of concrete and is 130 ft. high. The force employed at present consists of 60 men.

Lilly Hoisting-Engine Controller

A controlling device for hoists, invented by W. J. Lilly, superintendent of machinery for the Anaconda company, has been thoroughly tried out at the Leonard mine and has been found so efficient that the company is planning to install it at all hoisting engines operated by the company, involving an expenditure of something like $75,000. The controller is a little machine standing only 26 in. high, requiring neither steam, air, water or other pressure for its operation; it has no pipes, valves, piston or cylinder and is absolutely positive in its operation. According to Mr. Lilly's statements, the machine will:

(1) Prevent the engine from running the cages into the sheaves at the headframe, or into the sump at the bottom of the shaft.

(2) Stop the engine in case the engineer fails to slow down at a safe distance from the top and bottom landings and continues to slow down until he stops at the landing in the proper manner.

(3) Control the engine, if on reaching the top or bottom landings with the cages the engineer pulls the throttle open for starting on the return trip without reversing.

(4) Sound an alarm for slowing down the engine when the cages are nearing the top and bottom landings.

(5) Ring an alarm when the engine begins to overspeed in hoisting or lowering.

(6) Stop the engine if the engineer does not heed this alarm and bring the engine to normal speed.

In general, the device will perform every operation that an engineer can perform in bringing the engine to a stop.

Steel Production in the United States

The Statistical Bureau of the American Iron & Steel Association has compiled and published its full statistics of the production of steel in the United States in 1913. The production was the largest ever reported, though it exceeded that of 1912 by a small quantity only, as shown below. The chief point noted is a further decrease in the make of bessemer or converter steel, and a large gain in open-hearth steel, chiefly in basic metal.

The steel production in 1913 by processes was as follows, in long tons:

	Acid		Basic		Total	
	Tons	%	Tons	%	Tons	%
Bessemer (convertes)	9,545,706	30.5	....	.	9,545,706	30.5
Openhearth	1,255,305	4.0	20,344,626	65 0	21,599,931	69 0
Crucible	121,226	0.4	....	....	121,226	0 4
Electric	30,180	0.1	....	. .	30,180	0 1
Miscellaneous	3,831	...	....	.....	3,831	.
Total	10,956,248	35.0	20,344,626	65 0	31,300,874	100 0

Of the bessemer or converter steel, 9,465,200 tons were turned out as ingots and 80,506 tons as direct castings. Of the openhearth ingots, 20,689,715 tons as ingots and 910,216 tons as direct castings. Of the crucible steel, 17,571 tons; of the electric steel, 9107 tons, and of the miscellaneous or special steels, 3244 tons were direct castings. Included in the basic openhearth steel are 2,210,718 tons produced by the duplex process, made from metal partly treated in bessemer converters and finally purified in openhearth furnaces. This is an increase of 772,064 tons, or 53.6%, over the previous year.

A comparative statement for two years is as follows, the figures being in long tons:

	1913	1914	Changes
Bessemer	10,327,901	9,545,706	D.782,195
Openhearth	20,780,723	21,599,931	I.819,208
Crucible	121,517	121,226	D. 291
Electric	18,309	30,180	I 11,871
Miscellaneous	2,853	3,831	I 978
Total	31,251,303	31,300,874	I 49,571

Bessemer steel decreased by 7.5%, while open hearth increased by 3.9%. There was not much change in crucible and special steels, while electric steel increased by 64.8%. The total increase was 0.16% only. In 1912 the total production of steel in the United States exceeded that of pig iron by 1,524,366 tons; in 1913 the excess was 334,573 tons.

In 1913 the production of steel treated with ferrovanadium, ferrotitanium, nickel and other alloys was 714,357 tons, a decrease of 78,141 tons from 1912, but a large increase over any preceding year. Of this alloy steel, 625,430 tons were produced as ingots and 85,927 tons as direct castings. The total included 74,924 tons bessemer steel, 213,404 acid openhearth, 386,486 basic openhearth, 28,279 crucible and 11,264 tons electric and miscellaneous steel.

At the close of 1913 there were 30 plants equipped to make steel by the standard bessemer process and 80 by the Tropenas or other modifications of that process. There were 119 basic and 93 acid openhearth plants, 29 of them being equipped to make both acid and openhearth steel. There were 110 crucible steel plants and 19 electric plants.

A New Blast Furnace to Smelt Concentrates

By Ellis W. Honeyman*

SYNOPSIS—Description of a blast furnace built at the works of the Detroit Copper Mining Co. to smelt concentrates produced in the company's mill in the Morenci district, Arizona. The furnace is operated under low blast to prevent excessive production of flue dust.

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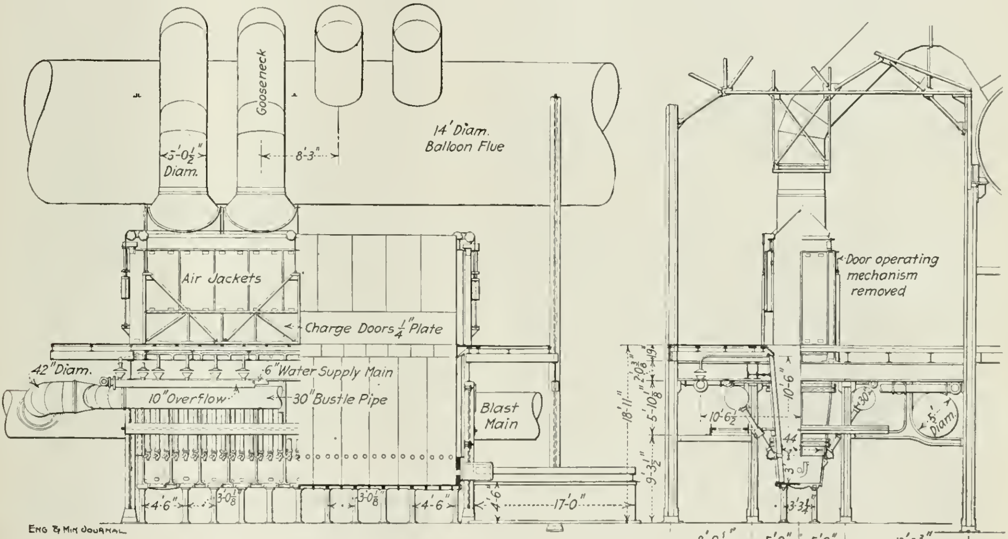
The new 44x396-in. blast furnace erected by the Detroit Copper Mining Co., of Morenci, Ariz., is interesting as an example of a blast furnace designed to do what is customarily regarded as reverberatory work. The principal copper-bearing material smelted is the concentrates made in the company's mill, about two miles north of the smelting works. The old blast furnace, which had done practically all of the company's smelting for the last 12 years, was in a bad state of repair, and, moreover, in order to handle the tonnage, it was necessary to drive it faster than was advisable when running on so fine a charge.



Detroit's New Blast Furnace for Smelting Concentrates

Smelting a Fine Charge with Low Blast and Slow Driving

The blast-furnace plant handles about 440 tons of total charge per day and the furnace was made unusually large for this tonnage for two reasons. First, it was desired to reduce the intensity of the blast in order to diminish the heavy production of dust incident to the smelting of a charge of fines in the blast furnace. Then, the necessity for fast driving of the old furnace in order to handle the tonnage had compelled the production of rather basic slags by use of barren limestone flux. With a furnace of ample capacity run slowly, more acid slags could be produced with a corresponding reduction in the tonnage of flux and at a considerable saving in the cost of mining and smelting this barren material. The new blast furnace is 44 in. wide at the tuyeres and is operated under a blast pressure of only about 14 oz. The furnace is 33 ft. long and is constructed of single-tier jackets, 11 being required for each side and two jackets for each end. The furnace superstructure is air-jacketed and has a gable top to prevent the lodgment of dust.

Cast-Steel Bottom Plates

The furnace bottom plates are made of cast steel, this material having been selected with a view of lessening the tendency to crack; the plates are strengthened by webbing, but are not water cooled. They rest on a double row of cast-iron columns. The furnace bottom is lined with chrome brick set on end on a 4½-in. layer of firebrick.

The furnace jackets are similar to those used in the Cananea furnaces, being 3 ft. wide and extending to the feed-floor plates. The water space of these jackets, however, is deeper than customary, being 6 in. The jackets have a batter of 13½ in. in a height of 13 ft. 6 in. The fire sheets are of ⅝-in. steel plate and the backs of ⅜-in. plate. Two 4x6x$\frac{7}{16}$-in. angles are attached to the back of each jacket as a reinforcement, the edge of the 6-in. legs being in contact with the fire

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*Philomath, Ore.; formerly smelter superintendent, Detroit Copper Mining Co.

sheet. The end water jackets extend only to the tuyere line, below which is a cast-iron tap jacket containing a coil of pipe for water cooling.

The side jackets are held in place by jacks or turnbuckles attached to girders forming part of the furnace building. The lower pair of girders, shown in the accompanying elevation of the furnace, are built up of ⅝-in. plates, 48 in. wide, 6x6x⅜-in. angles and ⅜x15-in. cover plates. These girders are tied together across the ends by a pair of 5x3½x⅜-in. angles, bolted to the girders, and are readily removable, when it is desired to change the end jackets. The end jackets are held in place by two sets of binders made up of a pair of 8-in. I-beams; the end binders are connected by 1½-in. steel rods running the length of the furnaces; each rod is in three sections, adjustment being obtained by turnbuckles and by nuts at the ends.

THE DETROIT TUYERE

There are three 4½-in. tuyeres in each side jacket; the tuyere blocks are of cast steel, with long rivets extending through the jackets. Attached to the outer surface by means of stud bolts is a cast-steel collar, slotted to receive the bolts by which the tuyere is held in place. The tuyere is provided with a stuffing-box into which the 4½-in. blast pipe is thrust, the joint simply being packed with asbestos. The tuyere cap is attached at the bottom by a loose-fitting hinge, the faces of the cap and tuyere being finished. When in use they are held together to make an air-tight joint by a revolving finger which intercepts a wedge on the outer surface of the cap.

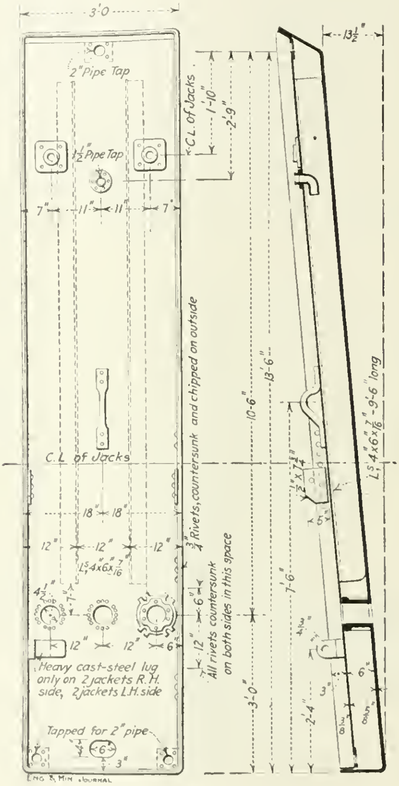
This finger principle is used on the tuyeres at several Southwestern smelting works, especially the Shannon and the Calumet & Arizona works, having originated, I understand, at the former plant. In the Shannon design, however, the cap revolves on the bolt of the finger, so that when a tuyere is slagged, the cap must slide over the face of solidified slag in the tuyere and then requires the assistance of a sledge hammer to open.

In my design, the cap drops completely out of the way the instant the finger is lifted. A raised ring was left on the inner surface of the cap to center it on the tuyere in case the hinge becomes very loose from wear. The construction of the cap might have been cheapened slightly by omitting this and having simply two flat surfaces to make the joint. As it stands, there are no expensive ball joints, springs, etc., and when the joint is made it is air-tight. A wooden plug is used in the cap for a peephole. An arrangement for holding a wooden wedge is provided on the bottom of the tuyere as a slag escape. The wedge burns out more readily than a plug in the event of a tuyere slagging, and the wedge is cheaper and easier to make.

The tuyere valve is an adaptation of the Copper Queen design and is on the order of a stop cock. It works easily and closes air-tight, and is more satisfactory than the usual gate valve. The tuyere and tuyere valve are attached by means of slotted flanges and bolts, so that by simply loosening the nuts, the tuyere and tuyere pipe can be removed to facilitate repairs to a leaky tuyere or to clear the way for a quick change of jackets.

The furnace spout is a steel water-jacketed trough; it is made of ½-in. plate on the inside and ⅜-in. plate on the outside, inclosing a 3-in. water space. Either end of the spout can be placed adjacent to the furnace breast; the blast is trapped by means of a mud dam in the outer end. The blast main is 60 in. in diameter and the bustle pipe 30 in., the connection to the main being 12 in. About 20,000 cu.ft. of free air is used per minute at 14-oz. pressure, supplied by a No. 9 Connersville blower driven by a Crossley gas engine.

The water-piping system for the jackets is all overhead and is reached from the big flat girder at the side of the furnace, this being used as a walkway. The overflows are close to the corresponding inlet valves and proper regulation of the water is easy to obtain. The funnels receiving the overflow water are protected from dust by shields of slightly larger diameter on the outlet pipes. The fresh-water supply main is 6in. and the waste main is 10 in. in diameter.

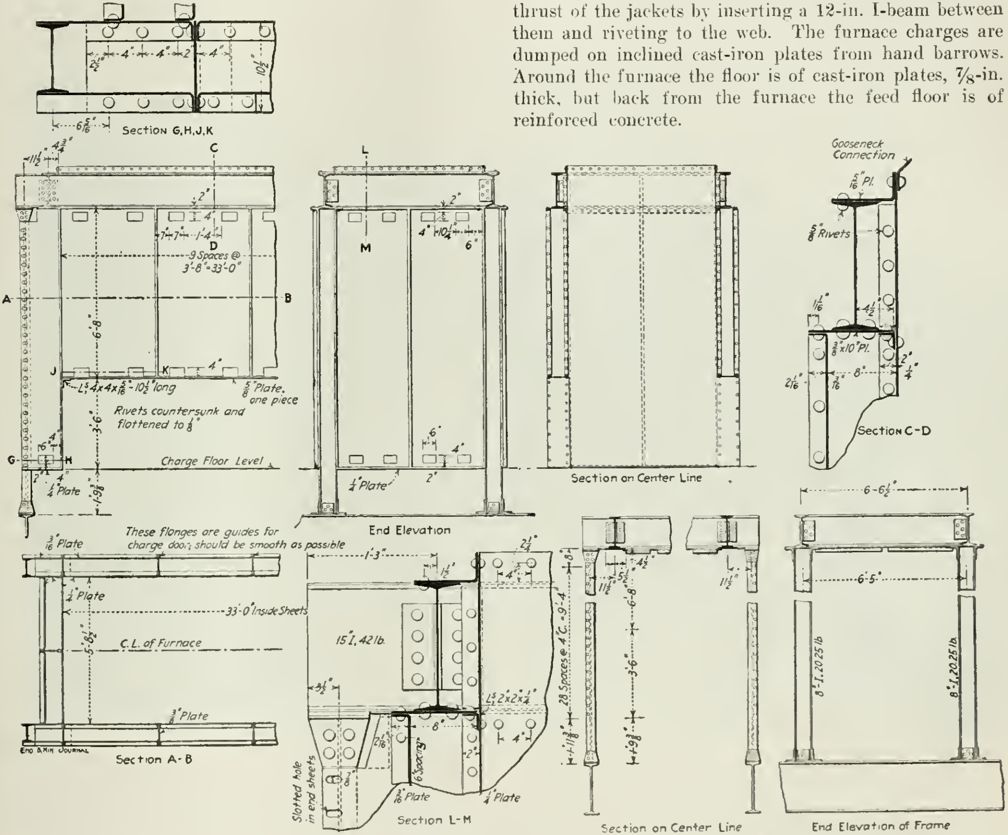


TYPICAL SIDE JACKET

The furnace settler is of the usual cylindrical type, being 17 ft. in diameter and 4 ft. 6 in. high. It is made of ¾-in. plates. There is a 5x3x½-in. angle around the top of the settler shell and at the bottom a trough formed of a pair of angles with a series of plates; this is to carry away cooling water if it is found necessary to use a spray. On top of the settler there is a raised sheet-steel working platform. The settler bottom is lined with firebrick set on ends, except at the tap holes and under the furnace spout, where chrome brick was used. The sides of the settler are lined with chrome brick, 9 in. long; a 6-in. space is left between the brick and the shell to permit expansion; this is filled with converter lining lightly tamped; only 10 courses of chrome brick are used on the side, after which five courses of firebrick are laid, the average matte level being below this line of division. The tapping blocks are made of copper, being cast in the converter plant. They are cast around a chrome block 5 in. thick and have a hole 2 in. in diameter.

The furnace superstructure is made up of a series of air jackets, the inner sheets being of ¼-in. steel and the outer of $\frac{3}{16}$ in. The division wall of the jackets is formed by a ⅜-in. plate and the air space is 8 in. Above the charge opening and below the air jackets is a ⅝-in. plate running the entire length of the furnace and supported at each end on 4x4x$\frac{5}{16}$-in. angles. The air-jacketed superstructure is suspended from a frame resting on heavy girders beneath the feed floor. To avoid leaving a resting place for flue dust, the top of the superstructure was made in the form of a gable roof, from which lead four uptakes 5 ft. in diameter. This design was used as being easier to construct and maintain than a single large uptake. The uptakes lead to a steel balloon flue, 14 ft. in diameter, made of $\frac{5}{16}$-in. steel plate. A track is provided under the flue for a small car which receives the dust from a series of 6-in. pipes placed at 30-in. intervals. When the new furnace was erected, the old dust chamber No. 1 was torn out and a new one erected in its place, the plant meanwhile running on dust chamber No. 2. The latter and the new chamber are of hollow tile, with reinforced-concrete roof, and have wire baffles. The dust is removed by drag-chain conveyors.

The feed doors are of ¼-in. plate braced by 2x2x¼-in. and 3x3x$\frac{5}{16}$-in. angles, and are operated by hydraulic cylinders. The feed floor is supported at the sides of the furnace by girders formed of a pair of 24-in. I-beams with a cover plate on top to exclude flue dust. These girders were strengthened laterally to take the thrust of the jackets by inserting a 12-in. I-beam between them and riveting to the web. The furnace charges are dumped on inclined cast-iron plates from hand barrows. Around the furnace the floor is of cast-iron plates, ⅞-in. thick, but back from the furnace the feed floor is of reinforced concrete.



Details of Superstructure of Detroit Blast Furnace

With the new blast furnace and enlarged dust chamber, there has been an improvement in the metallurgy and the cost of the installation was small compared with that of a complete reverberatory equipment. Moreover, the construction of a new blast furnace permitted the utilization of other equipment already at hand. The Detroit company uses Crossley gas engines in its power plant; to have utilized fully the power generated from the waste heat of a reverberatory furnace would have meant a much larger investment than was involved in the construction of this new blast furnace, which is serving its purpose admirably.

Buying and Selling Brass Scrap

Some of the tricks of scrap-metal buying are written up by W. H. Parry, of the National Meter Co., in *Metal Industry*, June, 1914, which show that mine salters have their counterparts in other lines.

Some few years ago there was bought one lot of 50,000 lb. of scrap copper, supposed to be high grade. What there was of it was fairly good. The stuff was delivered in casks of the hogshead variety and the tare was painted on each with white paint and in very large characters, with the evident intent of showing the customers that deception was not the seller's middle name. There being no immediate necessity for opening the casks, they were stored in a room outside of the foundry proper where the temperature in winter was all it was outside and then some.

After a few days in cold storage, some copper was needed by the melter, and he armed himself with a pinch bar, ax and hammer and such other light dental tools used in the profession. He was rather surprised to find that all the casks were open and had been for some time, as every cask in the lot had been burst to pieces from the frost. Every cask had been filled with water by the dealer. That is, there was some copper in them, but as water is a whole lot cheaper than even scrap copper, he figured to get away with the deal by being in collusion with somebody. He might have got away with it at that but for the melter, who reported the matter, more through a dislike for hewing ice to get at the copper than from any great desire to shine as a simon-pure, honest man.

The dealer was notified to take the mixture of casks, copper and ice away, and when called upon to explain the matter, blandly said that as most of the copper had been covered with insulation, it had been burned off and the wire had been placed in the casks hot. In order to avoid kindling them, they had sprinkled a little water on the copper to cool it off. On closer examination a liberal amount of oakum was found clinging to the top and bottom heads, and it was inferred that it was used to calk the heads so that they would hold a lot more than a mere sprinkling of water. It was estimated that at least one quarter of the net weight was *aqua pura*.

The next time this dealer supplied the company with copper he was instructed to deliver it in bales. He did, and they were some bales, averaging 1000 lb. to the bale, most of which was a copper-plated steel wire with a sprinkling of fine wire. In fact, the wire was so fine that the shrinkage in melting it in a Schwartz furnace was so great that Andy Carnegie would go broke using it if he paid more than 3c. per lb. for the stuff. You can imagine what happened when they tried to melt the copper-plated steel wire in a furnace that was suited to melt brass only. As the melting point of steel is so much above that of brass the inevitable consequence was a lot of annealed steel wire, covered with the ashes copper, and well balled up at that. This happening almost drove the scrap dealer into the madhouse, as he claimed that he had sold the metal in good faith, having bought it as copper. It was found a little later that in his storage plant he had successfully operated an electric plating outfit, and it was suspected that his knowledge of how the wire became copper-plated had some depth.

Another company, a big purchaser of metals, had grown careless in its scrutiny of the means employed by the scrap dealers in delivering scrap copper to their foundry. They only woke up when the ale casks that were used as containers were found to have staves 3 in. thick and heads 5 in. thick. Since the average tare to be subtracted for this class of casks was about 80 lb., and as they actually weighed over 200 lb., it does not need anybody with an over-bright mind to figure a loss of 120 lb. to the cask. There were 50 of these casks in the lot, and 6000 lb. would not be a bad guess for the amount that the dealer had figured on getting away with. In this particular instance the dealer was caught with the goods on, and came very near wearing a striped suit for a few winters up the river.

In selling materials to this gentry, eternal watchfulness is as absolutely necessary as in buying from them. One of the biggest dealers in this part of the country is the owner of an immensely large St. Bernard dog weighing in the neighborhood of 150 lb. This animal is so well trained that if his boss is selling materials, he just loves to be weighed in with the load. He also has a strange antipathy to weighing out, but let his boss be the buyer, he then insists on being weighed as part of the empty truck, but never as part of the truck gear when the load leaves. This dog has earned his weight in diamonds is the belief of many good people in Brooklyn, N. Y., and the citizens of that town "point with pride" to this dog as an example of what can be accomplished if one will live in Brooklyn long enough to be trained properly.

The old dodge of weighing the driver plus a couple of well weighted feed bags has no place or standing here because of its being so well known. But when they ring in a heavy cast-iron plate about 3 in. thick that just fits in the driver's seat well covered with a couple of blankets it is about time to sit up and take notice. More particularly when several such plates are found on your premises after the junk dealer is through. You will then realize that there is a considerable difference in price between what he paid for the cast-iron plates and the residues he was hauling out from your place. In manipulating the weighing scales you will find that the dealers are not lacking in skill, and the stunts they can pull off on you are well worthy of close study.

In the employ of many dealers they have specially trained truck drivers. These drivers are so well versed in hewing close to the line of honesty that in driving on the scales when they are selling goods they can hit the center of the scales without any trouble. With equal ease when they are buying they can place one of the truck wheels so that half of its width, at least, is not on the scales. You may well believe that as sharpshooters these drivers ought to be able to hit the bull's eye 23 times out of a possible twenty.

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The First Pig Iron to Be Manufactured with Anthracite Coal in the United States was smelted at Catasauqua, Penn., 75 years ago, on July 4, and an "Old Home Week" was held in that city that week to commemorate this event. The celebration program consisted of parades, band concerts, fireworks displays and sports. The first furnace to use successfully anthracite coal as fuel was erected by David Thomas, a Welshman, at Catasauqua, in 1840. Mr. Thomas, who had had a successful career as an iron maker in Wales, was induced to come to this country and to establish the furnace by companies holding large tracts of coal land in the Lehigh Valley. The original furnace was 42 ft. high and 12 ft. bosh and it was the first unit of what is today the Crane Iron Works, now a part of the Empire Steel & Iron Co. Mr. Thomas remained with the Crane Iron Works until 1852, when he turned over the management to his sons and established the Thomas Iron Co., at Hokendauqua, Penn., a short distance away.

The Chiksan Mines, Chosen--II

By Clarence L. Larson*

SYNOPSIS—The concession contains many quartz veins, most of them narrow and not reaching the surface. The main ledge can be traced 10,000 to 12,000 feet on the surface. Sajunkohl mine is the principal working on it. Tonkohl mine is on a parallel vein to the north. Chungtarrie is about a mile and a half farther north. The ore is gold in quartz with sometimes sulphides and galena.

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The concession contains many quartz ledges, most of which are small, both in width and length. There are two or three outcrops of white and barren quartz, running from 30 to 50 ft. in width. Of the narrow ledges the large majority appear to be but gash veins having no considerable traceable extent. Two or three, however, may be traced hundreds of feet continuously across the country. They have been opened up in occasional spots by prospect holes.

The main ledge is traceable for 10,000 to 12,000 ft., and strikes northeast and southwest. Upon this ledge, and about midway between its traceable ends, is located Sajunkohl mine, the largest on the concession. At each end natives have worked down from the surface for 100 to 200 ft. Some company work has followed, but as yet Sajunkohl mine has been the only profitable venture on the largest ledge in the concession.

Practically all of the other known ledges lie to the north of this main vein, and the placer ground in the main valleys below. About 1000 ft. north of the main vein there is an almost parallel ledge on which Tonkohl mine is being worked. This is the second largest mine on the concession, and has produced a grade of ore considerably higher than that of Sajunkohl.

Chungtarrie is about a mile and a half northeast of Sajunkohl and Tonkohl mines, and is on a separate ledge. This mine has just passed the prospect stage, and now bids fair to hold its own as a small mine. Aside from these three mines all work is of a purely prospective nature.

The Tonkohl Mine, Chosen

Lens Formation of Ore

Ore occurs in lenses only, and these are usually indicated by but little value at the surface, if any at all. However, barren ledge quartz or ledge waste, together with proper ledge walls may readily be traced on the surface for long distances. The country is predominantly schist and granite, with pegmatite dikes, which seem to have had something to do with the ore deposition, since they occur in the neighborhood of the ore, sometimes serving as a smooth vein wall, and at other times knitting into the quartz ore on one wall, and again serving as both vein walls. Usually the pegmatite grades into granite.

Another kind of dike is present in the district. It consists of a brown, earthy material, ranging in width from stringers to 15 and 20 ft. It seems to have no particular relation to the ore deposits. These dikes usually occur in the granite. At one place in Sajunkohl mine such a dike served as hanging wall for a barren vein.

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*Box 24, Moscow, Idaho.

The lenses of ore are usually small and vary greatly in length from level to level. In Chungtarrie, No. 2 level opened up a 150-ft. back, while but 50 ft. was available on No. 1 level. This little mine contains many faults, but as yet the work has not progressed far enough to formulate any rule about it.

Sajunkohl mine has two shafts, but one of which is being operated at the present time. The abandoned shaft is approximately 150 ft. in depth. There are three drift levels and one adit opened up to the west. Above the No. 2 level the lens has been stoped out an average width of 5 ft., 200 ft. in height and about 350 ft. along the strike. On No. 3 level but 150 ft. of low-grade ore was encountered, although barren quartz continued on each side of this distance. Conditions did not warrant the continuance of sinking and hoisting operations in this extra shaft, and it was temporarily abandoned late in 1912, pending further investigation to be carried on from the main shaft. This lens has, however, provided the largest working area of any of the four yet developed. The ore is iron-stained quartz, barren of galena, and averaging $5 to $7 per ton. No pay values occurred in the surface showing of this lens.

The main shaft, located 280 ft. to the east, is now about 380 ft. deep on a 65° incline. Three levels have been opened to the east at 100-ft. intervals. The headings are now at 1200, 650 and 175 ft. from the shaft center. Three individual lenses have been opened up. These vary greatly in length at various altitudes, so only average dimensions will be given. The first lens shaded into ledge waste in No. 3 level, but ore is found 30 ft. above; thus its known dimensions to date are 4 ft. wide, 250 ft. high, and has a length along the strike of but 80 ft. This ore contains much sulphide, both of iron and lead, and has averaged $7 to $10 per ton.

The second lens is found about 80 ft. to the east of the first. It has been opened up by Nos. 1 and 2 levels, averages 90 ft. in length along the strike, has an average of 4 ft. width, and extends 180 ft. above No. 2 level. The ore was principally oxide above No. 1, with a wide streak of pyrite, but is essentially white quartz below No. 1, impregnated with fine points of galena. The ore has averaged $5 to $7 per ton, and as yet has not been cut by No. 3 level.

Between the second and third lenses lie 300 ft. of barren ledge waste. To date this has only been opened up by No. 1 level. In the stope above the level the ore averaged 8 ft. in width 200 ft. in length and extended up 80 ft., then pinching into barren ledge material. The ore from this stope is sulphide, containing both pyrite and galena and is rather schistose in appearance. These four lenses of Sajunkohl lack surface value, although three of them display outcrops of valueless quartz.

Tonkohl mine has been sustained on a single lens of ore. The shaft is 550 ft. deep on an 82° incline, and has six levels. The lens, averaging 4 ft. in width, had a small but high-grade surface showing, lengthened with depth, and extended down almost continuously for 350 ft. It had an average length of 200 ft. At depth the vein flattened to about 55° and the quartz pinched out. No. 6 level at a depth of 500 ft. shows a reversion toward a steeper dip, but as yet has developed no stoping ore, although an occasional stringer of quartz has been found containing $6 to $8 per ton. The ore from this lens was oxide for a depth of 100 ft., and from there turned into white quartz impregnated with galena points. The ledge has been prospected a horizontal distance of 1000 ft. beyond the limits of the ore, but no further lenses have been discovered. Remembering that the country has been much eroded, developments at greater depth should prove interesting and throw light on the genesis of the ore. A study of known conditions applied to the actual operating results indicates a district where pay lenses do not, as a rule, outcrop, or at least do not show pay value in the outcrops. The lenses are small and usually of low grade, about $9 per ton, and much barren ledge material lies between adjacent pay shoots.

PROSPECTING METHODS

Native work is encouraged as much as possible and a great deal of it has been done. All such work is licensed through the company's offices, two arrangements being used. In one the natives are allowed to work a certain place, grinding and panning their own rock, paying the company a unit sum per miner employed per month. In the other arrangement the tributers work on a royalty basis, bringing their ore to the Yangdei mill for treatment and paying on a sliding scale of from 50 to 66% of the net assay value from which the company receives payment for milling, and its profit.

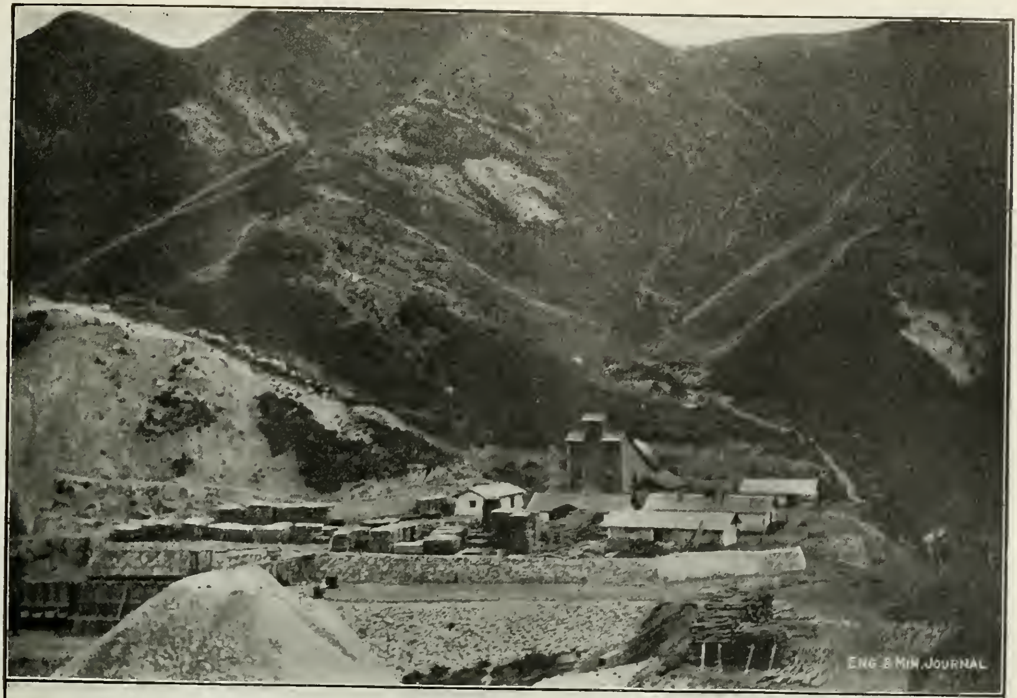
Native work is assisted by the company, according to the judgment of the superintendent of prospecting, in various ways, such as the providing of windlass and water bucket, or supplies such as explosives and steel or possibly an agreement of payment if ore is struck. The company reserves the right to take over any prospect at any time and then settles on the tributer a suitable bonus. Company prospecting is also being done, usually upon ledges that have previously been worked by the natives with some degree of success. Company work becomes necessary if any amount of water is to be handled.

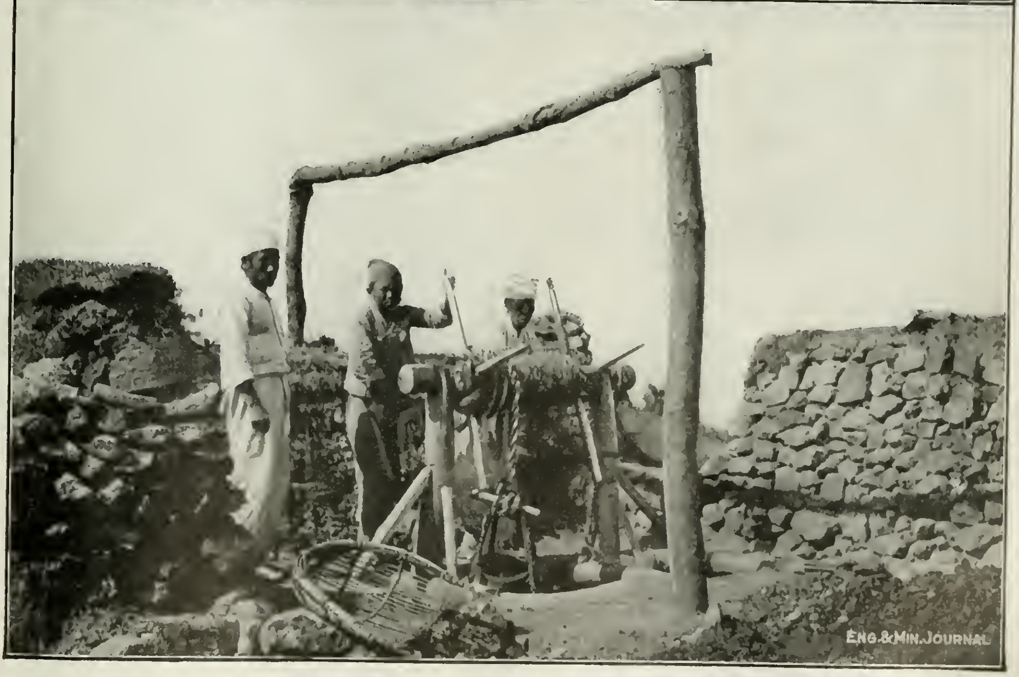
METHODS OF MINING

A two-compartment shaft is the rule, the compartments being 4x4 ft. in the clear, one being utilized as a skipway and the other as a ladderway and for piping. The shaft is in most cases inclined to follow the ledge and from it levels are opened off at 100-ft. intervals, measuring along the dip. Regular sets of 8x8-in. sawed timber are placed at 5-ft. centers. Two-inch lagging is employed on all four sides usually, but if the walls are good the two ends only are lagged. The compartments are divided by a brattice of 1-in. boards. Thus timbered the cost per set of two wall plates two end plates, one divider, six posts, lagging, brattice boards and wedges, complete, is $12.83.

In opening from a level, long posts are used and a leveler sill is placed on each of the two end plates of the floor set, and on its divider. A crosscut from the skipway compartment is run directly into the hanging wall for 25 ft., from its end drifts are started at right angles to the crosscut and thus parallel to the vein. These drifts are deflected in regular curves so as to intercept the ledge at distances from 45 to 50 ft. from the center of the shaft. Drifting on the ledge continues.

Meanwhile shaft-sinking operations continue, and at a point 25 ft. below the station set a skip-pocket raise is started up into the hanging wall, breaking through into





THE SAJUNKOHL MINE AND A NATIVE PROSPECT HOIST the end of the station crosscut. The pocket gate is installed at once and all excess waste in the level hoisted. The pocket is then enlarged at the top, and the station cut by enlarging the crosscut. The station is made to take timbers leaving 10x10 ft. in the clear; the floor is lagged with 2-in. boards. The track is next installed into the main drifts running over the long way of the ore pocket, and a grizzly of rails placed over the pocket. This method of balancing the operations allows continuous driving of level headings and shaft while cutting station and pocket, and minimizes the amount of rock to be shoveled into the skip for hoisting.

Headings may then be started at the points where the drifts struck the ledge, back toward and penetrating through into the shaft, thus completing the information concerning the block of ground above, and also serving as drain drifts direct to the station sump, or to the footwall side of the shaft, according as to whether the station is a pumping point or not.

Pumps are placed on alternate levels; a crosscut is run directly into the footwall of the shaft on the skip-way side, for 25 or 30 ft. Then sinking operations begin on the last 15 or 20 ft. of the crosscut and are carried to a depth of 10 to 12 ft. The sump is then enlarged on the sides. The pump may then be set on sills over the sump.

Drifts on the vein usually require timbers; crosscuts do not. Frequently the hanging wall is solid, allowing the use of a hitch. A cap set into this hitch, and a footwall post will then serve. However, if ore is present, a mud-sill becomes necessary, and usually it is advisable to utilize the hanging-wall post also, in order to avoid buckling of the three-piece set, as has occurred under heavily filled stopes.

In Tonkohl mine both walls are uniformly good and drifts usually demand timbers only where stoping is to take place. Stull caps are set in overhead hitches and stoping started. Small round timbers are laid upon the caps and filling placed directly over them. Seldom are posts required, other than those used at points where chutes are placed.

In Sajunkohl mine, however, in all stoping country, it is the rule to use two posts, cap and sill sets, 5 ft. apart, and round lagging above. Side lagging is seldom required.

When ore is encountered, raises are driven 100 ft. apart to the surface or to the next level, thus securing ventilation and openings for the introduction of filling waste. Usually alternate raises are two-compartment, one chute and other manway. From these raises overhand stoping operations begin, and as the first floor is removed along the strike, the tunnel sets are carefully knitted over with the round lagging, 4- to 6-in. timber. The stope is carried up in the conventional bench fashion for a distance of 5 to 15 ft., limited by the condition of the walls. During this period of mining, chutes are timbered up every 25 ft. along the strike, and ore is pulled in quantity just sufficient to leave good working room at the back. At the end of this period all the ore is transferred into the chutes, these being pulled just enough to allow more ore, thus avoiding the excessive wear on the timbers by falling rock in an open chute. Filling is then introduced from above and leveled up to within about 4 ft. of the back. The cycle of operations is then repeated. As the stope reaches the upper level, the floor pillar is removed in short sections, catching up track and sill-floor timbers on sills below, and thus obtaining almost perfect ore extraction.

Frequently stope hanging walls are heavy and tend to break off in large slabs, requiring stulls. In some cases these stulls are recovered in the filling process, in others abandoned. Throughout all mining operations, aside from the shaft and station timbering, native round timber is employed.

MINE DEVELOPMENT

All development work is done by contract, and several headings are usually allotted to one man. Contracts are paid by the foot, the price including all labor (miners, muckers and timbermen), explosives, drill steel, candles and all miscellaneous supplies. Rapid work is encouraged by offering a bonus per foot for amounts in excess of those announced, each contractor being informed early in the month as to the bonuses to apply to his various headings.

The use of piston and stoping drills has begun but recently and hence definite results are not yet available. All of this paper will apply to hand work only. A general statement may be advanced at this time, however, that in drifting and raising work in hard ground, the machines attain footages about twice as great as would be attained by hand work. The labor cost is less but that of explosives considerably greater.

Shaft sinking is double-hand work, except for popholing. Three 8-hr. shifts of four miners per shift are employed. The contractor also provides a day and a night boss. Drilling usually continues through two shifts, thus hoisting the broken rock at night only. This is necessary as shafts have but single skipways and day is entirely occupied with ore and timber hoisting. A table of cost of sinking of the large mine shafts is given.

COST OF SHAFT SINKING

	Sajunkohl	Tonkohl
Labor	$10.59	$7.92
Explosives	1.16	1.99
Candles	0.66	0.67
Drill steel	1.05	1.68
Supplies	0.30	0.30
Timber	2.66	2.85
Framing sets	0.18	0.26
Hoisting	0.94	1.58
Total per foot	$17.54	$17.25
Footage	96½	51
Working depth, ft.	240-336	500-551

The footage per month ran from 11 to 25 in Sajunkohl shaft, and averaged 16½; from 11 to 14 in Tonkohl shaft; averaging 13.

Tunnel driving is also three-shift work, and four miners are used per shift, double-hand. Each shift drills and blasts its own holes. From 4 to 7 ft. of hole are drilled per man per shift. A table of costs follows:

COST OF TUNNEL DRIVING

	Sajunkohl	Tonkohl
Labor	$2.42	$1.97
Explosives	0.47	0.68
Candles	0.16	0.16
Drill steel	0.21	0.29
Supplies	0.04	0.05
Timber	0.15	0.15
Timber framing	0.01	0.02
Hoisting	0.42	0.26
Total per foot	$3.88	$3.58
Footage	844	1024

Monthly advances range from 30 ft. in hard ground, or in soft ground necessitating spiling, to 70 ft. in good country. The record to date is 89 ft. The drifts are made about 5x7 ft. in the clear. In drifting work lower per-foot costs are attainable by operating but two 10-hr.

shifts daily, but at a sacrifice of speed. Hence in all workings where speed is essential, three shifts is the rule.

Raising is two-shift work, the shift being ten hours. Each shift drills and blasts its own holes. Raise men drill 4 to 8 ft. of hole per man per shift. Stulls set in wall hitches are usually sufficient for timbering. In main raises through stopes this timber is usually removed with the upward progress of the stopes and full set timber installed. Raises are usually run small, say 4x6 ft. A table of costs is given.

COST OF RAISING

	Sajunkohl	Tonkohl
Labor	$1.19	$1.43
Explosives	0.38	0.79
Candles	0.10	0.18
Drill steel	0.10	0.27
Supplies	0.03	0.03
Timber	0.17	0.28
Timber framing	0.01	0.03
Hoisting	0.09	0.19
Total per foot	$2.07	$3.20
Footage	460	530

Korean Miners in a Stope

Monthly advances run from 20 ft. in some extremely hard ground in Tonkohl, to 70 ft. in easy ground in Sajunkohl.

Winze driving is done by three-shift work; four miners per shift of 8 hr. Windlass hoisting of the broken rock is necessary. Twenty-five to 30 ft. per month is attained in dry ground such as is usual in Tonkohl mine Sajunkohl winzes usually tap considerable water, requiring the use of pumps, and occasioning slow progress from 60 ft. down. The recent air-drill installation allows of quick raise work and makes it neither necessary or efficient to drive winzes beyond the first easy stage of 50 or 60 ft. Costs of winze work is shown in the table.

DETAILED COST OF WINZES

	Sajunkohl	Tonkohl
Labor	$4.74	$3.71
Explosives	0.66	0.78
Candles	0.32	0.27
Drill steel	0.53	0.59
Supplies	0.19	0.09
Timber framing	0.04	0.03
Timber	0.65	0.30
Hoisting	0.62	0.53
Total per foot	$7.75	$6.30
Footage	310	246

Winzes have two compartments, in the clear 4x4 ft. for hoisting, and 2½x4 ft. for manway. In Tonkohl mine stull timbers set in hitches are usually sufficient, with occasional hanging wall plates. On the foot wall a bucket track is constructed of 2x4-in. by 10-ft. timber. Sajunkohl winzes usually have square sets of round timbers.

Crosscuts are run small, about 4x6 ft., and are all two-shift work of two men each. No timbering is required. Costs of crosscutting is shown in the accompanying table.

COST OF CROSSCUTTING

	Sajunkohl	Tonkohl
Labor	$1.72	$2.34
Explosives	0.57	1.15
Candles	0.11	0.22
Drill steel	0.25	0.39
Supplies	0.02	0.04
Hoisting	0.20	0.54
Total per foot	$2.87	$4.68
Footage	142	134

Sajunkohl work has usually been in soft schist, while the Tonkohl work has been in granite and hard schist. Chinese miners are excellent in drifts, crosscuts or raises in dry ground, but will not work in wet places or in winzes or shafts underground. In drift work they are more efficient than the Koreans. As muckers and trammers they completely outclass the Korean workman. The latter do good work in wet ground and seem very hardy, only occasionally succumbing to malarial attacks or water-bitten feet. They work with no foot or leg protection other than straw sandals; rubber coats made from the wrappings of explosives are usually provided for the wet places.

Stoping

Practically all stoping work for the past year has been done by contract, the price paid being based on the square foot of wall area exposed by the stoping operations. The contract rate includes all labor of mining, mucking, timbering, tramming and filling, and the cost of all explosives, drill steel, candles and miscellaneous supplies. Prices are determined from study of the pertinent conditions such as the characteristics of the ground as to drilling and breaking, length of tram, timber requirements, filling conditions, etc.

Stopes are measured the last day of each month, and the exposed wall areas calculated by the use of a planimeter. Prices have ranged from $1.30 to $1.60 per square foot. Miners in contract stope work make from $0.26 to $0.30 per day. Two 10-hr. shifts are employed and blasting allowed twice on each shift.

TABLE OF STOPING COSTS

	Sajunkohl	Tonkohl
Breaking	$0.35	$0.38
Mucking and tramming	0.08	0.11
Timbering	0.01	0.01
Drill steel	0.05	0.06
Supplies	0.03	0.02
Explosives	0.09	0.11
Candles	0.04	0.06
Timber	0.09	0.08
Timber framing	0.01	0.01
Hoisting	0.19	0.15
Total per ton	$0.94	$0.99
Tonnage	17,845	10,502
Duty per man in stoping	0.57	0.50

CONTRACT SYSTEMS

The main argument in favor of contract work is that an unwritten law seems to have been established throughout Korea, calling a miner's day's work the drilling of 4 ft. of hole, regardless of ground conditions. Thus day's-pay work in either stoping or development will average, per man per day, about 4 ft. ¼ in. of hole. Each contractor usually has several working places, employs his own day and night bosses, and is required to be on shift every day. The method employed by different contractors in the division of their money is interesting and pertinent. The money due each heading, after proper subtraction of the costs of all supplies, is issued in an envelope to the contractor. From such an envelope, the muckers and trammers are first paid at a rate of 20c. per shift, the tool boys at 17½c. and the timbermen at from 30 to 40c. The remainder is divided among the miners, bosses and the contractor, according to the shifts worked, the contractor himself being credited with a shift per day for each day in the month. Should the average shift wage be more than ordinary day's pay wages, that is, 25c., the miners make the contractor a present. The contractor shares in each of his headings. In the case of large stopes, the contractor usually takes a percentage for his share after the muckers, toolboys and timbermen are paid, usually 10%, and divides the rest among his miners.

Some development contractors also follow this method of percentage subtraction. In but one known case has a contractor paid his men on a straight day's wage basis. This one was an especially capable man and had a number of places among which were two difficult winzes. He appropriated part of his stope money to help out on the winzes; whether the fact was known or not to his stope miners is a question.

Contract wages vary from 26 to 30c. in stope work and in dry headings, and in wet and difficult places, 25 to 35c. High footages attaining bonus prices raise miners wages to 35 to 45c. per day.

Shifts and Wages at Calumet & Hecla*

It is found impracticable in the Copper Country to put in three 8-hr. shifts with a 24-hr. day, inasmuch as the time occupied in handling the men and supplies would cut seriously into the hoisting capacity, while the amount of broken material would be increased, so that the balance of operations would be disturbed. Two shifts are, therefore, worked each day, and the interval between is used for handling supplies, timber and men, and for giving the workings opportunity to clear of smoke after blasting.

Under the old system of work, the trammers in the mine, whether on night or day shift, each worked six shifts per week. The miners worked only five night shifts, or five and one-half day shifts; the day-shift miners came up at noon on Saturday and would not go to work again until Monday night; while the night-shift men who came up Saturday morning would not go to work until Monday morning. This figured but 23 shifts of actual work per month; nevertheless the men were paid for 26 shifts. About Jan. 1, 1913, however, the system was changed at the Calumet & Hecla mine and its subsidiaries, and while the miners were allowed a shift for Saturday, coming up at noon, the total number of shifts for which they were paid in a month was only 24. The rate of pay, however, was raised so that they got as much money as when they were paid for 26 shifts. Of course, with the contract men this change in the method of payment made no particular difference.

Under the old system the amount of time actually put in at work by the miners varied largely with the depth of the mine. In some properties it may have been as much as 8½ hr., but in the Calumet & Hecla it probably was not much over 8 hr. Under the present system the time worked is probably about half an hour less than under the old. The men are now allowed only a half an hour for lunch, whereas in the old system they were allowed a full hour. They are underground at present a full hour less than they were formerly. The changing of the shifts is partly on company time and partly on the time of the men.

Mr. MacNaughton presented a statement of average earnings of the underground men. At the Calumet & Hecla and subsidiary mines, July 1 to Dec. 31, 1912, the miners on stoping earned on an average $3.05 per shift; for drift stoping they earned $3.30; for drifting, $3.19; for sinking, $3.51; the general average was $3.11.

The average tramming wage at all the mines was $2.91 per shift. The average combined mining and tramming earning was $2.94 per shift. Since the miners were paid for 26 shifts, while working only 24, the general average of all kinds of mining, distributed over the 24 shifts actually worked, would be $3.37 instead of $3.11.

Similarly, Jan. 1 to June 30, 1913, operating under the new system, the average earning for stoping operations at the Calumet & Hecla and subsidiary mines was $3.39; the average for drift stoping was $4.07, the average for drifting was $3.63; the average for sinking was $3.57; the average for all this mining was $3.48. During the same period the tramming average at all the mines was $2.79, and the average underground wage, that is for mining and tramming, was $3.16.

Bill Validating Phosphate Locations

WASHINGTON CORRESPONDENCE

Senator Smoot, of Utah, and Representative French, of Wyoming, have simultaneously introduced in the two houses of Congress a bill intended to validate deposits of phosphate rock heretofore made in good faith under the placer-mining laws of the United States. The bill provides, among other things:

> That where public lands supposed to contain deposits of phosphate rock have heretofore been located in good faith under the placer mining laws of the United States, such locations shall be valid and may be perfected under the provisions of said placer mining laws, and such locations shall give title and possession to such deposits. This Act shall apply to such locations heretofore patented: Provided, That this Act shall not apply to any location made subsequent to the withdrawal of such lands from location, nor shall it apply to lands included in an adverse or conflicting lode location unless such adverse or conflicting location is abandoned.

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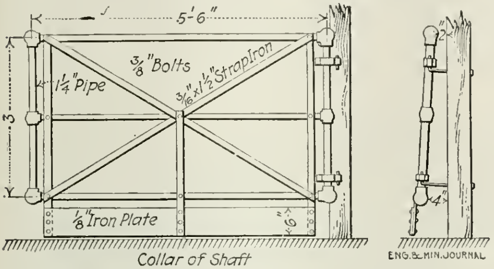
*From testimony given by Manager James MacNaughton before the Congressional Committee Investigating the recent mine strike.

Details of Practical Mining

Swinging Shaft Gate of Iron

By W. H. Jobe*

A Verona Mining Co. shaft gate, reproduced in my annual report for 1912-13, is shown herewith. It consists of a frame of pipe and iron fence fittings braced with strap iron. The gate is hung at a slight inclination, so as to swing shut of its own weight. An iron plate, 1/8x6 in., is fastened to straps from the gate at the bottom and serves as a "toe board."



Shaft Gate of Pipe and Strap Iron, Hung to Swing Shut by Gravity

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The Danger of Primers

The practice of making up a supply of primers long before they are to be used is one that should be discouraged (*du Pont Magazine*, July, 1914). Although it is often convenient to have them made up before beginning loading, this is not so safe as to make them up at the time, and there have been many misfires reported on account of the primers having been kept too long. The cause of these misfires is not fully known, but it is probably due to the nitroglycerin, which is an oil, soaking into the fuse, dissolving and thinning part of the asphalt waterproofing, so that it runs into the powder core and results in extinguishing the fire when it arrives at that point in the fuse.

While rules and regulations for the handling of explosives, expressly forbid storing or shipping dynamite and caps together, yet primers, which are dynamite and caps put together in the very most dangerous combination possible are frequently allowed to be stored and carried around without due precaution.

Dynamite by itself, when set on fire, generally burns up without exploding and does no harm except to drive away everybody near-by with its objectionable and noxious fumes; but when dynamite is primed, it burns only a short time and then explodes; there is no uncertainty about that.

All that can be said in favor of making up primers ahead of time is that it is convenient to have them at hand for loading. Misfires are exceedingly inconvenient and misfires are apt to occur when primers and caps and fuse are kept for any length of time before loading. That primers of any kind are infinitely more dangerous than dynamite and detonators kept separate, no one will deny.

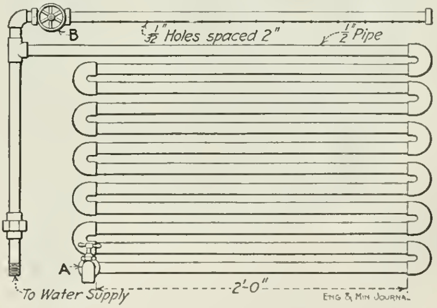
[Unquestionably primers are exceedingly dangerous things, and the careless way in which they are sometimes handled is outrageous. In general, the principle is correct, that dynamite and caps be kept apart until the last possible moment. Nevertheless, it is coming to be pretty well recognized among the better-managed mining companies that it is safer to have one or more experts in the mine making up primers than to intrust this delicate job to every common-or-garden miner. This, of course, necessitates making up the primers in quantity ahead of time and transporting them as such to the working place. The danger of accident in transportation is, of course, increased, but we believe that the danger of misfires, which is probably the greatest hazard in blasting, is appreciably decreased by having the primers all properly made.—Editor.]

⁂

Cooler for Drinking Water

By E. W. Durfee*

For those living in arid regions, where a supply of ice is not always available, the apparatus herein described will be found satisfactory for supplying cool drinking water. One has been in use at the Alvarado mine for the last two summers and has been found superior in every way to the *olla*, so commonly used throughout the southwestern United States. It is more efficient as a cooler, is perfectly sanitary and does not require the attention for filling and cleansing that is necessary with the other device.



Small-Size Radiator for Cooling Water in Dry Climates

Its efficiency, of course, depends upon the amount of humidity in the atmosphere, but for average conditions in Arizona the difference between the temperatures of the wet and dry thermometers in summer is about 30°, and sometimes runs as high as 40°.

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*Inspector of mines for Iron County, Crystal Falls, Mich.

*Congress Junction, Ariz.

The accompanying sketch shows the construction, the whole being made up of ½-in. pipe and fittings. The pipes and return bends should be wrapped with thin cloth and placed in a shaded open place, where the prevailing winds will cause the maximum evaporation. The drip from the upper pipe should be regulated by means of the valve *B* to just the amount necessary to keep the pipes below wet. As the cool water is drawn from valve *A* it can readily be seen from the sketch that the pipes are kept filled from the water supply.

With an apparatus the size shown, about ten glasses of cool water can be drawn at one time, after which it will take about 15 min. to cool another supply to the minimum temperature it will attain.

⁂

Sectional Concrete Shaft Lining

A new and ingenious method of shaft lining, described in detail by Marcel Gillieaux, in the 1914 number of *Annales des Mines de Belgique*, is noted briefly in *Coal Age*, June 13, 1914.

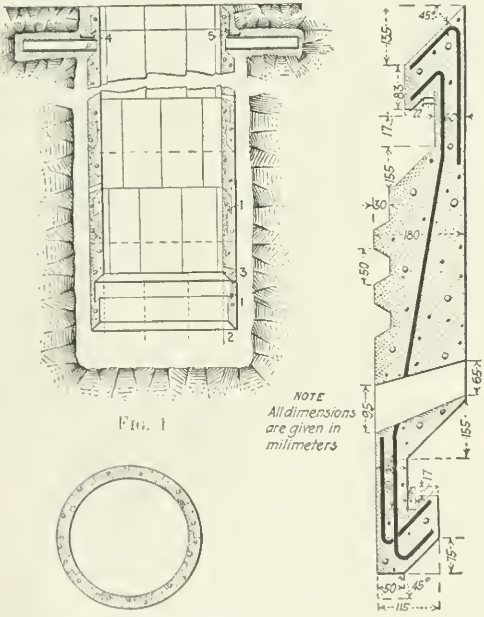


Fig. 1 Fig. 2 Fig. 3

A Suspended Reinforced-Concrete Shaft Lining

It is applied to circular shafts and consists of panels of reinforced concrete keyed together both horizontally and vertically and capable of being suspended one from another by hooks or goosenecks cast at top and bottom of the blocks. The shape and proportions of the blocks are evident from the illustrations. Fig. 1 shows a lining in a shaft, supported by bearers in concrete. The plan, Fig. 2, illustrates the vertical jointing. The dimensions of Fig. 3 are in millimeters. The opening at 3, Fig. 1, serves the double purpose of allowing the blocks and lining to be centered by iron bars to the shaft wall and of affording an opening for running in cement to fill between the lining and the rock.

This appears to be the only concrete lining for a circular shaft which can be carried on down as sinking progresses.

⁂

Liquid Rheostat for Hoist Control

For the Brier Hill electric hoist of the Penn Iron Mining Co., Michigan, an automatic controller was first installed. It required so much attention and was so noisy that it was replaced with the liquid rheostat illustrated here (*Bull.* A. I. M. E., February, 1914).

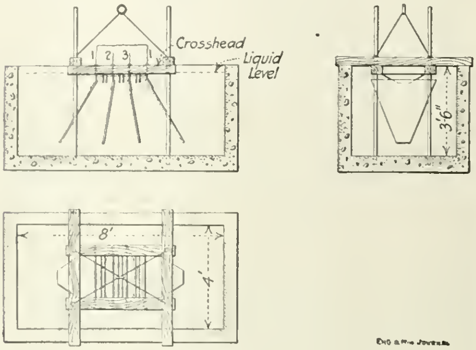


Fig. 1. Construction of Rheostat

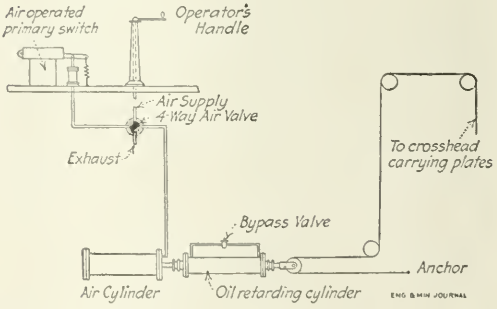


Fig. 2. Operating Mechanism of Controller

The tank is built of concrete, Figs. 1 and 4, open on top and kept nearly full of a weak solution of sodium carbonate. A timber crosshead suspended above the tank and four iron plates are attached to its lower side, as shown. The plates are connected to the three secondary leads from the motor. The crosshead is raised and lowered by a rope connection to the hoist room. The plates are inverted trapezoids, the shortest side being down, they are also set to flare from each other so that the lower edges are farther apart. As the plates descend, the resistance between them decreases rapidly. The fact that they are inclined, also serves to stir up the solution somewhat. In each of the three spaces between the large plates are two smaller plates set much closer together, electrically connected to the larger plates and adjusted for height so that they enter the water just as the large plates become completely submerged. By adjusting the distance between these small plates, the amount of slip of the motor when pulling full load at full speed can be varied.

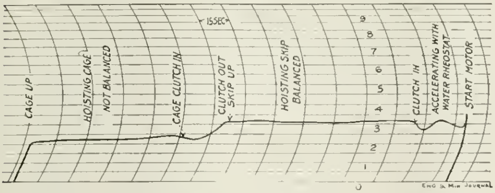


FIG. 3. HOISTING CURVE FOR SKIP AND CAGE

The system of controlling the submergence of the plates is shown in Fig. 2. A four-way valve having only two positions, "on" and "off," is manipulated by the hoisting engineer. In the "on" position, that shown in the drawing, a supply of compressed air is admitted to a small cylinder, which closes the primary switch. At the same time, live air from the air cylinders connected to the rheostat is allowed to exhaust to the atmosphere. The release of pressure in this cylinder permits the crosshead and plates to sink in the water by their own weight, but the rate of sinking is controlled by the amount of opening in the bypass valve connecting the two sides of the oil-filled cylinder, which is connected in tandem with the air cylinder.

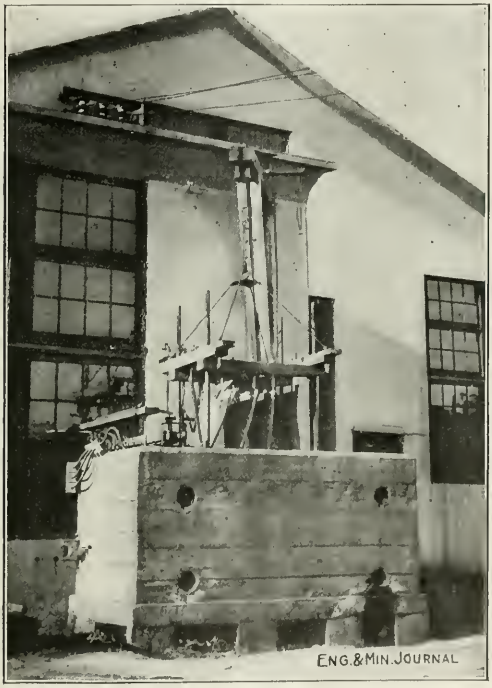


FIG. 4. THE RHEOSTAT CONTROLLER OUTSIDE THE HOIST-HOUSE

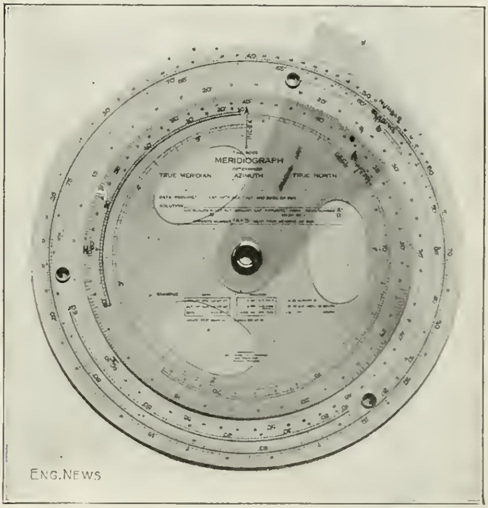
Near the end of the trip, the engineer throws the controller valve to the "off" position; the air exhausts from the primary switch cylinder, so that the switch opens and live air is admitted to the rheostat cylinder, which raises the plates.

In Fig. 3 is shown a typical hoisting curve. It is customary to bring the motor and transmission machinery up to speed before clutching in the drum. This operation consumed 20 sec., and the power demand was remarkably uniform. As further explanation of the curve, it should be stated that the hoist has two drums, one for the cage, the other for the skip, the latter balanced with a counterweight. The horizontal line of the skip hoist represents almost perfect counterbalancing.

⁂

Simplification of Solar Determination of Azimuth

A recently developed device called the "Meridiograph" is designed to simplify calculation so as to make the determination of astronomical north by the solar method a relatively easy matter without the use of auxiliary attachments on the transit. It was described in *Engineering News*, Feb. 26, 1914.



THE MERIDIOGRAPH

The field work consists of taking an observation with an ordinary transit on the center of the sun and determining its altitude and its bearing in relation to some other line. The latitude of the place is determined from a map and the declination of the sun is obtained from an ephemeris. These data are then combined by means of the meridiograph to give the true azimuth of the sun at the time of observation, and thus the true azimuth of the line used as a reference course in the field. The instrument resembles in general a circular slide rule. It consists of two graduated disks rotating relatively to each other, of a guide arm and of a transparent covering. In use, two settings and a simple addition only are required. An accuracy of from 1′ to 2′ is claimed, depending on whether the sun is near the horizon or not.

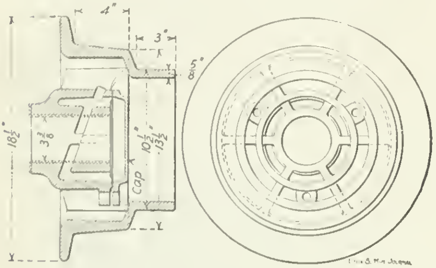
While direct solar observation has always been available as a method of determining north, it involved troublesome calculations, using spherical trigonometry. It is in the elimination of these calculations that the meridiograph becomes useful. The device is manufactured and sold by its inventor, Louis Ross of 268 Market St., San Francisco, Calif.

⁂

Rear Skip-Wheel of Two Diameters

By T. Swift*

The accompanying drawing shows a rear wheel used by Witherbee, Sherman & Co., Inc., of Mineville, N. Y., for skips of 68 cu.ft. capacity, operating on a track dipping 30°. The wheel is of cast steel made by the Bethlehem Steel Co. It turns on a $3\frac{3}{8}$-in. axle, in a babbitted bearing. The tread of smaller diameter facilitates the dumping of the skip on arrival at the pocket: it rides on inclined timbers, thus elevating the rear end of the skip. The front wheels are of similar construction, but with the smaller tread omitted; this enables them to pass between the dumping timbers with which the smaller tread engages. The cap is removable, being bolted on through three lugs; it and the oil recesses are filled with heavy car oil to insure the necessary lubrication.



Wheel for Rear of Skip with Two Treads for Dumping

⁂

A Wrought Candle-Sconce

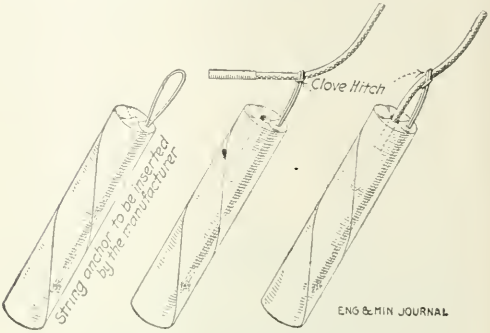
The drawing shows a candle-sconce used in the Harold mine on the Mesabi. It is of an unusually substantial pattern, being worked out by the blacksmith. The stick can be driven into a post securely by a rap on the end, this being protected by bending over it a lug of the saucer. The saucer itself catches all drippings.

Sconce Consisting of Saucer, Stick and Socket

Modified Priming Device

By William W. Jones*

I described in the Journal, Feb. 21, 1914, a device which I had patented for attaching the fuse to a primer so as to eliminate the danger of the cap's pulling out. This device included a small wood or fiber anchor. There may be possibly some difficulty caused by this tamping and I am therefore recommending that this be omitted and that a double cord be used instead, to take a clove hitch over the fuse or the wires. The method of doing this is evident from the drawing. As with the first described device, the cord must be included in the powder stick when it is manufactured.

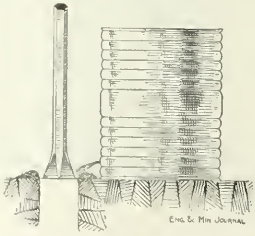


Manner of Constructing Primer

⁂

An Automatic Chuck Tender

In the excavation work of the Hardaway Contracting Co. for the power dam of the Southern Aluminium Co. at Badin, N. C., an ingenious method of supplying drilling water to the holes is employed. The drilling is done with piston machines on tripods, operated by one man each. The holes are, of course, down holes and about 3 in. from the collar of each there is set a powder can with a small hole near the bottom. The stream of water issuing from this falls into the drilled hole and takes care of itself, while the operator cranks his machine. The rock in process of excavation is a greenstone, amphibolite.



Powder Can Arranged to Supply Water to a Down Hole

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*Mining engineer, Mineville, N. Y.

*State mine inspector, 148 Jay St., Albany, N. Y.

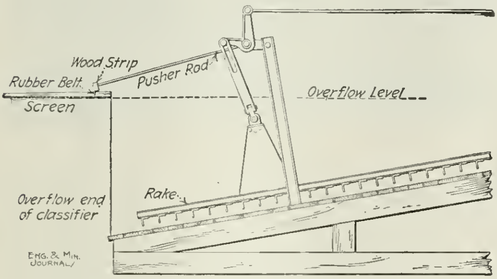
Details of Milling and Smelting

Self-Cleaning Classifier Screen

Abundance of wood chips in the mill pulp at the Hollinger mill, Timmins, Ont., led to the arrangement of a device to screen them out automatically and at the same time keep the screen clean. The device is shown in the accompanying drawing.

At the slime-discharge end of the Dorr classifiers, a screen of the proper aperture is placed the entire width of the overflow, so that all of it has to pass the screen. All chips and floating pieces are caught on the screen and prevented from passing on with the pulp.

To keep the screen clean, a reciprocating pusher is made by tacking a strip of rubber belting to a wood strip the same width as the slime-overflow opening. A rod of iron is fastened to the middle of this strip at right angles to it, and the other end of the rod is fixed to the lower bracket of the Dorr classifier. This imparts a back and forth movement which sweeps the chips to the rear of the screen where they can fall out of reach of the pulp.



Overflow Screen Cleaner for Dorr Classifiers

The ends of the wood strip which carries the belting, slide on a strip which is inclined slightly, so that at the end of the back stroke it raises slightly, resulting in a motion similar to that of the rakes in the Dorr classifier itself. In this way chips and rubbish are removed from the pulp without any particular care on the part of the mill men.

* * *

Elevators and Centrifugal Pump

Operators in different localities have been divided as to their preference for belt-and-bucket elevators and centrifugal pumps for raising pulp. In America the preference has been for the elevator, while in Africa more appreciation seems to be given to the centrifugal pump. Both have advantages. As to power requirements, the elevator seems to have the best of it, since it is balanced, and power is required only for a straight lift of the actual material to be raised, aside from the little friction in the pulleys. The centrifugal pump is also balanced, but has pipe friction to overcome and lacks in mechanical efficiency. On the other hand, it is cleaner and more easily handled, except when repairs are to be made.

* * *

Oxyacetylene Welding

Oxyacetylene welding is now practiced at many mines and metallurgical establishments for making repairs to equipment which, in many cases, it would require months to replace in any other way. When oxyacetylene apparatus first arrive at the works, the books of instruction regarding its use are carefully studied by those who are going to operate the apparatus. As time goes on, however, the books of instruction are lost and new operators take the place of old ones, so that the instructions originally given are lost and the welding is not so efficiently done by the later operators. To insure the best work in oxyacetylene welding, the instructions should be carefully followed and for this reason we are reproducing, with the permission of the Vulcan Process Co., of

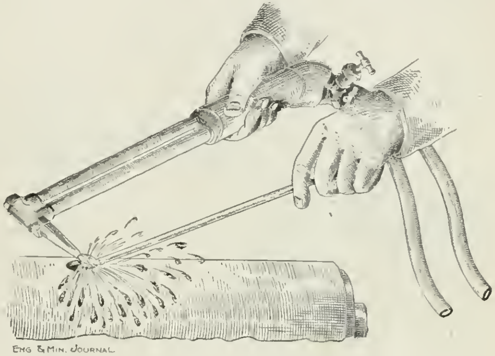


Fig. 1. Proper Position of Welding Torch for Filling in Holes

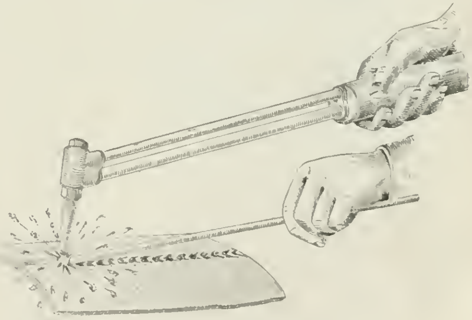


Fig. 2. Proper Method of Holding Welding Rod

Minneapolis and Cincinnati, some engravings from its book of instructions, illustrating correct methods of holding the welding rod and manipulating the torch.

Fig. 1 shows the correct position of the welding torch for filling in holes; and in Fig. 2 is given the proper method of holding the welding rod. The added metal must not fall drop by drop into the weld, but must form a pool of molten metal that can unite with the molten sides of the opening, as shown in Fig. 3. Fig. 4 illustrates the circular movement of the welding torch during the execution of the weld, while Fig. 5 shows the side-to-side movement used for welds of greater thickness. The low-pressure torch, based on the principle of the injector, has largely been superseded by the positive- or medium-pressure torch in which both the acetylene and oxygen are under an appreciable pressure.

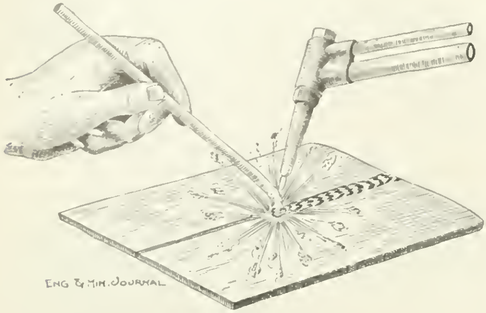


Fig. 3. Metal Added Must Not Fall Drop by Drop into the Weld

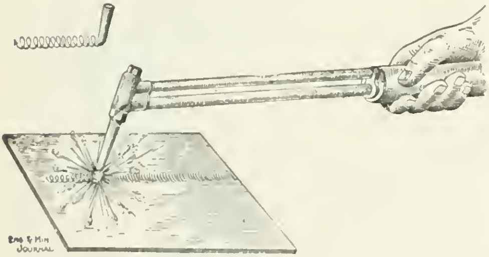


Fig. 4. Circular Movement of Welding Torch

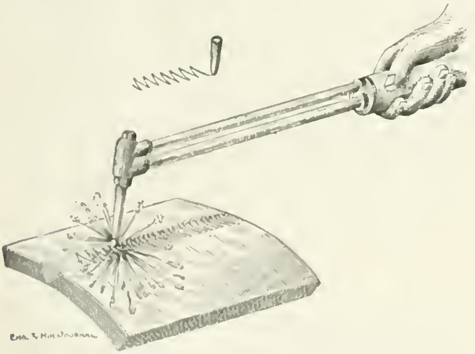


Fig. 5. Side to Side Movement for Executing Welds of Greater Thickness

Slime Dam of Cyanide Boxes

In cyanide plants of the older type, it was usual to impound slimes residues in dams made of sand or of the partly dried slime itself. With plants of the newer type, however, which treat an all-slime product, the residues are such that it is hardly possible to use them to make a dam. The material is too fine and slimy to have the requisite strength, and is likely to break away and run when the wet residues come in contact with it.

This problem of slimes retention is an aggravated one at the mill of the Nipissing Mining Co., due to the fact that the product is so fine that it all goes through a 200-mesh screen, and also that the residues must be prevented from infringing upon adjoining property. It has been solved cheaply by utilizing empty cyanide cases for the basis of the dam.

Slime Dam of Cyanide Boxes

All the cyanide cases are saved, and when they are required for use, they are taken to the dump, filled with slimes, and a line of them, placed close together, strung across at the desired point. The weight of the slimes anchors the boxes securely, and as they are protected by the case, there can be no washing away. The drying slimes soon calk up the interstices between the boxes, and a tight, solid dam results. The method has proved entirely satisfactory.

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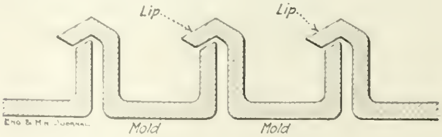
Overlapping Bullion Molds

Bullion melting at the Buffalo mill, Cobalt, is done in reverberatory furnaces, and there is a problem in passing the stream of molten metal from one mold to another without spilling. To minimize this loss, molds are made with a lip which overhangs into the next mold, so that any molten silver may be deflected into one mold or the other without spilling. A number of these molds are placed on a long truck which can be run under and past the tapping spout. When one truck of molds is full, the stream can be dammed momentarily while another is pushed into place. The accompanying drawing shows the overhanging lip of the molds.

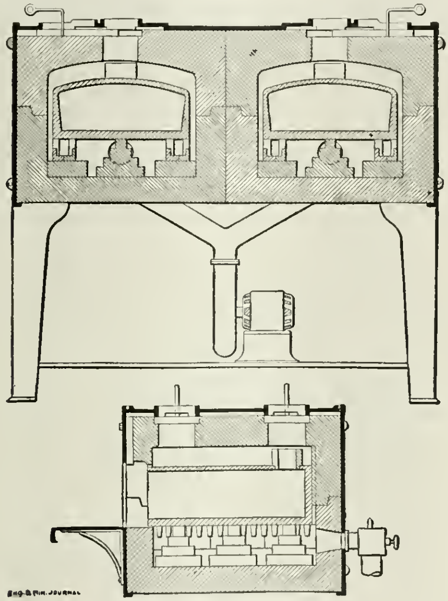


Bullion Mold with Overhanging Lip

The Assayer and Chemist

Case Assay Furnace

A new assay furnace has been patented (U. S. pat. 1,076,346) by W. W. Case, of Denver, Colo., which has for its object the elimination of the inconvenience which accompanies the use of solid fuels like coke, coal or charcoal, and also the inefficiencies of liquid fuels like gasoline, oil, etc., the difficulties in the latter case being principally due to unequal heating. The new furnace is oil fired, two or more muffles being heated by the burner and fan. Proper heat distribution is obtained by splitting the flame of the burner by angular pedestals, which also serve to support the muffles. The furnace itself is composed of two parts, of fireclay, and is easily taken apart for cleaning or renewing.



Case Assay Furnace

A flue system is arranged so that an oxidizing current through the muffles may be commanded at any time for feathering cupels.

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Picric Acid in Iodometry

Picric acid is recommended as a standard substance for iodometry by A. Sander (*Zeit. angew. Chem.*, p. 192, 1914). It is not hygroscopic and gives a very sharp end-point without the addition of an indicator. The following equations illustrate the interactions involved:

$$6C_6H_2(NO_2)_3OH \text{ (or 6HCl, etc.)} + 5KI + KIO_3 =$$
$$6C_6H_2(NO_2)_3OK \text{ (or 6KCl, etc.)} + 3I_2 + 3H_2O.$$

Iodine is estimated by thiosulphate solution standardized by the picric acid $\left(\frac{N}{24} \text{ or } \frac{N}{100}\right)$. The iodide-iodate solution should contain 40 grams of potassium iodide and 10 grams of iodate per liter. It is stable, but becomes yellow on prolonged exposure to light; sodium thiosulphate is then added until the color disappears. Many colored solutions of acids—and bases—may be analyzed iodometrically if starch solution be added toward the end of the titration of the iodine. An illustration of this is the determination of sulphurous acid in the presence of thiosulphate and sulphuric acid.

The total sulphurous acid and thiosulphate are determined by titration with iodine, and then the sulphuric acid produced by oxidation of the sulphurous acid is determined by adding excess of iodide-iodate (see preceding abstract), and titrating the liberated iodine with sodium thiosulphate, thus:

$$3H_2SO_4 + KIO_3 + 5KI = 3K_2SO_4 + 3I_2 + 3H_2O.$$

A mixture of sulphurous and sulphuric acids may be analyzed in a similar manner, the former being oxidized by iodine, and the total sulphuric acid then present determined with iodide-iodate solution. Bisulphates behave in an analogous manner.

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The Iodate Method for Copper

By W. W. Brostrom*

The potassium-iodate method for the accurate determination of copper presents many features that recommend it to the chemist, but a lack of practicable methods of manipulation have caused it to be neglected.

During the last two years the Calumet & Arizona Mining Co.'s laboratory has experimented extensively with this method and has finally developed a method of manipulation that gives satisfactory results, comparing favorable with the electrolytic or iodide methods. On careful work a determination can be made in 40 min., and where accuracy of $\frac{1}{10}\%$ is sufficient, in even 20 min. However, for close work directions should be carefully followed.

As a matter of comparison, the following results will give an idea of its accuracy. The assays were made by four different chemists, all in different laboratories:

Iodide	Electrolytic	Iodate	Umpire (Ledoux)
8.57	8.54	8.53	8.55
9.50	9.52	9.48	9.49
8.55	8.55	8.52	8.50
9.05	9.08	9.01	9.03
9 22	9.27	9.20	9.25
9.84	9.91	9.84	9.84
Av. 9.122	9.145	9.097	9.110

The following solutions are required:

Potassium iodate, chemically pure, 14.73 grams per liter (0.0025 Cu.).

Potassium sulphocyanate, chemically pure, 40 grams per liter.

Sodium sulphite, chemically pure, 200 grams per liter.

Chloroform or carbon tetrachloride.

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*Chief chemist, Calumet & Arizona Mining Co., Warren, Ariz.

If the ore does not contain more than 12% copper, take one gram of ore; if higher, take only ½ gram. Place in a 250-c.c. Erlenmeyer flask. Decompose with appropriate acids, adding 3 or 4 c.c. of sulphuric acid. Evaporate to fumes. Add about 50 c.c. cold water, when cool and ammonia until just alkaline. Then add 5 c.c. strong hydrochloric acid and bring to a boil on the hot plate. Reduce the copper by adding 10 c.c. sodium sulphite solution. When the assay is white, add 5 c.c. of potassium-sulphocyanate solution to precipitate the copper. Boil for one minute and remove from the hot plate. If the assay turns red at this point, it indicates too much acid. By adding ammonia carefully, this can be destroyed. However, it does not affect the copper.

Filter while hot on an S. & S. filter No. 589, white band is best, fitted closely in the funnel. Fill the filter nearly full and allow the solution to run through. Considerable of the precipitate will probably pass through the filter. Filter this again. The second filtrate will be absolutely clear. Finally filter the rest of the flask, washing the flask thoroughly with hot water. When the last washings have passed through the filter, remove the filtrate and replace with a clean beaker. As the precipitate has a tendency to creep, it should now be carefully washed down to the center of the filter paper with a small amount of water. Allow this wash to run through, finally passing the filtrate again through the filter. This catches all the precipitate that has crept to the top of the filter. Finally wash thoroughly with hot water four times, directing the stream only at the top of the filter. The solution and wash water filter rapidly and it takes but a few minutes to go through the foregoing operations.

In the original flask place 30 c.c. strong hydrochloric acid, 20 c.c. water and 1 c.c. chloroform or carbon tetrachloride; the latter is preferable. Remove the filter from the funnel with a circular motion to remove any adhering precipitate from the funnel.

Place the filter paper with the precipitate in a wide-mouthed copper flask of about 250 c.c. capacity and add the contents of the Erlenmeyer flask. Shake the flask a minute, then gradually add the standard iodate and shake vigorously. An intense red color will be produced, which increases until one-half of the copper has been titrated, and then decreases until the reaction is finished. After each addition of the iodate, the bottle is vigorously agitated until finally one drop of the iodate will discharge the last remaining color. A little practice will be required to shake the flask skillfully without a stopper. About two minutes will be required to titrate an assay.

If one gram of ore was used, divide the cubic centimeters by 4 to get the percentage of copper.

To avoid loss of the assay in case of over-titration, a solution of KSCN can be made that will just balance the iodate. By titrating back with this solution until the red color again appears and deducting the KSCN reading from the KIO_3 reading, the true value may be found. By titrating a few cubic centimeters of the stock KSCN solution with iodate, an approximate solution of the value of the iodate can be made up and finally adjusted.

Once standardized, both iodate and sulphocyanate solutions will remain unchanged until used up. The latter on long standing forms a "mother," which should be filtered off before using, as its presence affects the results. This solution may be used to standardize the iodate when once its true value has been found.

There are no interfering elements except silver, which should be filtered off when present in appreciable quantities. Arsenic, antimony or lead have no influence on the assay. After using this method for two years, we have still to find where it has fallen down in any way, and believe it is equal generally to any other volumetric method for copper and superior in many respects.

Detection of Infinitesimal Amounts of Arsenic

The method is based upon the deposition of a mirror of silver by the action of the hydrogen arsenide upon a solution of silver nitrate contained in a narrow glass tube bent twice at right angles, and comparing the mirrors obtained with standard mirrors (L. Moreau and E. Vinet, *Comptes rend.*, p. 869, 1914). The arsenic hydride is generated in a small U-tube, containing 0.5 grams of platinized zinc and dilute sulphuric acid. One limb of the U-tube is connected with the above-mentioned glass tube and the other with a dropping funnel containing the solution under test, and with a hydrogen generating apparatus through a second U-tube containing silver nitrate solution; the current of hydrogen is regulated to give 15 to 20 bubbles per minute in the mirror tube. By this method 0.001 mg. can easily be detected and estimated, but care must be taken not to use more than the specified quantity of the "purified" reagents.

Iodometric Equivalents

The following table from the *Chemical Engineer*, June, 1914, is a convenient one for pasting up in the laboratory:

THIOSULPHATE AND IODINE EQUIVALENTS

$Na_2S_2O_3$ value × 0.8022 = iodine value.
$Na_2S_2O_3$ value × 0.2241 = chlorine value.
$Na_2S_2O_3$ value × 0.5051 = bromine value.
$Na_2S_2O_3$ value × 0.2747 = MnO_2 value.
$Na_2S_2O_3$ value × 0.1292 = $KClO_3$ value.
$Na_2S_2O_3$ value × 0.1461 = $KClO_4$ value.
$Na_2S_2O_3$ value × 0.1096 = chromium value.
$Na_2S_2O_3$ value × 0.4367 = lead value.
$Na_2S_2O_3$ value × 0.1517 = ozone value.
Iodine value × 1.2465 = $Na_2S_2O_3$ value.
Iodine value × 0.2953 = arsenic value.
Iodine value × 0.4722 = antimony value.
Iodine value × 0.1263 = sulphur value.

Use of Tantalum Electrodes

Wegelin (*Chem.-Zeit.*, 1913, p. 989) obtained better deposits of zinc and copper on a platinum-wire-gauze cathode than on one of perforated sheet tantalum. This, however, is to be attributed to the different forms of the electrodes, for with an electrode of tantalum-wire gauze, deposits were obtained equal in quality to those obtained with a platinum-gauze cathode under similar conditions. Oesterheld found that tantalum cathodes became brittle in use. This is true, however, only when relatively high current densities are used, and does not apply to electro-analytical operations.

"Policeman" for Platinum Crucibles

A neat "policeman" for platinum crucibles is made of a piece of heavy platinum wire, or old anode stem, flattened so as to give a chisel point. This is then mounted in a wooden handle. To avoid scratching the crucible, the corners of the chisel end may be slightly rounded. This is a very useful tool in dislodging deposits on the side of the crucible, such as form in hydrofluoric evaporations.

Correspondence and Discussion

Placer Law Applied to Petroleum

Not havin' much to do the day, I've been studyin' Misther Ball's larned discoorse on "The Placer Law as applied to Petrolyum," as contribyted to the Institoot last Fibruary, and am now pretty well balled up on the subject. I agree that the placer law is highly unsatisfaact'ry.

The ixtra-latheral rights of ile drillers is touched on be Misther Ball, but he does not seem to make anny attimpt to classify ile deposits and ile wells as veins or lodes. Now it shud be plane to anny wan at all that an ile well is a kind of artery or artificially created apex to a vein. It extinds down into the heart of the earth, and the heart of the earth takes the ile from the vein and poomps it up the artery.

Whin the heart action is weak, the ile man pulls the ile up with a poomp. An' the felly with the biggest pull gets the ixtra-latheral rights, and there ye are.

Bill McGinty*.

El Paso, June 20, 1914.

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Ore Treatment at the Argo Mill

In the Journal of July 4, in an article on "Ore Treatment at the Argo Mill," by A. H. Roller and H. T. Curran, the authors assume credit for having successfully applied cyanidation to the complex ores of this Colorado district, attributing the success to the use of an electric cell placed at the head of the zinc boxes, and to the use of ammonium salts.

The use of ammonium salts is not new to the metallurgical fraternity, but such success as attended the use of these salts at the Argo mill may be new and worthy of note. It is claimed that by virtue of ammonium salts, the precipitation of copper in the zinc boxes is prevented. (See table below.) That the use of the electric cell is a "distinctive feature" aiding precipitation, oxidizing the reducing agent in the solution, and beneficially toning the whole system, may best be judged by the following comparison of results, with and without its use.

COMPARISON OF PRECIPITATION

Period	Electric Cell	Ammonium Salts	Zinc in Use, Cu.Ft.	% Bullion in Precipitate		Ratio of Bullion to Copper	Fineness of Cast Bullion	Gold in Box Tail
				Low	High			
Apr. 1 to Nov. 1 1913	With	With	231	1.2	6.4	1 to 0.9	397 (*a*)	16.7c.
Jan. 1 to July 1 1914	Without	Without	78	14.6	25.6	1 to 0.7	720 (*b*)	6.6c. (*c*)

(*a*) Only one bar of bullion cast in the period, the precipitate having been shipped regularly to the American Smelting & Refining Co., Omaha, for treatment.

(*b*) Low-grade bullion due to copper. By special treatment of the precipitate, the grade of bullion is now about 900 fine, none of which is included in the average of 720.

(*c*) At present, with 90 cubic feet of zinc, the box tail seldom exceeds 2c.

Commercially speaking, the successful application of cyanidation, or any other method of ore treatment, implies at least that the bare operating expenses shall be covered. As this mill had at no time, up to the time of change in management, on Nov. 1, 1913, paid operating expenses, it is difficult to see wherein the venture was a success. The mill was in unsuccessful operation from Apr. 1, 1913, to Nov. 1, 1913. In October, Richard A. Parker, of Denver, was appointed consulting engineer to the company. After a careful investigation, he shut down the mill. He then appointed O. F. Heizer as manager, who in turn appointed me mill superintendent.

In November, under the new management, a test run of five days was made, at the end of which period, the mill was closed down pending radical alterations, touching nearly every department of the mill—sampling, crushing, concentration, agitation, filtration, precipitation and refining. These alterations have been made, notwithstanding the statement "any future changes will be small details governed by convenience." That the extraction has increased from 59.8% (Apr. 1 to Nov. 1, 1913) to over 90% (at present) seems to justify the alterations.

Jackson A. Pearce.

Idaho Springs, Colo., July 17, 1914.

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In the Journal of July 4, Mr. Roller and I had an article on the Argo mill. This article was written before the change of management, but was not sent in until shortly afterwards as we were holding off to get some details on the filter which we were installing. I severed my connection with the company at that time and Mr. Pearce has since been mill superintendent.

I am connected with the Oneida-Stag Mining & Milling Co. as mine and mill superintendent and I am sure Mr. Roller, when he sent in the article, did not wish to convey the idea that I was still connected with the Argo mill. In justification of Mr. Pearce's position, I will greatly appreciate any effort of the Journal to give due publicity to the fact that he has been superintendent since the change of management.

Harry T. Curran.

Idaho Springs, Colo., July 19, 1914.

⁂

What Is a Prospector?

Regarding the analysis of a prospector in the Journal of July 4, I am a good deal of a prospector myself, in that case you can take off the 22.5% of alcoholism; I never taste any. The other qualities you may let go.

I have found on many occasions that a few dollars invested with a hardy prospector or practical miner will return with up to 1500% more, sometimes within a year. I have myself on many occasions invested a good deal of money with technical mining experts, but so far have never yet got a dollar back. Every cent a total loss, and this has gone into the thousands of dollars.

G. C. Monberg.

Leadville, Colo., July 12, 1914.

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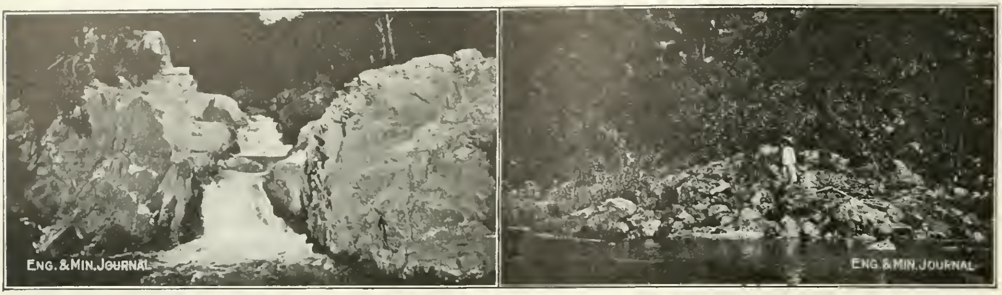
*Ex-sicrety, Durango local lodge, Amalgamated and Disintegrated Federation of the Ex-patriated Plaza Miners of Greater Texas. Expelled by other Plaza miners for doing a little real work.

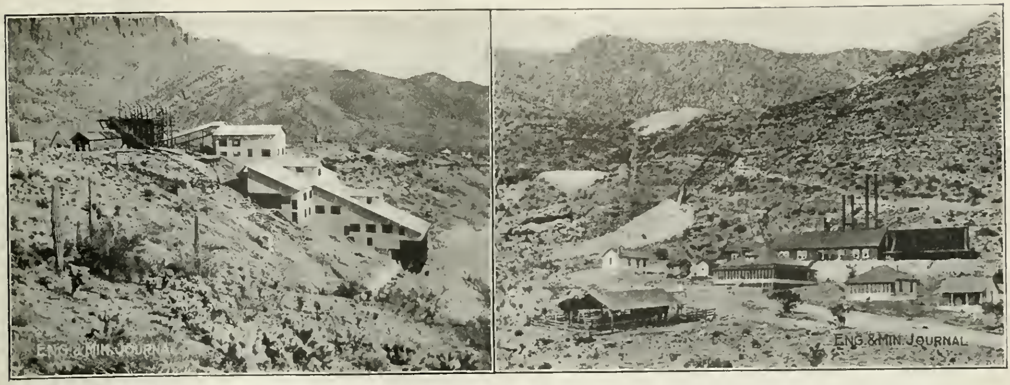
Photographs from the Field



Las Truchas Iron-Ore Deposit, Michoacan, Mexico
Views show ore in bed of a stream and float ore on the bank.

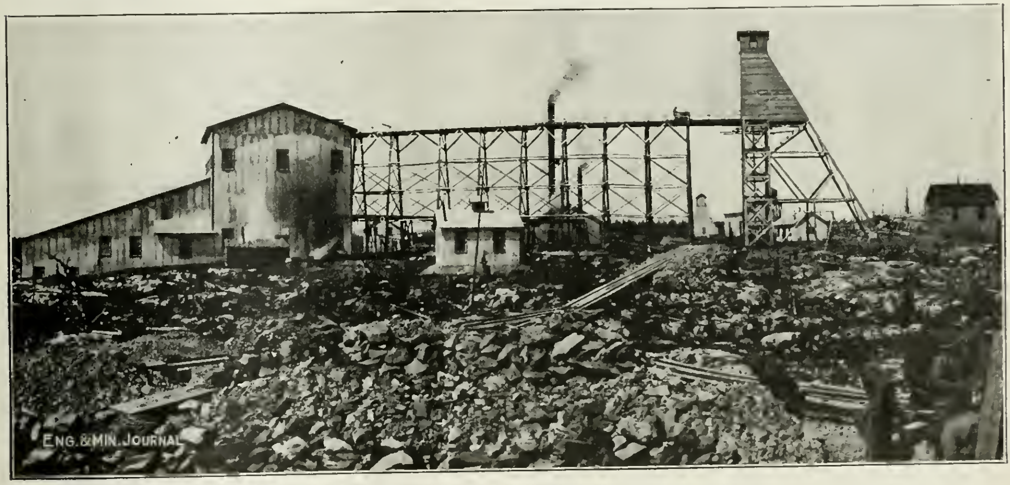
Bed of Kerr Lake, Ontario, after Water Was Pumped Out
The view on the left shows one of the veins found. This vein yielded "plate silver" and assayed 2500 oz. per ton.

General View of Clarkdale, Arizona, and New Smelting Wo s
The older smelting works at Jerome is barely distinguished. It appears faintly, more than half way up the mountains ar



Mill and Mine Plant of Magma Copper Co., Superior, Ariz.

The mill, recently started, is of 150 tons daily capacity, treatment consisting of table concentration followed by Callow process of pneumatic flotation. Lower terminal of the tramway is the unfinished structure at head of the mill. The town of Superior is in the distance at the right. The view at the right shows the assay office, mine office, power plant (back), dormitory and mess hall. The uppermost dump is at the old Magma shaft, now abandoned. Principal mine opening is the Flindt adit.



Dome Lake Mill and Headframe at Porcupine, Ontario

Mill crushes about 40 tons of ore daily, recovery of gold being effected by amalgamation only.

of the United Verde Copper Co., now nearly Ready to Be Blown In

little beyond the faint white line of the road that disappears to the right of the center of the left half of the photograph.

Butte-Duluth's New Plant

BUTTE CORRESPONDENCE

Butte-Duluth's new crushing plant, new leaching machines, Dorr thickener, Kelly filter press and electric haulage were started simultaneously not long ago, rendering the hands of the operating staff pretty full. However, things went very well, there having been a minimum of incidental starting troubles.

The Kelly filter press, working under an entirely new condition, is performing excellently well, giving a clear electrolyte and perfectly washed slime tailings. The Symons machines in the crushing plant, both vertical and horizontal, are doing excellent work. The fine reduction disk, or vertical, has several minor mechanical defects, which are being remedied, but it has the ear marks of becoming an efficient grinding machine.

The 8x30-ft. Dorr machines are started and are operating in an ideal manner. They are giving an extraction on an average of seven days of 92.1%. The addition of Dorr thickener and Kelly filter press to take care of the slime discharge from the leaching machines has cut the acid consumption from about 72 lb. of 60° Bé. per ton of ore to 45 lb., to say nothing of the saving in copper, which formerly went into Horse Creek.

The new cell room is in course of construction. This room is to contain 128 cells. The cells are to have an anode and cathode arrangement longitudinally with the flow. Mr. Sherwood believes that a type of cell has been evolved here which will do away with lead lining. The new cells are being made by the Pacific Tank Co., of Portland, Ore. It is intended to insulate all iron bolts with rubber hose. To protect the wood from saturation, the interior of the cells will be coated with "Amberoid." This is a new acid-proof lacquer evolved in the laboratories of the Mellon Research Institute of the University of Pittsburgh, by Dr. L. V. Redman. The Butte-Duluth company has had in operation a cell made as above, and has had good success with it.

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The Unprofitableness of Graphite Mining

The following remarks on the financial hazards of graphite mining in the United States are taken from the U. S. Geological Survey's bulletin on graphite.

Today there are more abandoned graphite mines and mills in the United States than the number in operation. The number of times that some of these properties have changed hands in the course of a few years evinces a record of misrepresentation and disappointment that can hardly be equaled in any other branch of mining, and many properties have been notoriously associated with stock manipulations of doubtful character. It should be clearly understood by anyone who contemplates the development of one of the flake-graphite deposits that the technology of concentrating such materials is yet in its infancy; that there are no well established systems of treating the materials, such as exist, for example, for the treatment of gold or copper ores; and that the product obtained is variable in quality and in market value and subject to severe competition with foreign graphite. The largest part of the foreign graphite that comes into this country is brought in by American firms, who either control or own foreign mines or have purchasing agents abroad, and are, therefore, in a position to take immediate advantage of any change in the markets at home or abroad. In general, the cost of producing flake graphite is so high and the price at which it is sold so low that even under the most economic conditions the margin of profit is small. Moreover, certain rocks that carry graphite contain other minerals in such intimate association with the graphite as to preclude any possibility of successful concentration—such, for example, are rocks in which graphite flakes are interleaved with mica—and a careful study of the material by an expert should precede any attempt at development.

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U. S. Coal Production in 1913

There was a record production of coal in the United States in 1913, amounting to 570,048,125 short tons, according to the report of Edw. W. Parker, of the U. S. Geological Survey. This is an increase of more than 35,000,000 tons over the production of the previous year.

Coal was produced in 29 states, 23 of which showed increases. The decrease in Colorado was due solely to labor troubles. The largest increase was made by Pennsylvania, with West Virginia second and Kentucky third. The coal mines of the country employed in 1913 747,644 men. The average number of days worked by bituminous miners was 232 and by anthracite miners 277 days. The average production per miner in bituminous mines was 838 tons, and for anthracite miners, 532 tons, both figures being an increase over the 1912 average.

⁂

Winona Copper Co.

The 1913 report of the Winona Copper Co., Winona, Mich., shows a balance of assets amounting to $74,508 and unpaid assessments of $43,624, of which $21,079 have been paid since making out the statement. The receipts, exclusive of assessments, were $228,695, and expenditures were $341,727. The production was 1,448,737 lb. of copper from 120,806 tons of rock, yielding 11.99 lb. of copper per ton. The average price received for copper was 15.4c. The following table gives the cost of regrinding the jig and finisher-table tailings with six 8-ft. by 36-in. Hardinge mills. With three mills in operation in 1912 the copper recovered by regrinding amounted to 1.2 lb. per ton stamped. With six operating, the recovery amounts to 2.4 lb. per ton stamped, although the grade of the rock was lower.

May to Dec. 31, 1913	Total	Cost per Ton Reground c.	%	Units per Ton Ground
Power, 1.094c. per kw.-hr.	$8,186.98	15.30	80.23	13.99 kw.-hr.
Labor	404.31	0.76	3.99	
Supplies:				
Pebbles, 0.7226c. per lb.	933.24	1.74	9.12	2.414 lb.
Lining, 1.467c. per lb.	117.52	0.22	1.15	0.15 lb.
Set steel lining	176.55	0.33	1.73	
Incidentals	383.80	0.72	3.78	
Totals	$10,202.40	19.07	100.00	

⁂

Sulitelma Mines, Norway, Produced in 1913 165,000 tons of pyrites and 1 85 tons of bessemer copper. The profits for 1913 amounted to $264,720, and a dividend of 6 per cent. was declared. Last year the shareholders got nothing, the whole of the earning being devoted to writing off. Last winter the new modern smelter of American type was put up, and the Ovre lakes kept open by means of the steamer "Ranen," loaned from the Dunderland Co. until the modern type icebreaker on order is delivered next autumn.

Editorials

The War in Europe

Austria has arrogantly and wickedly declared war on Servia out of revenge for the assination of the Archduke Franz Ferdinand and to satisfy the ambitions of its army. The world is fearful that all the great nations of Europe will become involved, and the markets of all kinds, both stock markets and commodity markets, but especially the former, have experienced cataclysms. Our own markets have not escaped; so closely are they tied to the markets in Europe. The probable effect of a general European war upon business in the United States is excellently outlined by Frank A. Vanderlip, president of the National City Bank, as follows:

> As far as this country is concerned it would of course be adversely affected by such a great war as Europe is trying to avoid. As we have no merchant marine of our own, we would find our ability to ship our industrial and agricultural products to Europe restricted, as the French, German and English merchant marine would not be able to operate as it does today. Such a condition would result in a depression of our industries for the time being.
>
> No good can ever come of warfare, for it is destruction of capital, and capital makes prosperity. The idea which some people have that a war would be beneficial to this country is a theory which belongs to the stone age of economics. If we get more for our goods abroad in case their industry there is paralyzed by war we will also have to pay the higher prices at home. I can hardly imagine a great European war of such long duration as to enable our building up a great merchant marine of our own.
>
> Such a war would prove a great hindrance to the necessary financing which many of our great industrial plants and railroads must do in the very near future. It would hold back such reorganizations as are absolutely necessary to readjust railroad properties in this country.

As we go to press the only hope is that hostilities may be confined to the two countries, Austria and Servia, directly involved at present. If diplomacy can avert the spreading of the conflagration that is the best to be expected. It appears from the Austrian newspapers that this conflict was urged there as early as the beginning of July, but upon the world at large the prospect burst only a few days ago like a bolt out of a clear sky.

⁂

Copper below 13 Cents

But little more than six months ago the producers of copper were confidently expecting an upward swing of the market. Indeed, conditions were regarded as such that the price might be carried up to 18c., even to 20c. This was when Europe was taking enormous quantities and when a revival in American business was expected to take place immediately. The new currency bill had just been passed and had been accepted even by its previous critics as an important step toward the rehabilitation of the commercial structure in this country. The President had just made a reassuring statement to the people regarding the attitude of his administration toward business affairs. The stock of copper was phenomenonally low. Production had been for many months previous about at a standstill and no important increase was in sight. The conditions justified the optimistic opinions respecting the copper market that were then held. Instead of their fulfillment, however, we have seen what we have seen, including during the last week a fall in copper to below 13c.

It is unnecessary to repeat our reviews of the causes leading to this. Suffice it to say that the contraction in American consumption has been the basic cause. Early in July an attempt to turn the market was cleverly engineered and during that time some large transactions were made, but although the market was raised fractionally, it developed quickly that the demand from consumers was not sufficient to hold the advance, discerning which producers became insistent sellers again and once more the price sagged off. On this slump the interest of Europe failed to be awakened, which, no doubt, was due in a considerable measure to apprehension over the political conditions which culminated in the war scare beginning last week.

During recent weeks the Wall St. and minor trade papers have given a wholly erroneous, uninformed idea of the conditions actually existing in the copper market. In fact, it has been difficult for producers to dispose of their output, all are averse to carrying unsold stock, and each one has been afraid that his competitors would get ahead of him in disposing of product. The conditions have demanded the shrewdest kind of marketing, in executing which no seller parades his real prices from day to day, and if he talks he talks big in order to make his wares look good. Nor does the producer who has millions of pounds weekly to merchandize among consumers disclose his hand to picayune buyers and petty speculators.

Copper has been weak for a fortnight previous to this review and has been emphatically weak since July 20, when there began to be a pronounced pressure to sell. All the facts of a market may not always be told from week to week lest some confidences be betrayed, but at this late date there is no harm in disclosing that the rallying of the market in the first week of July was an experiment that failed, or rather it was a testing of conditions which were found to be unsatisfactory, and that the hesitation of Europe to enter into further contracts for supplies became evident a good many days ago.

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A Novel Proposition in Butte

The proposition of the Butte Miners' Union, the old union, that the city of Butte should indemnify it in the sum of $138,291 for failure to protect its property, which was destroyed in June, is a novel one. In ordinary circumstances, the complainants might have some justification, although the destruction of property by the sudden attack of a mob, which no municipality could combat effectually, might be classed with those things that are characterized as acts of God, for which the municipality is no more responsible than for failure to protect property against fire by not having an efficient fire department.

The miners' unions have, however, openly threatened to destroy the property of their employers upon occasions when some of their demands have not been granted, and, in fact, have done so in the Cœur d'Alene, at Cripple Creek, and elsewhere, and most recently in the coal fields of Colorado. The objection to such a practice when applied the other way around and a claim for damages on such an account looks cheeky. But it simply illustrates what a difference there may be in whose ox is gored.

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Unit Construction Costs

That is a very noteworthy paper which E. Horton Jones publishes in the July bulletin of the American Institute of Mining Engineers on "Unit Construction Costs from the New Smelter of the Arizona Copper Co., Ltd." This was a new smelting works erected by Mr. Jones, under the general direction of Dr. L. D. Ricketts, at a cost of about $2,000,000. Mr. Jones with the assistance of his staff summarized the cost with a minuteness that perhaps is unrivaled. Anyway, we are safe in saying that nothing equal to this has heretofore been published, and the engineering profession owes a great debt both to Mr. Jones and to Dr. Ricketts for allowing these data to be published.

Mr. Jones treats his subject in five chapters, as follows: Unit costs, comparative costs, composite costs, wage scale, raw materials prices and description of costs. Taking up these chapters in the reverse order, the last is to some extent a description of the works, or, rather, of such portions of them as give the necessary information for anybody to determine the character of the work and judge as to the applicability of a unit cost in another place. The chapters on the costs of material and labor are of course basic, these being fundamental factors that come into any estimate. In composite costs we find everything grouped according to divisions of the works, such as the cost of the several buildings, of the ore bins, of the dust chambers, of the power plant, etc. In comparative costs we find data of the expense of putting in the concrete work, of excavation, of erecting machinery, structural steel, etc. In the chapter on unit costs, we find the cost of the plant, in detail, allocated in a different manner from that in chapter 3, here being given the cost of the crushing plant, of the sampling plant, of the roasting plant, of the reverbatory plant, etc. Everything is given in minute detail and everything is reduced to the unit cost, viz., so much per cubic yard, or per linear foot, or per ton, etc.

Many years ago we inaugurated in the JOURNAL a discussion of the cost of mining, hoping to develop data analogous to what Mr. Jones has done in this paper for smelting. This discussion brought out a great deal of interesting material, but it failed singularly to bring out what we wanted, and we were forced to the conclusion that the mining engineers of the country, speaking generally, did not possess that kind of data and had not been trained to think in the way necessary to produce it. No doubt the same criticisms might have been correctly made with regard to the practice in smelting and the erection of metallurgical plants. Mr. Jones has, however, demonstrated that he is a thinker on the subjects of his profession, and we prophesy that his recent contribution will not only be a stimulus to other engineers to think likewise, but also will be of immediate value to smelting men and builders of metallurgical works everywhere; to them indeed his paper will become a well-thumbed *vade mecum*.

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More Flotation Litigation

The Minerals Separation Co. is going to try out its patent litigation once more. Having been denied a rehearing in the Circuit Court of Appeals, where the previous decision was rendered, its only resource was to bring suit in another circuit. Consequently it selected the Miami Copper Co., which is a Delaware corporation, and has brought suit in Delaware. Obviously this is distinctly a test case, inasmuch as the Miami Copper Co. has been trying the flotation process only in an experimental way, and probably no damages will be claimed.

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Mining a Flat Vein

The objects in life of a mining engineer are to find ore and to break and handle it cheaply. Of all the handling operations, the first one, mucking, is most neglected. Tramming and hoisting have been mechanically developed to a high degree, but, as one engineer has put it, we are mucking today about as they did in Solomon's time.

The problem has, of course, been attacked to some extent; the most successful way to solve it is to eliminate it by a generous use of chutes, as at the Ray mine. In cases where this is impossible, mechanical loaders are being experimented with, and undoubtedly will be developed into successful machines in time, although none has as yet won any spectacular success. There will always be cases, however, to which neither of these solutions is applicable, and the hardest problem which the miner meets is that involving a flat-dipping deposit, say 10° to 30°, narrow or of medium thickness, and not of any great extent in its other dimensions. In such an orebody the man-handled muck-stick is likely to be used for a long time yet, and under such conditions the mucking, that is, getting the broken ore to the haulage level, is likely to cost about as much as the actual breaking.

Various expedients are resorted to for overcoming these adverse conditions, shaking chutes and gravity trams being most commonly used. In this issue Mr. Newberry describes the ingenious scheme worked out for the Golden Cross mine in southeastern California. It was necessary here to keep all costs low, and especially all initial costs. The stopes were small and the amount of ore to be handled in each was not enough to pay for any elaborate installation. Development was relatively expensive, due to the faulting, and the processes of mining and development had to be combined to as economical a whole as possible. We believe that the method adopted was about the most suitable that could have been devised, and was in most features unique. The only similar scheme with which we are familiar, and that differs in a good many particulars, is one found in some of the anthracite mines.

The costs are low, considering that the only even partially favorable conditions encountered were a fair thickness of the ore, a material not exceedingly hard, and apparently a sound hanging wall.

Leaving the question of mining and stoping, the adoption of raises for transverse exploration, instead of crosscuts, was a happy idea. The material from the raise requires no mucking; the use of the economical stoping drill is permitted; the raise is available for a chute when ore is encountered, whereas a crosscut is frequently wasted; and, finally, with the dip here existing, the raise is the shortest way across the possibly ore-bearing formation. It is hard to see why this scheme does not find a more general adoption.

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The total production of coal in the United States in 1913, according to the figures collected by Edward W. Parker, statistician of the Geological Survey, was 570,048,125 short tons. This is 35,581,545 tons more than in 1912, and is the largest output ever reported. Coal was mined in 29 states, nearly all of them showing gains over the previous year. About 46% of the total came from Pennsylvania.

BY THE WAY

The Potomac Glass Co., of Cumberland, Md., capitalized at $25,000, on a business of $160,000 during the fiscal year just ended, declared a dividend of 92%. Most of the company's shares are owned by its 300 employees, consisting of men, girls and boys. The plant runs day and night and has orders ahead for over a year. The first dividend of 10% was declared in 1910 after eight years of operation. Other dividends were: 1911, 32%; 1912, 62%, and 1913, 72%. Do these enterprising, intelligent and thrifty coöperative working people appreciate what a crime they are committing in paying themselves dividends of nearly 100%?

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One of the most amusing and characteristic happenings which spice the history of the late Jim Wardner, the promoter, is reported by *The Chalcopyrite,* of Skeena Crossing, B. C., as follows: A railway train upon which Wardner was traveling was stalled for an hour or two in a little town. While wandering aimlessly about the place, he strolled into its one grocery store, and seeing a small pan of eggs on the counter asked: "Are those eggs fresh?" "Wife fetched 'em in from the hen-house this mornin'," said the grocer. "It's a long time since I had a real old-fashioned egg-nog," said Jim, "and if you will furnish the eggs I will provide the whiskey and other ingredients, and we will have a most enjoyable drink." "I'm quite willin'," was the response. Crossing the street to a saloon, Wardner gave the proprietor a pleasant greeting, and after a few introductory remarks about the weather and the crops, said: "By the way, I have just discovered some fine new-laid eggs over in the store, and if you will furnish the whiskey I will arrange for the eggs and we will have an uptodate egg-nog." "It's up to you," replied the saloonkeeper. Back across the street went Wardner and straightway returned with the grocer and his eggs. The saloonman did his best and soon placed upon the bar three foam-crowned glasses of the beverage. Suddenly a puzzled expression appeared on his face and he asked, "Say, stranger, this man furnished the eggs, and I have put up the rest of the material, now where do you come in?" Said Jim, with a smile, as he raised the glass to his lips, "I am the promoter."

The following extract from William Ogilvie's "Early Days on the Yukon," indicates clearly how excessive conservatism may retard the development of rich mineral territory. In the year 1859, a young man of the city of Toronto, Canada, entered the service of the Hudson's Bay Co. and was sent to the other end of the world, as it was considered then, to the company's most distant post, Fort Yukon. In the fall of the year soon after his arrival he wrote a long letter home, giving a minute account of his journey of nearly five thousand miles. On Oct. 2, 1864, he wrote again, and told of the fur trade and its dog expeditions in the winter, and boat voyages in the summer after furs. I have copies of both these letters, and though all the contents are interesting, the following paragraph is extremely so, as foreshadowing the future of the Yukon: "I had some thoughts of digging the gold here, but am not sure about it. I do not think it is in paying quantities at the fort, but if I could only get time to make an expedition up the Yukon, I expect we should find it in abundance, but I am always on the voyage or busy at the fort during the summer, and in the winter nothing can be done in the way of gold hunting. I think that next fall, after arriving from my trip down the Yukon, I shall be able to go up the river. There is a small river not far from here that the minister, the Rev. McDonald, saw so much gold on a year or two ago that he could have gathered it with a spoon. I have often wished to go, but can never find the time. Should I find gold in paying quantities I may turn gold digger, but this is merely a last resort when I can do no better."

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It is not universally known that at one time several Standard Oil men were interested in prospecting for gold placers. But we are informed that in 1898 some of these gentlemen organized what was known as the Principality Mining & Grazing Co., for the purpose of exploiting a large tract of land in the Northwest Territory of Canada; having been led to believe that the Canadian Government would grant to them a concession to operate in that region. When matters reached an encouraging stage, an experiment was tried in order to test the feasibility of selling leases to prospective gold miners; and in one afternoon several were sold in one locality at a price of $1000 each. Lieut. S. F. Adair, formerly with the Fifth Cavalry, U.S.A., was commissioned to negotiate with the Canadian officials, and when Lieut. Adair's doubts as to the securing of the concession were confirmed, he advised his principals to make no attempt to sell leases. Unfortunately those already sold could not be canceled, as the purchasers insisted upon the terms of the contract being carried out. This task was entrusted to the ex-cavalryman, and in order to secure sufficient ground for all, a like number of additional miners was employed from Pacific Coast points. Early Klondikers may recall the "mysterious thirty-six," who would not reveal their ultimate destination. They would not because they could not. Nor did their military guide have a precise knowledge as to where the goal might be. He simply knew that it was "up to him" to produce the goods. In due time each lease buyer was placed in possession of a placer claim of suitable size and the precious contracts were returned to New York. Needless to say, the Principality Mining & Grazing Co. did not continue its operations.

Sinking the Athens Shaft

Special Correspondence

Sinking is again in progress at the Athens mine, which the Cleveland-Cliffs Iron Co. is developing, near Negaunee, on the Marquette range, and almost all of the permanent equipment is installed. It will be several years, however, before mining can be started. The shaft will be sunk below 2000 ft., and it is figured that an average of 80 ft. per month will be excellent sinking. The shaft is circular, 17 ft. in diameter in the clear, but is being cut to 20 ft. It will be concreted from the top to the bottom.

The cement is poured into the forms through a 6-in. pipe. The segments of steel plate which form the outer circumference of the circle are 5 ft. high and well reinforced, and two of these circles, making 10 ft. in height, represent the spacing of a steel set. The steel members crossing the shaft horizontally have studs at each end, 18 in. long, which are bolted to the main piece and firmly held in position by plates on each side of the member. There are holes cut in the steel forms to receive these ends. The ends, or studs, remain permanently in the concrete, the rest of the member being withdrawn when the forms are removed and again bolted into position when the work is ready. The timbering for any portion can be easily removed in this manner. The shaft will have two skip-ways, a cage-way and pipe- and ladder-ways.

A cage is being used in the sinking, the first time in this part of the country that such has been tried. It is working well. The idea was developed by S. R. Elliott, superintendent of the Negaunee mines of the company. The cage is surmounted by a substantial steel crosshead, through which are strung three cables. At a distance of 100 ft. above is another crosshead of wood. When the cage descends into the shaft, the lower crosshead is caught at the point where the bearers cease and from this point to the bottom of the shaft it is kept in line by the cables which run through the crossheads. In hoisting, the cage comes up into the guides accurately and freely. A large Lake Shore Engine Works hoist is used, and the compressor is of the Nordberg type. The headframe is of steel, 110 ft. high. The engine house stands on a hill 520 ft. from the shaft, the cable being carried on towers 80 ft. apart. The tower nearest the shaft is 100 ft. high.

Double Dealings by Representatives of Companies

By A. L. H. Street*

It is an actionable wrong against a mining company for its superintendent to enter an agreement with a lessee of the company whereby the superintendent is to receive a percentage of the lessee's profits under the lease, unless the company is fully apprised of the nature and extent of the agreement, according to a recent decision of the Nevada Supreme Court, announced in the case of Frances Mohawk Mining & Leasing Co. vs. McKay, 141 *Pacific Reporter* 456. The Court said:

> The law will not tolerate an agreement or understanding between one principal and the agent of another, by which agreement such agent is to receive a commission or reward, which gives the agent an interest against his duty to his principal. In other words, an agent cannot be allowed to put himself in a position in which his interest and his duty will be in conflict, and, if he does, any profit that he may derive in the execution of his new assumed position must be accounted for to the principal who may claim it as a debt for money received for his use. Any gratuity to an agent, after he has entered into his agency, given to him for the purpose of influencing the execution of his agency, must be accounted for to his principal.

Clayton Bill and Compulsory Sales

Washington Correspondence

In reporting the Clayton trust bill, on July 22, to the Senate, the Senate Judiciary Committee has made, as the new draft of the measure shows, an important change in the form of the bill sent over by the House of Representatives, insofar as relates to mining. The Committee has left out of the bill entirely section 3, which read as follows:

"That it shall be unlawful for the owner, operator, or transporter of the product or products of any mine, oil or gas well, reduction works, refinery, or hydro-electric plant producing coal, oil, gas, or hydro-electric energy, or for any person controlling the products thereof, engaged in selling such product in commerce, to refuse arbitrarily to sell such product to a responsible person, firm, or corporation who applies to purchase such product for for use, consumption, or resale within the United States or any Territory thereof or the District of Columbia or any insular possession or other place under the jurisdiction of the United States, and any person violating this section shall be deemed guilty of a misdemeanor and shall be punished as provided in the preceding section."

Speaking of the reason for striking out this section, the Judiciary Committee says: "It would primarily deny freedom of contract to one of the parties, and consequently would be of doubtful constitutional validity. Passing from this consideration, the committee believes that such an enactment, which would practically compel owners of the product named to sell to anyone or else decline to do so at the peril of incurring heavy penalties, would project us into a field of legislation at once untried, complicated and dangerous."

Mine Rescue Car in California

The U. S. Bureau of Mines Rescue Car No. 5 will be in California early in September. The car will be first at Auburn, Placer County, from which point it will work the Grass Valley and Nevada City district. On account of the narrow-gage tracks of the local railroad, the car cannot go actually into these two districts. After completing its work in that section of the state the car will go into the Mother Lode region.

A. A. Krogdahl, first-aid miner with the Bureau of Mines, has been training men in first-aid work in the Mother Lode region. He is working at Plymouth, Amador City, Sutter Creek, Jackson, and from there will go to Campo Seco and Angels Camp, whence he will work south along the Lode. It is planned to have him visit most of those mines in the state that are situated off the railroad.

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The Raritan Copper Works Now Issues a Safety Magazine, the "Ingot." A particularly good feature is an illustration each month of how some prevalent form of accident happens and how it can be avoided.

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*Attorney, St. Paul, Minn.

PERSONALS

Kirby Thomas is making examinations in the San Juan district, Colorado.

Edward C. Weatherly has returned to Ouray, Colo., after spending six months in London.

R. B. Stanford left New Orleans July 23 for Choluteca, Honduras, to be gone two months.

Theodore V. K. Swift will sail for Cuba on August 8, where his address will be care of Tuinucu Sugar Co., Tuinucu, Cuba.

Floyd S. Youtsey, of Denver, Colo., is erecting a mill for the St. Louis Smelting & Refining Co. at St. Francois, Missouri.

Robert P. Millard, Mining Engineer, announces the opening of new offices at 1424 Rockefeller Building, Cleveland, Ohio.

Morton Webber, who has been engaged in Idaho on examination work for New York interests, has gone to Montana on professional business.

Frederic E. Calkins, of Globe and Miami, recently with the American Smelting & Refining Co., has been made mine inspector by the mining companies at Morenci, Arizona.

W. J. Priestley, Jr., former superintendent of the Alaska Treasure mine of Juneau, is now in charge of the Washington Anthracite Coal Co.'s property near Glacier, Washington.

Charles P. Aicher, late manager of the Butte Mining Co. of Alma, Colo., has accepted the position of manager of the London Mines & Milling Co., which operates the London Mine in Park County, Colorado.

H. N. Thomson, formerly of Anaconda, Mont., and Tooele, Utah, is at Clarkdale, Arizona, for the present. He is acting in the capacity of consulting metallurgist at the new plant of the United Verde Copper Company.

Horace Young, recently with the Trethewey mine, Cobalt, Ont., has accepted the position of consulting engineer with the Alguinican Development Co., and general manager of its subsidiary companies the Reupen Molybdenum Mines, of Eastern Ontario, and the Julian Alaska Gold Mines.

Samuel S. Webber, Trenton, N. J., has resigned his position as chief engineer of the Trenton plant of the American Steel & Wire Co., and has gone to Charlestown, N. H., to spend the summer. For a quarter of a century Mr. Webber was connected with the Trenton Iron Co. before it became a part of the American company.

OBITUARY

William Frazier, a prominent mining operator in Taos County, New Mexico, was shot and killed by John Birdwell, also a mining man, in self defence, on July 16. According to reports from Taos, a controversy arose between the men over a decision of the Supreme Court in which Frazier was declared only a third owner in the Frazier Group of mines at Twining, and upon which negotiations were under way for a sale to Boston parties at $7800. It is alleged that Frazier vowed he would kill Birdwell if he came upon the property, and when he appeared there a dispute ensued, in which shots were fired by the men simultaneously, Frazier falling dead. Both men are well known in the Taos County mining districts, having financial connections in Boston and New York.

J. Weidman Murray, aged 60 years, for many years connected with the iron and steel trade at Pittsburgh, died July 16 at his home in that city. Mr. Murray was born at Lebanon, Penn., and went to Pittsburgh in 1876 to become associated with the old Keystone Bridge Works. Subsequently he became identified with the Weimer Machine Works, Lebanon, and later moved to Birmingham, Ala., to become mechanical engineer for the Tennessee Coal, Iron & R.R. Co. Mr. Murray returned to Pittsburgh 19 years ago to become manager for the E. P. Allis Co., and continued in the capacity of Pittsburgh representative upon consolidation of the Allis-Chalmers Co. He was a member of the Dusquesne Club, the American Iron & Steel Institute, the American Society of Mechanical Engineers and the Engineers' Society of Western Pennsylvania.

Rev. Horace Carter Hovey died at Newburyport, Mass., July 27, aged 81 years. He was born in Indiana and educated at Wabash College. He served for a number of years as a Presbyterian minister, being at the same time an assiduous student of geology. In 1900 he resigned his pastorate at Newburyport to devote the remaining years of his life to scientific work and geology. He lectured on geology in many of the cities and colleges of the East. Dr. Hovey was a Fellow of the American Association for the Advancement of Science, the Geological Society of America, the International Geological Congress, the National Geological Society, and the Société Geologique of France. Dr. Hovey wrote extensively on geological subjects and published several books on caves, which were his specialty. Among his best-known works are several on the Mammoth Cave. He also wrote the articles on caverns in a number of editions of the "Encyclopedia Britannica." Edmund Otis Hovey, curator of the Department of Geology of the American Museum of Natural History, New York, is his son.

Dr. John Galbraith, dean of the Faculty of Applied Science and Engineering in Toronto University, and one of the foremost scientists and educators in Canada, died suddenly from heart failure on July 22, at his summer residence, Go-Home Bay, in the Georgian Bay district of Ontario. He was born in Montreal in 1846 and graduated at Toronto University in 1868. After graduating he engaged in railroad work, and in 1878 became professor of engineering in the Ontario School of Practical Science, of which he was appointed principal. In the early days of that institution Dean Galbraith taught all the branches of engineering himself, and in the face of great difficulties succeeded in building up the school to the position it at present occupies. When it became affiliated with the university, Dr. Galbraith was appointed Dean of the Faculty of Applied Science. He was one of the three commissioners appointed to investigate the collapse of the Quebec Bridge, a work which occupied some 10 months. The report of the investigation is now used as a text book in the university. Dr. Galbraith was one of the founders of the Canadian Society of Civil Engineers, and in 1909 was elected president of that body. Among other honorary positions which he held were the vice-presidency of the Engineering Section of the British Association for the Advancement of Science, and the vice-presidency of the Engineering Section of the American Association for the Advancement of Science. A striking tribute paid to Dr. Galbraith's work in promoting scientific education was the dinner tendered to him in Toronto last December, in celebration of the 35th anniversary of the School of Practical Science, which was attended by over 500 guests, including prominent engineers from all over the Continent. Dr. Galbraith leaves a widow, two sons and a daughter.

SOCIETIES

American Peat Society—The eighth annual meeting will be held at Duluth, Minn., Aug. 20-22. A number of valuable papers on the peat industry are promised, and there will be an excursion to the peat areas to the north and west of Duluth. Julius Bardollo, Kingsbridge, New York City, is secretary of the society.

American Institute of Mining Engineers—The Iron & Steel Committee has appointed a special Subcommittee on Iron Ore, the members of which are Dwight E. Woodbridge, chairman; John Birkinbine; Chas F. Rand; William Kelly; B. W. Vallat; F. A. Vogel; E. F. Burchard.

The summer meeting of the Pennsylvania Anthracite Section was held following an informal dinner at the Pottsville Club, Penn., Saturday, July 25. William G. Whildin, mining superintendent, Lehigh Coal & Navigation Co., was to present a paper on "Steep Pitch Mining of Thick Veins." Informal discussion of the paper followed.

American Petroleum Society—This society was organized at Pittsburgh, Sept. 10, 1913, at a meeting of secretaries of 30 local societies. Its object is to secure the unification and coöperation of these different societies; to aid the refiner and dealer, in the everyday course of business by getting a standard instrument for each test used on petroleum and its products and a standard method for using it; to aid the producer of petroleum through the investigation and working out of practical methods for decreasing the hazard of locating wells, decreasing the cost of drilling them and increasing their output. The society aims, with the assistance of its members, to be representative of all the divisions and phases of the petroleum industry and to select standards out of the multitude of tests and instruments now used, and to institute and direct a scientific investigation of all the problems that now or in the future may confront the industry. The officers are: President, C. D. Chamberlin, Cleveland, Ohio; vice-president, Robert Galbreath, Tulsa, Oklahoma; Secretary, Irving C. Allen; U. S. Bureau of Mines, San Francisco, Treasurer, Warren C. Platt, Cleveland, Ohio. The first annual meeting will be held Oct. 15, 1914, in New Orleans.

INDUSTRIAL NEWS

Thurlow Steel & Forging Co., Chester, Penn., announces that its new plant is now in operation, under the management of John I. Rogers and Daniel C. Eagan.

John L. Malm, of the Malm-Wolf Co., Denver, Colo., is installing a dry chlorination plant for the Bunker Hill & Sullivan Co., to treat ore by the Malm process.

The General Electric Co. reports that an order was received from the Hercules Mining Co., Burke, Idaho, for two eight-ton, 30-in. gage, 500-volt electric mining locomotives.

The Chicago Branch of Keuffel & Esser Co., of N. Y., has now completed its removal to its new quarters, in the seven-story K. & E. Building, 516-518-520 South Dearborn St., Chicago.

The Anaconda Copper Mining Co. of Butte, Mont., has awarded the contract to the Redwood Manufacturers Co. of San Francisco for 15 redwood slime-treatment tanks 50 ft. diameter by 14 ft. stave.

Joseph T. Ryerson & Son, Manufacturers and dealers in iron, steel and machinery, of Chicago, Ill., announce the opening of a new warehouse in St. Louis, having taken over the W. G. Hagar Iron Co.

The Hardinge Conical Mill Co., of 50 Church St., New York, has just received a fifth repeat order from the Braden Copper Co., of Rancagua, Chile, for six Hardinge mills. These mills are all 8 ft. dia. by 48 in. cylinder and are to be driven by single reduction herringbone gears of the Wuest type.

The American Manganese Manufacturing Co., of Philadelphia, has taken over the properties of the Dunbar Furnace Co. at Dunbar, Penn., with those of the Dunbar Coal & Coke Co., and other subsidiary concerns. The company also owns the Cuyuna Mille-Lacs Iron Co., with mines of manganiferous iron ore on the Cuyuna range in Minnesota.

The Pacific Coast Steel Co. has made the final payment of $50,000 on the steel plant at Irondale, Wash., to the Metropolitan Trust Co., which took the plant over from the Western Steel Corporation. The new company has started repairing of the dock and is making other preparations to operate the plant. With the purchase the company gets several thousand tons of pig iron imported from China, which is now stored in the yards. The entire plant will be moved to Seattle and operated by the Pacific Company at Youngstown as an addition to the company's plant. A mortgage has been made to the Occidental Steel Co. covering the property, and a deed from the Occidental Steel Co. to the Pacific Coast Steel Co. has been filed. The purchase price is reported as $300,000. The Irondale plant has a capacity of 150 tons of pig iron daily.

TRADE CATALOGS

Sullivan Machinery Co., Chicago, Ill. Bull. 68A. The Sullivan Channeler in Engineering Work. 16 pp. 9x6 inches.

The Cement-Gun Co., Inc., New York, N. Y., catalog. The Cement-Gun. By Arthur E. Lee. 108 pp., illus., 9x6 inches.

American Concentrator Co., Springfield, Ohio. Bulletin No. 2. Coal and ore testing laboratory. 4 pp., illus., 6x9 inches.

The Kelly Filter Press Co., Salt Lake City, Utah. Bulletin; Kelly Filter Press in Dry Concentrates and Filtering acid solution.

The Brown Hoisting Machinery Co., Cleveland, Ohio. Catalog S. Brownhoist suspended concrete bins. 40 pp., illus., 6x9 inches.

The Harris Patents Co. 200 Fifth Ave., New York, N. Y., Bulletin AE. The Harris Valveless Engine Diesel Principle. 4 pp. Illus. 8½x11 inches, Bull. AC. 11 pp. Illus. 8½x- inches.

Smooth-On Mfg. Co., 572-4 Communipaw Ave., Jersey City, N. J. Instruction Book No. 7. Smooth On iron cement. 64 pp., illus., 4½x6½ inches. This catalog will be sent free to all who apply for it.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c each.

BESSEMERIZING COPPER MATTE. James B. Herreshoff, Jr., New York, N. Y., assignor, to Nichols Copper Co., New York, N. Y. (U. S. No. 1,103,925; July 14, 1914.)

BLAST FURNACES—Cooling System for Blast Furnaces. John Hugh Means, Mayville, Wis. (U. S. No. 1,102,281; July 7, 1914.)

CHARGE CAR. John E. Greenawalt, Denver, Colo. (U. S. No. 1,104,491; July 21, 1914.)

CHARGING LADLE. Daniel Brennan, Woodlawn, Penn. (U. S. No. 1,102,236; July 7, 1914.)

CLASSIFIER—Hydraulic Classifier. Morris Paul Kirk, Salt Lake City, Utah, assignor of one-half to John H. Leavell, Salt Lake City, Utah. (U. S. No. 1,102,672; July 7, 1914.)

CONCENTRATING TABLE. William A. Huelsdonk, Le Grand, Calif. (U. S. No. 1,104,300; July 21, 1914.)

CONCENTRATION—Ore Concentrating Apparatus. John M. Callow, Salt Lake City, Utah, assignor to Metals Recovery Co., Augusta, Me. (U. S. No. 1,104,755; July 21, 1914.)

CYANIDING—Filter for Slimes Pulp and the Like. George Ridgway, Kalgoorlie, Western Australia. (U. S. No. 1,103,080; July 14, 1914.)

DISTRIBUTOR FOR CONCENTRATOR. William A. Huelsdonk, Le Grand, Calif. (U. S. No. 1,104,299; July 21, 1914.)

DRILLING—Chuck-Retaining Device. George H. Gilman, Claremont, N. H., assignor, by mesne assignments, to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,103,009: July 7, 1914.)

FLOTATION PROCESS—Ore Concentration. George Albert Chapman and Stanley Tucker, London, England, assignors to Minerals Separation, Ltd., London, England. (U. S. No. 1,102,873 and 1,102,874; July 7, 1914.)

FURNACE—Metallurgical Furnace. John E. Greenawalt, Denver, Colo. (U. S. No. 1,103,196; July 14, 1914.)

GOLD AND SILVER ORES—Recovery of Gold and Silver from Refractory Ores. Charles Butters, London, England. (U. S. No. 1,103,346; July 14, 1914.)

GOLD SAVING—Process for Saving Gold from Sand. Gerome H. Hamilton, Oregon City, Ore. (U. S. No. 1,104,112; July 21, 1914.)

HOISTING—Safety Apparatus for Mining Cages. Sidney William Richardson and William Staveley, Hokitika, New Zealand. (U. S. No. 1,103,841; July 14, 1914.)

LEACHING—Art of Extracting Copper. George B. Chittendedn, Chilito, Ariz. (U. S. No. 1,104,410; July 21, 1914.)

NICKEL—Extraction of Nickel from Mixtures of Nickel and Other Metals. Hans Edward Fierz, Basel, Switzerland. U. S. No. 1,103,747; July 14, 1914.)

ORE DUST—Process for Preparing Ore Dust for Smelting. William Cooper, Denver, Colo. (U. S. No. 1,103,400; July 14, 1914.)

ORE REDUCTION—Process of Reducing Ore to Metal. J. A. McLarty, Toronto, Can. (Brit. No. 16,277 of 1914.)

ORE TREATMENT—Process for Treatment of Minerals and Extracting Metal. Buenaventura Junquera, Oviedo, Spain. (U. S. No. 1,102,339; July 7, 1914.)

PROPS—Improvements in or Relating to Concrete Mining Props. F. Ruckrich, Frankfurt, Germany. (Brit. No. 3920 of 1914.)

ROASTING—Feeding Device for Roasting Furnaces. Harry H. Stout, New York, N. Y., assignor to General Chemical Co., New York, N. Y. (U. S. No. 1,102,454; July 7, 1914.)

ROASTING AND SINTERING ORES, Apparatus for. Arthur S. Dwight, New York, N. Y., assignor, by mesne assignments, to Dwight & Lloyd Metallurgical Co. (U. S. No. 1,102,982; July 7, 1914.)

ROASTING FURNACE. Knut Jakob Beskow and Arthur Ramén, Helsingborg, Sweden. (U. S. No. 1,104,288; July 21, 1914.)

SCREEN. Earl Adam Wood, Gem, Idaho. (U. S. No. 1,103,167; July 14, 1914.)

SEPARATION—Means for Separating Ores. Charles L. Hoge, Carterville, Mo. (U. S. No. 1,104,117; July 21, 1914.)

SIGNALING SYSTÈM for Mines and the Like. George Thomas Plumb, Johannesburg, Transvaal. (U. S. No. 1,102,951; July 7, 1914.)

SINTERING—Process for Sintering Smelting Products and the Like. Josef Savelsberg, Papenburg-on-the-Ems, Germany. (U. S. No. 1,103,318; July 14, 1914.)

SLAG-DISINTEGRATING APPARATUS. Lars Larson, Chicago, Ill. (U. S. No. 1,103,886; July 14, 1914.)

SMELTING FUMES—Process of Rendering Smelter Fumes Useful and Recovery of Their Values. Charles S. Vadner, SCalt Lake City, Utah. (U. S. No. 1,103,165; July 14, 1914.)

SULPHIDE ORES—Improvements in or Relating to the Separation of Metallic Sulphide Ores. F. J. Lyster, Broken Hill, N. S. W. (Brit. No. 11,939 of 1913.)

SULPHUR—Process of Recovering Sulphur in Elementary Form from Pyrite. Gilbert Rigg, Palmerton, Penn., assignor to New Jersey Zinc Co., New York, N. Y. (U. S. No. 1,103,081; July 14, 1914.)

TIN—Improvements in or Relating to the Treatment of Tin Ores. J. B. Macdonald, Pazna, Bolivia. (Brit. No. 12,267 of 1913.)

ZINC BLENDE—Process of Preparing Pyritiferous Zinc Blende for Magnetic Separation. Gilbert Rigg, Palmerton, Penn., assignor to New Jersey Zinc Co., New York, N. Y. (U. S. No. 1,103,082; July 14, 1914.)

Editorial Correspondence

SAN FRANCISCO—July 22

The Suits Against Whitman Symmes, the Mexican Mining Co. and its directors, brought some time ago by Coffin, Berghauser and Moise, were formally dismissed on July 17. The Mexican Mining Co. pays $7500, not as a judgment, but as a condition of settlement. It is announced that the Mexican Mining Co. and the Union Consolidated Mining Co. will join the Comstock Pumping Association at once. Superintendent Symmes will return to Virginia City and resume work on the lower levels of the Mexican, and also begin work on the Union.

The New State Highway Through Shasta County, from Redding north will follow the old California and Oregon wagon road to Antler by way of Baird instead of by way of Kennett. The reason given by the highway commission for cutting off the smelting town is that a saving of $125,000 will be made. Baird, furthermore, being a mineral springs resort, is more attractive to automobile tourists than Kennett, which is the center of the copper-mining industry on the west side of the Sacramento River. The ignoring of the claims of Kennett is in keeping with the policy of the commission, which has given little attention to the needs of the mining sections in routing the new highways. The only routings of direct benefit to the mining sections are those which could not be avoided. It need not be charged that the highway commission purposely ignores the demands of the mining industry, but it is apparent that the wishes of the automobile travelers have been largely responsible for the routings of the highways. Shasta County has for many years been in the habit of taking the worst of it; and the habit seems to grow. The routing of the highway through Shasta County by way of Kennett would be of great commercial advantage to Redding, the county seat and the chief town between Red Bluff and Dunsmuir. Such a route would also include the copper camps of Keswick and Coram. With the resumption of smelting at Coram and with the concentrating of copper ores at Keswick, the west side districts will swing back into their old stride and in time it will be necessary for Shasta County to build such a road as should now be built with the bonds that the county has subscribed to the state highway funds.

DENVER—July 23

Another Chapter in the Long Fight Against Highgrading in the Cripple Creek district was to be opened July 20, when attorneys for the mine owners association were to file application in the district court for an injunction restraining 21 assayers from doing business in the district. The petition alleges that these men are responsible for "the encouragement of highgrading" and that most of them could not possibly exist on the legitimate proceeds of the business. The petition also alleges that the defendants are operating a "systematic fence" for the purchase of stolen high-grade ore and that the loss to the mine owners of the district is upward of $500,000 a year.

Sessions of the Western Federation of Miners' twenty-first executive convention were held in Denver during the week of July 19. The attendance was not large, probably not exceeding 200 delegates. State Auditor Roady Kenehan delivered the main address of welcome, including in his remarks a tirade on capital's warfare against labor and charging Governor Ammons with being out of sympathy with the labor movement and with being responsible for the state's purchase of "horses to ride down labor men." Otto Thum, Denver's commissioner of property, and President John McLennan, of the Colorado district of the United Mine Workers of America, also made addresses of welcome to the visiting delegates. The real figure of the convention was Charles H. Moyer, president of the Western Federation. His long biennial report was concerned chiefly with the suggestation of amalgamating the Federation with the United Mine Workers and with denunciation of the seceding faction at Butte. He blamed the loss of the strike at Bingham Cañon to the refusal of the members of the Brotherhood of Locomotive Engineers to leave their engines. He urged a Federal law establishing the rights of laborers to organize, and another law penalizing corporations that compel surrender of membership in labor organizations as a prerequisite to employment; he requested state legislatures to pass stringent measures controlling the dust nuisance in mines, and preventing the blacklist and association-card practices; he indorsed William B. Wilson, secretary of labor; he advocated coöperation with the U. S. Bureau of Mines, especially along lines of safety work; he proposed that mining students be taught the principles of unionism so that they may become understanding mine managers or superintendents. James Lord, president of the mining department of the American Federation of Labor, spoke on conditions in the southern Colorado coal districts and in Butte. A communication was received from the Webb City local union requesting aid in organizing that district. President Hoage, of the Denver Trades and Labor Association, reported that his organization had received a letter from the seceding members at Butte, and added that his "members could not rise to their feet fast enough to vote to throw the communication in the waste basket."

BUTTE—July 23

The Bullwhacker Copper Co. is threatened with receivership proceedings by some minority shareholders, who say they cannot understand why the company is losing money on its operations while a set of lessees who worked the property for a year or two made a lot of money. The property was shut down about 10 days ago, and it was announced that "it was unavoidable from the fact that a point in development and blocking out of ore has been reached where more machinery is absolutely necessary." Announcement of the possible receivership proceeding was made on the local stock exchange, and it was disclosed that Patrick Clark, of Spokane, president and one of the largest shareholders of the company, has advanced more than $100,000 to the company for building the mill and the present leaching plant, which had been officially credited with being a success. On the strength of this report and the profitable operations by former lessees, owners of mineral ground in that section of the district have been holding their claims at fabulous prices. It has been claimed that Bullwhacker copper was produced at a cost of 6 to 10c. A shipment of 52,000 lb. of Bullwhacker copper, 99.95% pure, has been made to Germany.

The Butte Mine Workers' Union—At a meeting July 20, William O'Brien and Mucky McDonald, the temporary president, were placed in nomination for president, to be voted upon Aug. 10. At the mass meeting held Sunday, July 19, a constitution and bylaws were adopted. The constitution provides that the election of officers shall be by voting machines. Each nominee for any salaried position shall have the privilege of selecting his own judge and clerk at the last meeting for nominations, but in no case shall there be more than 14 judges and clerks. The Butte Typographical Union, which offered to bring about an arbitration of the differences among the miners' organizations, was advised that the new union appreciated its good offices, but that it could not accept the offer, as there was nothing to arbitrate. At the mass meeting various clauses of the new constitution and bylaws were warmly discussed. Foremost among them was the question as to whether or not the new union should enter into any contract with the employing companies. It was suggested that the contract between the Anaconda company and the old union, which expires June, 1915, should be repudiated as having been entered into in violation of the bylaws of the old union. Other suggestions were to the effect that the contract should be lived up to. Finally, it was agreed that the bylaws of the new union should declare against any contract being entered into in the future with employing companies or individuals.

Senator Clark Instituted Suit in the Federal Court in Butte last week against the Butte & Superior for an injunction and accounting, after a two years' attempt to settle out of court. Senator Clark, or, rather, two of his companies, the Clark-Montana Realty Co. and the Elm Orlu Mining Co., are owner and lessee of the Elm Orlu mine, a property lying south of and adjoining the western portion of the Black Rock mine of the Butte & Superior Co., both claims being located on the Rainbow lode. According to the contentions of Senator Clark's engineers the vein has a dip to the north, and in its descent into the earth enters the Butte & Superior ground, and the latter company has been mining on that portion that lies within a vertical plane of the Elm Orlu east and west end-lines. When the question of ownership first arose, the opposing interests got together and agreed to let the controversy be settled by a group of engineers. These have been at work on the problem for two years. From time to time there have been rumors as to what the engineers were finding, these rumors usually being that the contention of Senator Clark was correct, but a few weeks ago head officers of the Butte & Superior and Senator Clark met with their engineers in Butte, for, as was stated, a final settlement on the report and the recommendations of the engineers. After a few days the conference dissolved; Senator Clark left for Europe and the Butte & Superior officers returned to the East. It was announced that terms and details of the settlement were not to be given out, but that the two companies would continue their amicable relations in a neighborly way. The injunction suit following a few days later therefore came as a surprise. Since the beginning of the controversy the disputed orebody has not been disturbed, the Butte & Superior company having confined its mining operations to the eastern portion of the property. Senator Clark's appearance as a plaintiff in a mining litigation is a novelty, as in many controversies extending over a period of years he has been on the defensive. [According to some reports this is merely a friendly suit, and according to others, the matter was settled finally out of court.—Editor.]

DULUTH—July 25

The Number of Men Employed this Year in the mines is estimated at less than one-half that of 1913, probably only one-third. The Virginia district has probably the largest proportion, due to the Oliver, company's employing a total of 1600 men there, of whom 1200 are at the Alpena mine, where removal of the ore is being pushed.

Pickands-Mather & Co.'s "First Aid" Contest was to be held at Hibbing, July 25, teams to compete from each of that company's 12 mines on the range and the winning team to go to the similar contest held at Ishpeming, Mich., in August, under the auspices of the Lake Superior Mining Institute.

At Duluth about 2600 Cars of Ore Per Day are being received, 1600 of which come to the Great Northern and the balance to the Missabe docks. In addition, the Iron Range is handling 900 cars per day at its Two Harbors dock and from 100 to 150 cars per day from the Cuyuna range are being received at the Soo Line and Northern Pacific docks in Superior.

The Tod-Stambaugh Co. is negotiating for a lease on the Great Northern Ore Company's Dean mine, which indicates that the policy of the latter company, after the option of its lease to the Steel Corporation, will be to lease its properties to other operators as well as to operate some itself through its mining subsidiary, the Arthur Iron Mining Co. It is not anticipated locally that the Great Northern operations will effect any material change in the open ore market after the withdrawal of the Steel Corporation, Jan. 1, 1915.

It Is Stated that the Oliver Iron Mining Co. will soon request bids for stripping the South Agnew Mine, at Hibbing. All survey and preliminary work has been done at the property. On the several tracts of land known as the Higgins Estate properties, near Gilbert and McKinley, the Oliver has developed two large orebodies, one estimated at 3,500,000 tons and the other incomplete as yet. The Oliver company buys the property on a basis of 10c. per ton for all developed ore, it having heretofore owned one-half interest in the fee with the Higgins Land Co. Part of the deposit can be stripped.

Realizing that any Change in the Labor Situation is unlikely for the remainder of the season, the migration to the wheat fields of Dakota has set in somewhat earlier than heretofore, much to the relief of the Mesabi Range authorities, and 400 to 500 men daily are leaving Duluth, westward-bound. A peculiarity of the present slack period is the fact that the 1913 scale of wages has been generally maintained, although slight cuts have been made in some instances. In fact, the demand for cheap labor, at \$2 to \$2.50 per day, exceeds the supply, due to the fact that the men prefer to await the high wages paid in the wheat belt after August 1.

Steel Corporation Is Opening Ten New Properties preparatory to maintaining its Mesabi production after the first of next year, when the lease of the Hill ore lands expires. One of these, the Leonidas, near Eveleth, will be the biggest underground mine yet developed on the Mesabi range. It has been estimated that the orebody contains close to 20,000,000 tons. Mining will be from a steel and concrete shaft, 400 ft. deep. Other large underground properties will be the Duncan, at Chisholm, and the Philbin, near Hibbing. The Steel Corporation's new mines also will include the Minnewas, Sullivan, Wanless and Prindell, in the Virginia district; the Vivian and Graham, near Biwabik, and the Dean, near Buhl. The various properties opened in the Hill lands will, after Jan. 1 next, be operated by the Arthur Mining Co., a Great Northern subsidiary. This company already is developing mines in tracts surrendered by the Steel Corporation heretofore, and by the opening of the season of 1915 it will be prepared to produce extensively not only from the workings now under Steel Corporation control, but from deposits it is itself making available. Considerable shipments will be made the present year, in fact. Some of the Arthur company's properties are the Hill Annex, Smith and Dunwoody.

A Resumé of Work on the Cuyuna shows that but three mines are shipping their production, the Kennedy, Armour No. 2 and Cuyuna-Mille Lacs. It was announced that the Rowe pit and the Ironton shaft would begin shipping by July 1. The Pennington and Thompson pits are still idle, as are also the Armour No. 1 and Meacham shafts. No announcements of activity at these properties have been made. The above lists all the North range producers. Of those companies not yet at the producing stage, the Duluth-Brainerd Iron Co. is now drifting on the 150 level to the ore, a distance not exceeding 100 ft. The new "Croft" shaft at Crosby has been located. A temporary shaft will be put down 400 ft. north of the main shaft, to be later converted into a timber shaft. The Northern Pacific Ry. will serve this operation, but as the Soo Line crosses the property it is likely that Soo Line tracks will be used. Jones & Laughlin are still drilling on the Feigh lands, adjoining the Pennington pit. Their option expires soon and they will no doubt lease the property, as there is a large tonnage in it.

On the South range the Wilcox shaft is nearing ore. Preparations were made at this shaft for a struggle with quicksand immediately above the orebody, as the drill samples had indicated the presence of quicksand. In sinking, however, only a mixture of sand and clay, mostly the latter, has been encountered. The inference is that in the churn drilling practically all the clay was churned out with the water, leaving only the heavier particles of fine sand to come up in the samples. The Brainerd-Cuyuna shaft, in the city of Brainerd, is sinking steadily, although a considerable volume of water has been encountered. The Barrows mine is not producing, although the pumps are kept at work. No announcement has been made as to the future of this South range pioneer, recently relinquished by M. A. Hanna & Co. The Adams shaft continues to stockpile its daily production, having now on hand probably 5000 tons. Much interest is being displayed in the district in regard to the proposed electric car line from Minneapolis to Brainerd via Anoka, St. Francis, Ogilvie, Onamia and the Mille Lacs lake country, thereby opening a large area of possible mineral-bearing land tributary to Brainerd.

IRON MOUNTAIN, MICH.—July 24

In the Felch Mountain District, northeast of Iron Mountain, principal point of the Menominee range proper, George A. St. Clair, of Duluth, and associates have undertaken exploratory work. Two diamond drills are employed. Little had been done in the locality for years. The present work is in the vicinity of the Calumet mine, a Pickands-Mather property, which has been idle for several years. Iron Mountain has been exceedingly quiet for several years so far as exploration or new development is concerned.

IRONWOOD, MICH.—July 25

The Wakefield Mine is a new shipper in the Lake Superior region. This property of M. A. Hanna & Co. lies south of the village of Wakefield, on the Gobegic range. It is an openpit, the ore mined by steam shovel. The deposit was discovered by Senden Rose, geologist and mining engineer, of Marquette, who was attracted by the formation; although the tract is well south of any mine previously developed in the Wakefield district, he decided to conduct exploratory work. An option for a lease was procured from the Keweenaw Association, of Boston, owner of the fee, and a drill was put into operation. Ore of excellent grade was encountered at slight depths below the surface, ranging from 30 to 70 ft. Subsequently it was determined the deposit was of large proportions. The option was exercised, and, in turn, the lease was transferred to the Hanna company on a royalty basis. The work of development was started last year. A large area has been stripped and production is now in progress. This is the first real steam-shovel mine in Michigan. The Balkan at Alpha near Crystal Falls will be the second of these.

The Mining News

ALASKA

ALASKA TREADWELL (Juneau)—Two mills handled 79,254 tons in June, producing $214,450 total gold.

ARIZONA

Cochise County

BLACK DIAMOND (Gleeson)—Phelps-Dodge company reported to have taken bond and lease on old Black Diamond mine. Estimated several thousand tons of ore on dumps that can be treated at Douglas profitably. Ores carry 2½% copper and about 7 oz. silver.

TOMBSTONE CONSOLIDATED (Tombstone)—Phelps-Dodge taken over control by securing at foreclosure sale for $500,000. Previously had acquired practically all claims against company, including notes of $1,500,000 face value. Unconfirmed report that Phelps-Dodge will install great pumping plant next spring; probably will not. Old company demonstrated that property had one of the largest inexhaustible reservoirs of water known in mining; popular superstition that direct connection with Pacific Ocean exists. At one time 10,000,000 gal. per day was pumped.

Gila County

WARRIOR (Miami)—Shipping about 100 tons 6% copper ore El Paso daily. Considerable development being done at property. Probable shipments will be materially increased if copper reaches stronger price.

GILA CANYON COPPER (Christmas)—Star churn drills being brought in to develop ground. Property shipped considerable ore in past from shallow workings. Intention of management to prospect ground thoroughly with drills in next 12 months.

CHRISTMAS (Christmas)—Reported mine to be sold at receiver's sale in near future. Property is owned by Development Company of America, which purchased from Saddle Mountain Mining Co. After paying off debts new company expended about $275,000 in development work and produced in 1907, 1,751,264 lb. copper, besides some gold and silver. Mine developed to depth of 850 ft., with about 16,000 ft. of work, which opened up ore estimated by management at 400,000 tons.

ARIZONA COMMERCIAL (Globe)—Drift being driven on 1200 level to connect with Old Dominion's Gray mine at same level. Now nearly 400 ft. in; less than 1500 ft. remains to be driven. Drift being driven from Gray side to meet it. Superintendent Boyd expects connection next October. Drift will drain Arizona Commercial; may be used to haul ore to Old Dominion. No stoping will be done until connection is made; all ore now shipped is produced by development work. Development continues to reveal greater reserves good commercial ore.

IRON CAP (Globe)—Because present low price copper, Iron Cap devoting more time to development; slightly reduced force. Last month shipped only 14 cars ore El Paso; this month probably will fall below that figure. No overhead expense, such as pumping, and management thinks better policy to keep shipments down until copper reaches stronger price; for present will mine just enough to pay slightly in excess of expenses. Orebody on 800 opened for about 300 ft. eastward from shaft and development drift being driven west from shaft at distance of 160 ft. begins to show vein matter with heavy iron content and some copper. General Manager Woodward says expects soon to enter commercial ore in this drift. Iron Cap building wagon road from county road to property.

INSPIRATION CONSOLIDATED (Miami)—Hoisting and compressor machinery being installed at rapid rate. One Nordberg compressor of 3000-cu.ft. capacity already in operation and another, Ingersoll-Rand, now being set up. This machine will compress 1325 cu.ft. free air per min. to 1000 lb. for underground haulage. All these machines are cross-compound, two-stage, with driving motor between. Synchronous motors used to insure as far as possible drive of uniform speed. C. V. A. Reed, in charge of erection of Nordberg compressor, now engaged assembling main hoist, also Nordberg. Work started on concreting 5,000,000-gal. reservoir. Entire reservoir to be concreted, reinforced with Clinton fabric. Presents unique problem in ferro-concrete construction, as sides are all sloping, with the two ends semicircular.

SUPERIOR & BOSTON (Globe)—Company shipping 70 tons copper ore El Paso daily, fines running about 5% and coarse ore from 9 to 10%. Orebody to east increasing in volume daily and Superintendent Tinker expects within another month to be shipping up to normal capacity of 100 tons daily. On 600, where vein was again encountered beyond the Quo Vadis fault, good ore now being stoped, and if conditions are similar to those farther west should be good body of ore there between 600 and 800 levels. For that reason 800 drift is being driven eastward to pick up orebody at the point where it was encountered on 600. Another 200 ft. must be cut before 800 drift reaches point sought; should be completed within six weeks. Face of east drift on 1000 level still about 75 ft. from Quo Vadis fault, being driven in footwall; no crosscutting will be done until fault is reached. If ore in any quantity is developed in eastern part of property another shaft will have to be sunk about 2000 ft. eastward from McGaw shaft. Company has installed hydraulic ram that is pumping back 150,000 gal. of the mine water daily into storage tanks at shaft, 85 ft. above. Another to lift water for various domestic purposes to point 250 ft. above will soon be installed.

Mohave County

SOUTHWESTERN COPPER (Yucca)—Timbers begun to arrive at station. As soon as they reach mine, sinking will be resumed on shaft.

GOLDEN GEM (Cerbat)—Mine being unwatered preparatory to extensive development work under direction O. F. Keuncer, Los Angeles.

COPPER GIANT (Hackberry)—Tests made on reground concentrates by Minerals Separation company show excellent possibilities. Reported that milling plant is to be erected soon. Coarse concentration will follow some usual method, only reground tailings being treated by flotation.

Pinal County

NEWBURY (Price)—Reported work will be resumed within next 30 days .Large amount of water to be pumped.

CALIFORNIA

Amador County

PLYMOUTH CONSOLIDATED (Plymouth)—New mill expected to go into commission in August.

CENTRAL EUREKA (Sutter Creek)—Twenty stamps dropping on good ore recently developed on lower levels. Shaft repaired and development in progress in addition to regular mining.

TREASURE (Amador City)—Ore of good grade disclosed in lower levels. Mine an old producer reopened about two years ago under management of E. S. McCurdy. Development carried on in spite of many obstacles. Indications are now that theory of persistence of veins at depth has been proved.

Butte County

OPHIR GOLD DREDGING CO. (Oroville)—Old Nevada dredge out of commission for some time has been robbed of large quantity of amalgam; man named Murphy arrested. Company intended to dismantle dredge and clean up sluices at same time.

Eldorado County

MONTEZUMA (Nashville)—Development in progress by representatives of Plymouth Consolidated Gold Mining Co., Ltd.

SHAW (El Dorado)—Electric power being installed. Current will be brought in over two-mile pole line from Western States Gas & Electric Co.

TREADWOOD SYNDICATE, LTD. (London)—A twelve-drill, two-stage air compressor and other equipment installed; arrangements made to open new ground in Oro Fino mine.

Imperial County

IMPERIAL VALLEY GYPSUM CO. (Holtville)—Preparation being made for installing plant to work gypsum deposit situated east of Holtville. Water being developed on premises.

Inyo County

WILSHIRE BISHOP CREEK (Bishop)—Mine unwatered in one week. Last year it required ten weeks. Difference in time due to improved methods. Development and ore extraction begun. Timbers being hauled for cyanide plant construction. All machinery is on ground, except tube mill at Bishop, ready for wagon haul.

LORETTA (Coaldale)—Main shaft down over 1600 ft., water encountered. Probable shaft will be sunk to 1700 ft. point before crosscutting. Schwab interests developing property and if operation follows development, 55-mile railroad to Coaldale will be necessary. If orebodies are proved and mine successfully operated this should make important copper-mining camp.

ST. IVES (Bishop)—Mark Matthews and others of Tonopah have secured two-year lease and purchase option on this mine in Chicago district. Stated 350 tons of ore on dump and 500 tons in sight underground. Shaft down 200 ft. and 5-ft. vein is said to carry medium-grade ore. Pipe line 1100 ft. long will be laid to bring water from spring; 7-ton Tetrault mill will be installed.

Lake County

UKIAH ASBESTOS MINING CO. (Ukiah)—New company organized to mine asbestos near Mendocino County line. Officers and directors are C. A. Miller, president; J. W. Wald, secretary; F. O. Taylor, treasurer; A. Beamer, general manager; T. L. Clark, director.

Modoc County

MODOC (Highgrade)—Three carloads ore ready for shipment. One to Selby, one to Kennett, one to Thompson; total shipment, 45 tons. This is for purpose of sampling and ascertaining best method of treatment. Ore is blocked out in mine. Vein is 7 ft. wide and shows good indications of persisting with depth. Order given for 25,000 bd.ft lumber for construction of ore bins. If sampling and treatment of ore shipped warrant, reduction plant will be built on property. N. E. Guyot, manager.

Nevada County

RED LEDGE (Washington)—Mine bonded to New York men. W. F. Meeks directing preparations for development.

Property has been successfully operated on small scale with tunnels and small mill.

GOODWIN (You Let)—Reported Anti-Debris Association will stop hydraulic mining, because of turning muddy water into Bear River. Town of Auburo gets water supply from Bear River.

Plumas County

CAMERON (Seneca)—This gravel mine bonded to Mr. Gilmer, Utah. Development on this property was first to tap channel on north fork of Feather River.

Shasta County

MOUNTAIN COPPER CO. (Keswick)—Installation of machinery in new concentrating plant in progress. Development in Hornet and Iron Mountain mines proceeding along normal lines. Large deposit of concentrating ore been developed in Iron Mountain.

REID (Redding)—Andrew Goodrich, foreman, and Joseph Garcia, miner, killed by blast at bottom of shaft July 17. Harvey J. Sallee, superintendent, escaped with injuries, though only 7 ft. up ladder when blast was fired. Bodies of Goodrich and Garcia torn to pieces. Men were lighting fuses of 17 holes and had difficulty in finding last fuse. No details of accident received.

Sierra County

BELLEVUE (Downieville)—Bellevue Mining Co. has commenced 3000-ft. tunnel from point in main tunnel of drift mine on Gibsonville ridge to tap channel higher in ridge and work ground near old Thistle shaft, where gravel was rich.

SIERRA-POORMAN (Downieville)—Winze at depth of 35 ft. just encountered 4½-ft. vein carrying high values in free gold and arsenical sulphides. Knobs of gold protrude from pieces of solid sulphide, while broken and decomposed parts of ledge pan gold freely. Mrs. H. T. Bragdon of Oakland is principal owner.

Siskiyou County

AIKEN (Oak Bar)—Profitable season closed and hydraulic elevating plant removed and installed at upper end of pit, ready for fall water-supply.

Trinity County

ASBESTOS CLAIMS located on east fork of Trinity River, near old mining town of Cinnabar, 18 miles northeast of Carrville, by Ben and Amos Johnson of Castella.

Tuolumne County

APP (Jamestown)—Five stamps put in commission. Principal work being done is cleaning up 60-stamp mill and retimbering collar of shaft. Alex. Chalmers of Lightner mine is managing property.

COLORADO

Custer County

HECTOR MINES DEVELOPMENT CO. (Westcliffe)—Company formed to take over Hector group adjoining old Bassick mine. Erection 50-ton cyanide plant to be started at once. Robert S. Billings, manager; J. F. Brazelton, assistant.

Park County

LONDON MINE—This property, opened in 1872, on London Mountain, seven miles west of the town of Alma, has now been absolutely idle for two years. For some years operations have been only spasmodic. In the minds of most persons who have not given special study to this mine, it is supposed to be in or along the London fault; but this is an error, as the London vein has apparently no genetic connection with the fault nor is it in the fault. The mine produced, for years, from a much faulted vein that was traced and stoped clear through the mountain. The theory propounded some time ago to the effect that oreshoots do not cross water courses appears to hold good in this case; for extensions of the London vein in both directions have been practically valueless. All mining heretofore has been through two main adits, one being driven from the north side of the mountain, the other from the south side and about 300 ft. lower. Development at greater depth is required before production can resume. It is feasible to drive a new adit much lower from the south side of the mountain but it would certainly be deadwork for a long distance. One scheme that has been proposed is to drive a crosscut from the eastern side of the mountain; but this would be nearly a mile long in hard granite most of the distance. The last operations were conducted under a peculiar lease in which one-half interest was held by the owners of the property, the remainder by John M. Kuhn and John H. Singleton, of Alma, with Mr. Kuhn as superintendent. These operations were successful, from a financial standpoint, but they did not provide for continued activities since, during the life of the lease, no development was attempted. At present, therefore, the mine is worked out clean. Any sort of development now is prevented by lack of harmony among the owners—the Story, Jewett and Packard estates. It seems there are two factions with contrary notions concerning the conduct of this great group. Lessees will not undertake expensive methods of opening the mine at new depth nor will the owners.

San Miguel County

CLOUDBURST ABOVE TELLURIDE, July 27, resulted in flood which broke dam, partly wrecked 15 business blocks including 100 buildings, drowned two people and rendered 50 families homeless. Damage estimated at $300,000.

Teller County

THE RAINFALL IN JULY has been excessive, the heaviest on record in the district, over 9 in. Lower levels of many mines are accumulating surface water faster than it drains away; much inconvenience results.

DRAINAGE TUNNEL—Tracks finished to breast and timbering completed. Work of actual driving will commence at once.

ALTMAN WATER COMPANY—Property of this company which supplies most of larger mines and mills with water from pumping plant at Grassy sold to private interests. H. L. Shepherd, of Cripple Creek, is new manager.

District of Columbia

THE FRENCH BILL, validating phosphate locations, terms of which are given on p. 208, this issue, was passed on July 23, by House, and is now before Senate.

WORK IN NORTHERN MEXICO is not distinctly urged by State Department, but mine operators, questioning those interested in Mexican affairs find in them distinct disposition to recommend resumption of operations. Impression given to mine owners lately visiting department, that if they can arrange matters with General Villa to secure protection for themselves they will probably be in fairly satisfactory position to go ahead without being disturbed.

MICHIGAN

Iron

ASHLAND (Ironwood)—Working force at this property increased to 200 men and all ore mined will be shipped. Company has sold 225,000 tons for delivery this year.

BAKER (Iron River)—Corrigan, McKinney closed this mine on order from head office in Cleveland. About 200 men were employed; good deal of ore shipped this season; great deal still in stock.

NEWPORT (Ironwood)—About 150 men were added to underground force, bringing total up to about 1000. Large ore sales have been made and all ore in stock with daily hoist will be sent out this summer.

JONES & LAUGHLIN (Ishpeming)—Shaft which company is sinking at Iron Mountain Lake, three miles south of Ishpeming, is down 200 ft. and will have to go to 650 ft. Ore will be encountered at about 100 ft. from the shaft. Shaft is 10 ft. 4 in. by 12 ft. 4 in. inside timbers, concreted for 30 ft. below collar. Little water encountered thus far in spite of fact that shaft is within few feet of lake; no trouble is anticipated, as ground is tight. Only 6 ft. of sand on surface and shaft will be in rock entire distance. Company has 10 forties and expects to locate other orebodies in addition to ones found, by drilling. Several operating mines in this territory number of years ago but little done there in 20 years. Most of men to be laid off at Lake Angeline mine when that property is closed for good in December will be given employment at company's new property.

DAVIDSON (Iron River)—Important suit involving this newly-developed and valuable iron property under advisement in the circuit court for Iron County, Mich., Judge R. C. Flannigan presiding. Mine opened and being operated by Davidson Ore Co. There is involved in outcome, validity of lease under which this company has possession. Anzetin Mtynarezyk, Polish clergyman, formerly of Iron River and latterly of Ohio, is plaintiff. Defendants are Constancy, Zygmunt and Rosalie Zyskowski, Frank Jackson, Molly Erickson and Michael Gleason, all of Michigan. Suit is complicated piece of litigation; history may be summarized as follows: Mtynarezyk became owner of tract in May, 1891, by purchase from Edwin Honneywell, holder of the patent issued by the United States Government, and in August, 1895, he conveyed it to Constancy Zyskowski, reserving mineral rights. Plaintiff left region and in 1908 received from Zyskowski letter in which he was asked to quash reservation of mineral rights. He did so for $25. Some months previous Michael Gleason had procured an option to explore the land. Ore was encountered, and in October, 1908, Gleason assigned option to Gleason Exploration & Mining Co., of which he is large stockholder. Provided as condition of assignment that company should pay to Gleason 3c. per ton on all ore mined and shipped. Option exercised in February, 1909, when there formally was issued to company lease calling for payment of a royalty of 15c. per ton, of which Zyskowski family was to receive 12c., Frank Jackson 1½c. and Molly Erickson 1½c. Gleason company in turn gave to Frederick N. Beegle, trustee, representing Davidson Ore Co., an option providing for further exploration of tract. Second option was exercised in June, 1910, on which date there was issued to Trustee Beegle a lease, under terms of which there was to be paid to Gleason company $15,000 and royalty of 35c. per ton, together with the royalty of 15c. as previously set forth. Plaintiff asks that relinquishment of mineral rights be set aside, leases annulled and he be free to do with mining rights what he pleases; alleges relinquishment was procured through fraud, it having been represented that reservation constituted hindrance to sale and that no ore existed. Set forth in defence that Mtynarezyk never was real owner of land; acted only as agent in acquiring tract from Honneywell, and money with which purchase was made was furnished by Zyskowski. When Michigan mines were assessed for state tax commission by James R. Finlay, in 1911, Davidson was listed as containing two million tons of ore, shown by diamond drilling. No doubt deposit is materially larger than indicated by exploratory work. Mine well developed by Davidson company and provided with fine equipment. Is producing and shipping.

MINNESOTA

Cuyuna Range

THOMPSON (Crosby)—Openpit will begin shipments July 27, being second new Cuyuna Range pit to ship this year.

PENNINGTON (Crosby)—Shipments started recently. Required minimum of 100,000 tons will be shipped, from present outlook.

CROFT (Crosby)—Contracts for erection of dry, boiler house and other mine buildings, aggregating $25,000, let to W. B. Shaver, Virginia, Minn., work now under way.

IRON MOUNTAIN (Crosby)—Company has closed deal with Eastern interests which will take over its property with royalty advanced from 35c. to 75c. Advance payment of $50,000 said to be included. Ore is high in manganese.

DULUTH-BRAINERD (Crosby)—Ore encountered July 15 150 level, 120 ft. from shaft. Company states that drift samples thus far have overrun drill-hole samples materially. First two samples analyze 36.75% mananese, 22.91% iron and 40.38% manganese and 19.55% iron, being somewhat superior to average of Cuyuna-Mille Lacs high-grade manganiferous ores.

Mesabi Range

TWO BIG CENTRIFUGAL PUMPS are removing water from Carson Lake; water being pumped into ditch which conveys it to Kelly Lake. Lake level already lowered 8 ft. The head of the lake is underlain with large deposit of ore which could not be recovered unless water were pumped out. Lake has been used as dumping ground for waste sands for several years.

ARTHUR IRON MINING CO. (Coleraine) — Contract awarded to A. Guthrie & Co., St. Paul, Minn., for stripping property on western Mesabi, near Coleraine.

OSTERBERG & JOHNSON (Biwabik)—Large deposit ore found by diamond drills in Sect. 10, 100 ft. below surface. Drills are being moved to another part of property to prove up extent of deposit.

MINORCA (Virginia)—Pickands-Mather is dismantling No. 4 shaft. Tracks, machinery and all other equipment being removed and mine will be abandoned. Other shafts of property will continue to operate.

WEBB (Hibbing)—Mine flooded last week when heavy rainstorm passed over Mesabi range. Shaft and levels filled with water in a short time, pumps being unable to handle heavy flow. No effort being made to remove water and reported that mine will be idle balance of season.

INTERSTATE IRON CO. (Grand Rapids)—Dredge which this company has been operating to strip large piece of ore land on extreme western Mesabi has not proved success; will probably be abandoned. The "mud hen," as it was termed, worked all right in sand, but trouble came when boulders and stumps were encountered. At times entire day would be lost removing debris from pipe lines. Costs have been low in some kinds of ground, but extremely high in others. Dredge is not being worked now.

Vermilion Range

NORTH AMERICAN (Tower)—Sample shipment 25 tons made for chemical analysis and test; said to be copper quartz; expected by those interested to analyze as much at 11% copper. Included in shipment were 30 sacks from the "gold-graphite" vein. This is first public announcement that mine has encountered copper, although discovery of gold, iron and graphite has been heretofore noted.—[Another layer added to the famous pousse café.—Editor.]

MONTANA

Granite County

ROYAL BASIN MINING CO. (Maxville)—Electrification mine and mill equipment progressing steadily. Contract just let for construction of pipe line to bring waters of Boulder Creek to site of proposed power plant, about four miles from mines. Pipe line will be of wood-stave construction, 7 ft. in diameter and one mile long.

Silver Bow County

BUTTE & SUPERIOR COPPER CO. (Butte)—Monthly report covering operations of oil flotation plant during June was filed with clerk of court in compliance with order made last November in suit of Minerals Separation Co. According to report, 26,258 tons were treated by flotation at $3.75 per ton of concentrates produced. Latter were valued at $27.27 per ton, f.o.b. company's mill.

NETTIE (Butte)—Unwatering shaft of this property of the Anaconda company, two miles west of Butte, is proceeding rapidly, and is now down to 350-ft. level. Mine is 540 ft. deep. It is expected that this work will be completed in three months. Shaft will then be sunk and although geologically there is small possibility of obtaining commercial copper, it is believed that chances of opening zinc ore are good, as this has been the case, with depth, with other silver mines in Butte.

BUTTE MAIN RANGE (Butte)—Plans perfected to resume operations at properties of this company, closed down about 12 years ago. Claims are in the eastern portion of Butte district, cover area of 45 acres patented ground, including old Sinbad with shaft 716 ft. deep. Crosscutting will be started from 500-ft. level, followed by sinking or raising on any ore encountered. Recent development on adjoining properties of East Butte, Rainbow Development, Tropic and others having proved continuation of vein system of Anaconda hill toward eastern section of district, company feels justified in resuming operations and starting extensive development work, for which sum of $50,000 has been raised among chief owners. Work is in charge of Superintendent Pat Sheehan.

EAST BUTTE (Butte)—Compaign of expansion inaugurated by company since purchase of Pittsmont properties is watched with considerable interest, inasmuch as results in deeper levels will materially affect other mines depending on what lower levels show. This refers to properties such as Davis-Daly, Tuolumne, Pilot-Butte and others. Development work in East Butte now proceeding on 1500-ft. level, lowest point in mine, comparatively shallow depth for Butte. Hand in hand with underground development work, company has carried on extensive and costly improvements of surface plants which will permit doubling present output of 1,000,000 lb. per month as soon as the price of copper makes such increase profitable. Not likely question of dividends will be considered until $500,000 owned by company account of Pittsmont purchase is liquidated. June was record breaker in production, which amounted to 1,215,323 lb. In addition company produced 25,190 oz. silver and 287 oz. gold.

NEVADA

Churchill County

MERGER (Jessup)—Car of ore assaying $60 recently shipped Hazen sampler; 200-ft. shaft being sunk.

Clark County

BOSS GOLD MINING CO. (Goodsprings)—High-grade gold ore discovered in winze being sunk from upper Boss tunnel. Car of this assaying $350 per ton ready for shipment. Development work under way for several months and good tonnage gold and copper ores developed

Elko County

ELKO PRINCE (Gold Circle)—Option reported as held by English company is really held by Goldfield Consolidated, according to statement of Albert Burch, general manager of that company.

NEVADA-BUNKER HILL MINING CO. (Bullion)—Crosscut tunnel being driven is in 2160 ft. Within next 300 ft. should cut Red Bird and Tripoli veins, from both of which good tonnage silver-lead ore has been produced. Air compressor ordered, will be used in driving tunnel. Four sets of lessees are working on company ground, three shipping ore to Salt Lake Valley smelting plants. This ore is hauled to Raines' siding, on Eureka R.R., 12 miles distant, by two auto trucks and by teams.

Esmeralda County

THREE MINERS IN GAS-FILLED SHAFT 20 miles northwest of Tonopah were reported July 21 as unlikely to be rescued alive. Shaft was 90 ft. deep, near Crow Springs. One miner escaped and summoned aid from Millers. Crew from Bureau of Mines rescue car went to assistance in automobile. Miners all Servians employed by Tonopah syndicate.

VERNAL MINING CO. (Goldfield)—A 1-ft. shoot high-grade ore struck in drift from winze below 100-ft. level. Drift on 200-ft. level will be extended to cut this shoot.

SILVER PICK CONSOLIDATED (Goldfield)—Satisfactory progress in development work. Two raises from 500-ft. level started and drifting toward Red Top property of Goldfield Consolidated under way.

JUMBO EXTENSION (Goldfield)—Due to increased percentage extraction made on ore being treated at Goldfield Consolidated mill, been found economical to mill there also ore formerly considered of shipping grade.

Humboldt County

A GOLD STRIKE ON COVE CREEK, in Pine Forest Range, has been made, it is reported. Gold found in both placer ground and quartz veins. Place 75 miles by auto from Jungo.

TRUITT MAY DAY NO. 2 (Haystack)—Lease granted on this property. Quartz vein, 15 in. wide, exposed on surface for length of 300 ft.; good pannings obtained along entire length.

MURRAY & AUSTIN (Haystack)—Two carloads ore being hauled to Jungo for shipment. Many lessees working in this district and considerable shipping-grade ore being mined from near surface.

HINES-BALDWIN (National)—Strike high-grade ore made on this property now worked by White Rock Leasing Co. Discovery made in raise from drift on Wheeler Tunnel level; shoot 6 ft. wide with 3-in. streak of high-grade ore.

Lincoln County

YUBA LEASING & DEVELOPMENT CO. (Pioche)—Stoping on 800-ft. level. Ore hoisted through No. 3 shaft and sorted on surface.

AMALGAMATED PIOCHE (Pioche)—Development work on newly discovered oreshoot on 1400-ft. level continues to open good grade ore containing silver, lead and zinc.

E. & F. MINING CO. (Pioche)—Stated work will be resumed in lower tunnel and shipments made from dumps. Property lies between Day-Bristol and Hillside, covers 240 acres.

Mineral County

ROCKLAND MINE (Rockland)—Consignment of 200 tons of machinery, lumber and general supplies arrived. Expected mining will commence in near future.

AURORA CONSOLIDATED (Aurora)—One 15-stamp unit of mill now running and test being made of cyanide equipment. If results are satisfactory, entire mill will probably be running within 30 days; if not, four months will be required to make necessary changes. Crew of 220 men now employed. Three-year contract made with Reading Mercantile & Transportation Co. to haul all freight from Hudson station to Aurora. Stated 30 cottages will be built by company for employees.

Nye County

TONOWA C. M. & M. CO. (Monte Cristo)—New tramway, mine to mill, completed; mill overhauled; 25 to 30 tons per day being treated.

MANHATTAN CONSOLIDATED (Manhattan)—Preparations being made to extract ore developed west of shaft. Track laid to Consolidated mill, 700 ft. distant, where ore will be treated.

RANDOLPH GOLD MINING CO. (Bonnie Clare)—Operations will be resumed Aug. 1, after four months' shutdown. North crosscut on 200-ft. level will be driven to cut downward extension of vein opened on 100-ft. level. Sinking on vein from 200- to 400-ft. level will then be done.

NEVADA CINNABAR CO. (Ione)—Installation of modern furnaces completed and plant is now producing eight flasks of mercury per day. Power supplied by 44-hp. gasoline engine which drives dynamo. Cost of new equipment said to be $180,000. Fifty tons ore per day being mined in glory-hole.

Storey County

SETTLEMENT OF DISSENSION between Mexican and Union companies arranged, according to statement of John Landers, vice-president of Mexican and president of Union, who says work will be resumed at once and sinking to 2500-ft. level done.

ALTA (Virginia City)—Shaft repaired from collar to 1600 level, and management contemplates taking up work there, where 5-ft. ledge uncovered carries low-grade ore.

UNION CONSOLIDATED (Virginia City)—Joint Union-Sierra Nevada winze will be pumped out below 2500 level, and at the 2350 crosscut extended to intercept vein

SIERRA NEVADA (Virginia City)—Work will be resumed in mine in near future. Sample milling of 25 tons recently taken from the 2500 winze gave average value at mill of $38.

BELCHER (Virginia City)—Increasing value in quartz is reported from north drift on recently recovered 1600 level, and material now being recovered is shipped to Yellow Jacket mill for treatment.

MEXICAN (Virginia City)—Sinking pump placed in 2500 winze, which will be unwatered, winze sunk from the 146-ft. point for sump, and station cut out at 2650 level. Drifting north and south on vein will then be taken up.

CONSOLIDATED VIRGINIA (Virginia City)—Northeast drift on 2500 level on vein is following 17-in. streak of quartz running $10 per ton. Streak is on hanging-wall slip, and on west wall another quartz streak is showing.

YELLOW JACKET (Virginia City)—New cyanide plant recently installed at company's 200-ton concentrating plant is in operation, designed to treat six tons concentrates per day, the output of the mill. Process is same as used at Goldfield Consolidated mill. Tailings have no commercial value and are not treated.

NEW MEXICO

Grant County

U. S. CONTINENTAL MINES CO. (Tyrone)—Option taken on Uncle Sam and Free Coinage mines in Burro mountains by J H. Shockley, of New York City. Irvin K. Farrington Co., of New York, said to have charge of deal.

85 MINING CO. (Lordsburg)—Company received 450-hp. engine, delivered to mine by 36-horse team from Lordsburg. Ore contract of J. Olney purchased by B. B. Owenby and J. P. Freeman, who intend using tractor for ore transportation to Southern Pacific railroad.

Luna County

BI-METALLIC MINING & MILLING CO. (Deming)—Company reported to have made rich discovery on property in Sierra County.

GERMAN-AMERICAN MINING CO. (Columbus)—Carload of machinery arrived in Deming, consigned to company operating in Tres Hermanas mountains, 20 miles southwest of Deming and 10 miles northwest of Columbus. Ore carries lead and zinc.

Socorro County

NORTH GRAPHIC MINING CO. (Magdalena)—Suit filed against company by A. L. Grimshaw, A. C. Thomas and R. B. Thomas. Receiver asked for and injunction preventing company making any disbursements until claims of plaintiff are settled.

PENNSYLVANIA

GENERAL SMELTING CO. (Wyndmoor) — Judge Ryan heard argument today on bill in equity brought by George Burton and Frank P. Myers, to restrain company from smelting zinc and zinc ores. Complainants are owners of extensive greenhouses in Springfield, Myers testified he had $120,000 invested in rose bushes and shrubbery, says that fumes, gases, dust and smoke from smelting plant have killed many plants and trees and that many more are dying. Burton, who has $45,000 invested, gave similar testimony. Decision reserved.

SOUTH DAKOTA

Lawrence County

FOREST OFFICERS WILL BUILD ROADS with $5500 available for work, 10% of amount realized during last fiscal year from timber sales on Black Hills forest reserve. Portion of Deadwood-Denver trail, between Pactola and Sheridan, was recently severely damaged by cloudburst, and this will be repaired at once.

IRONSIDES (Squaw Creek)—Tunnel being driven alongside large porphyry dike, toward orebody exposed in former work.

GOLDEN REWARD (Deadwood)—Thorough tests to be made with continuous-decantation cyanide process, dispensing with filter, to that end tanks and thickener equipment being installed.

TROJAN (Trojan)—Gradients being eliminated on ore-haulage road, by what is practically reconstruction of line. Gasoline locomotives used. Expected that work under way will permit engines to handle double their present load.

HEIDELBERG (Two Bit)—Last shipment of ore to Golden Reward mill at Deadwood was settled for at $25.40 per ton. Property was recently examined by agents of state securities commission and state mine inspector, under "blue sky" law, preliminary to issuing permit to company to sell treasury stock to public.

NEW RELIANCE (Trojan)—Ingersoll-Rand air compressor and stoping drills installed. One drill, working in vertical orebody, is supplying nearly one-half mill capacity. Orebody averages 8 ft. wide, known to be more than 1000 ft. in length, backs average 100 ft. for that distance. Mill dropping full complement, 30 stamps.

TITANIC (Carbonate)—During past year company spent $20,000 in development of old Iron Hill property. Work included erecting shaft house, installing machinery, sinking 267 ft. of shaft and running 290 ft. of drifts and crosscuts. At present time two jackhamer drills being used in drifting. Decided to install diamond drill at bottom, 300 ft., and run number of holes in different directions.

Pennington County

DAKOTA CONTINENTAL COPPER (Hill City) — Work suspended; no statement made as to future plans. Since water was removed last January, large Rumsey triplex, electric-driven pump was installed on 700-ft. level; shaft deepened from 813 to 850 ft., station cut at 825-ft. level and crosscut run on this level 240 ft. It passed through quartz vein barren of copper, and evidently not vein sought. All light machinery was removed from shaft, also motor of big pump; air lifts installed and everything put in such shape that resumption of work would be comparatively easy.

UTAH

Summit County

PARK CITY SHIPMENTS for week ended July 17 amounted to 2,930,860 lb. Largest shippers were Silver King Coalition, Silver King Consolidated, and Daly-Judge, in order named.

NEW CUSTOM MILLING CO., which has been remodeling old Grasselli zinc mill at Park City, has placed order for roaster with Knight-Christensen Metallurgical Co. Roaster will be of type used at Knight mill, Silver City. Ore being hauled from American Flag mine and stockpiled.

SILVER KING CONSOLIDATED (Park City)—Shipments of 30 to 40 tons and upward being made daily. Output from this property was second largest from camp for week ended July 17.

SNAKE CREEK TUNNEL (Park City)—Average daily progress during July, 13 ft., working two shifts. High record, 15 ft., including ditch, track, etc. Face of tunnel in limestone and considerable water developed.

SILVER KING COALITION (Park City)—Annual report issued, covering period of eight months to Dec. 31, 1913, fiscal year being changed to coincide with calendar year. Report shows that cost of excavating, reinforcing and concreting at new Silver Hill station was $46,796. Electrical machinery, compressor and installation cost $50,421, making total cost $97,191. Station is 8400 ft. from portal of Alliance tunnel and at depth of 1670 ft. below surface. Drifting started on 100-ft. level of Silver Hill shaft, and ore expected to be reached on this level. Shaft will be sunk to contact 1000 and 1200 ft. below tunnel, or approximately 2900 ft. beneath the surface. Ore known to occur along contact of limestone and quartzite east of here. Necessary to install heavy equipment so as to carry on work at depth.

WISCONSIN

FLORENCE IRON CO. (Florence)—Probably finest farm in Florence County belongs to this company, property of Ladenburg-Thalmann interests, of New York. Acreage is 400, of which 135 is cleared and in crops. Among live stock is flock of 375 sheep. Company's Bates mine, in Iron River district, has started shipments over the new Iron River extension of Chicago, Milwaukee & St. Paul. Milwaukee also hauling ore from Chicagon mine.

CANADA

Ontario

TRETHEWEY (Cobalt)—Company has dropped option on West Beaver silver mine near Port Arthur, Ont.

TECK-HUGHES (Kirkland Lake)—Interests controlling Nipissing have secured option to run for a year on enough of the stock of this mine to give controlling interest.

CASEY-COBALT (Cobalt)—Recent official reports not encouraging. Consulting engineer states unless new orebodies are discovered, coming year will show depletion of ore reserves.

PETERSON LAKE (Cobalt)—Judgment given in favor of Peterson Lake in action with McKinley-Darragh over staking of disputed territory. Costs assessed against McKinley-Darragh.

NORTH DOME (Porcupine)—On application of Timiskaming Mining Co., which is creditor to amount of about $85,000, court at Toronto has ordered this company to be wound up.

CART LAKE (Cobalt)—Company has shipped 7741 lb. high-grade ore running 2700 oz. per ton to Nipissing mill for treatment. Gould vein has been cut at 332 ft., where it has 1 to 1½ in. high-grade ore.

JUPITER (Porcupine)—Development work on 400-ft. level vigorously pushed by McKinley-Darragh under working option, but assays vary so greatly that mill run will be necessary as conclusive test of values. Winze is being put down to 500-ft. level.

TOUGH-OAKES (Swastika)—H. H. Johnson, consulting engineer, estimates average value of $32.60 over stoping width of between 4 and 5 ft. States that by Jan. 1 mine will have three years' ore developed for mill with capacity of 2500 tons per month, and estimated annual net profit will be $750,000. Orders being placed for machinery for new mill. Since commencement of operations, mine produced up to May 19 last, total of $220,000.

MEXICO

Jalisco

REVIVAL OF AMERICAN MINING in Jalisco seems more likely as result of assurances received by New York mine owners from Carranza. Gerard-Daly interests are quoted in New York as confident of early resumption of operations.

Sonora

CANANEA CONSOLIDATED (Cananea) — Oversight and Veta Grande mines reported as found on fire, July 24, Veta Grande was burning in several places, giving rise to belief that fire was incendiary. Company officials said they hoped to get blaze in that mine under control soon, but not much hope was held out for Oversight mine, with which it connects by tunnels. Copper Queen helmet crew was proceeding to mine because of first reports that several miners were entombed, but it developed later no one was endangered.

COLOMBIA

ANGLO-COLOMBIA DEVELOPMENT CO., LTD., (8 Old Jewry, London)—Equipment for company's new dredge, designed by Inder & Henderson, has been finished at Renfrew, Scotland, by Lobnitz & Co., Ltd. Dredge is to be erected near Novita on Condoto River where company has developed over 13,000,000 cu.yd. of gold-platinum-bearing gravel.

The Market Report

METAL MARKETS

NEW YORK—July 29

The metal markets have been weak, mainly on account of the collapse in the markets abroad, due to the war excitement. Home demand seems to be improving.

Copper, Tin, Lead and Zinc

Copper—The serious political disturbances in Europe have of course, had an immediate effect upon the copper market. Before war actually threatened, the market had been very quiet. Consumers abroad were covered for their nearby requirements and were disposed to hold off, and the same conditions prevailed in this country. The outbreak of the war between Austria and Servia bringing with it a financial crisis and a general desire on the part of European merchants to reduce their commitments to a minimum, practically stopped all buying over there. It also caused immediate pressure to sell, as a result of which prices for electrolytic copper quickly tumbled to 13c., delivered, 30 days. Sales at that price were made to domestic consumers on Monday. The crisis in Europe naturally kept European buyers out of the market. During the two days following, when the stock markets of the world were panicky, copper was practically unsalable. Electrolytic was offered by several agencies at 12⅞c., delivered, 30 days.

The average for the week of our prices of electrolytic copper was 12.904 cents.

The London market for standard copper has declined sharply. On Thursday, July 23, spot was £60; three months £60 8s. 9d. On Monday, July 27, spot was down to £58 15s.; three months £59 5s. On Wednesday, July 29, spot closed at £57 5s. and three months at £58 5s.

Base price of copper sheets was reduced ½c. on July 27 and is now 18½c. per lb. for hot rolled and 19½c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14½@14¾c. per lb., carload lots at mill.

Exports of copper from New York for the week were 8903 long tons. Our special correspondent gives the exports from Baltimore at 3820 tons for the week.

Imports of copper into France six months ended June 30 were 49,263 tons, an increase of 6277 tons over last year.

Tin—The demoralization of all markets as a result of the disturbed political condition abroad also seriously affected this metal. On the London Metal Exchange prices broke badly, reaching their lowest point, equaling a decline of over £8, on July 27. Quotations in this market followed those established abroad, with the difference, however, that the extraordinarily high sterling exchange made quotations in this market appear rather high by comparison. However, there was no interest shown by consumers, and hardly any business transacted between dealers. The market closed somewhat better at £135 5s. for spot and £138 10s. for three months, and about 30⅞c. for July-August tin here.

Lead—The market has been weak, owing to the desire of many holders to liquidate their stocks. At the lower prices there was a fair amount of business, including some for future delivery.

The European lead market is also weaker, Spanish lead being quoted £18 15s.; English lead 15s. higher.

Exports from Baltimore for the week included 336,292 lb. lead to Germany; 778,687 lb. to Glasgow, Scotland; $784,750 lb. to Rotterdam, making 1,897,729 lb. lead in all.

Spelter—Early in the week there was a good demand and some considerable tonnages changed hands at around 4.85@4.90c., St. Louis. Later on, when the European disturbances occurred there was some pressure to sell, in consequence of which prices declined, round lots being offered by producers at 4.75c., St. Louis. The market at this time was confused, reports of offerings at all kinds of figures being current, a condition that was not unnatural in view of the situation in the stock market.

The London market for good ordinaries is unchanged at £21 15s.; specials £22 10s. per ton.

Base price of zinc sheets is $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—Business seems to be improving so far as sales are concerned, but there is sharp competition for the trade. Current quotations are 17.50@17.75c. per lb. for No. 1 Ingots, New York; but there are reports that sales as low as 17.37½c. have been made.

Antimony—The market is a little brighter and business is moving more freely. Quotations are unchanged. Ordinary brands—Chinese, Hungarian, etc.—hold at 5.40@5.70c. per lb. For Cookson's, 7.10@7.30c. per lb. is asked, with 6.80@7c. for other special brands.

DAILY PRICES OF METALS

NEW YORK

July	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Dts. per Lb.
23	4.8800	54¼	13.10 @13.15	31⅝	3.90	3.72½ @3 75	4 95 @5.00	4 80 @4 85
24	4.8815	53⅞	13.00 @13.10	31¼	3.90	3.72½ @3.75	5.00 @5.05	4 85 @4.90
25	4.8805	53⅛	12.90 @13.00	31¼	3.85 @3.90	3.70 @3.75	5.00 @5.05	4.85 @4.90
27	4.8875	52⅝	12.80 @12.90	30¼	3.85 @3.90	3.70 @3.75	4.95 @5.05	4.80 @4.90
28	4.9100	53⅜	12.70 @12.75	30⅞	3.85 @3.90	3.70 @3.72½	4 90 @4.95	4.75 @4.80
29	4.9100	52½	12.70 @12.75	30⅞	3.85 @3.90	3.70 @3.72½	4.85 @4.90	4.70 @4.75

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we ded uct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c.

LONDON

July	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
23	24 13/16	60	13.04	60 7/16	64¾	143¼	144½	19	4.13	21⅝	4.70
24	24¾	59¾	12.98	60¼	64½	140¾	142¼	18⅝	4.05	21⅝	4.70
25	24 7/16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	24 7/16	58⅝	12.76	59¼	63	136¼	138	18½	4.02	21⅝	4.70
28	24 7/16	58⅜	12.66	59⅛	63	137	138¾	18⅝	4.05	21⅝	4.70
29	24	57¼	12.44	58¼	62½	138⅝	138½	18¾	4.07	21¾	4.73

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26½c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Quicksilver—The market has been quiet and prices rather easy. New York quotation is $36 per flask of 75 lb., with 52@53c. per lb. for small lots. San Francisco, $36 per flask, with about $2 less quoted for export. London price is £6 15s. per flask, with £6 12s. 6d. quoted by second hands.

Nickel—Quotations for ordinary forms—shot, blocks, or plaquettes—are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Minor Metals—Quotations for **Bismuth** are $1.80 per lb. for imported, $1.72 for metal from native ores—**Cadmium**, 750 marks per 100 kg.—81c. per lb.—at works in Germany—**Magnesium**, $1.50 per lb., New York—**Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, and $5 per lb. for small quantities.

Exports from Baltimore for the week included 220 lb. selenium to Hamburg, Germany.

Gold, Silver and Platinum

Gold—Although the European markets are reported much disturbed by the war scare, no premium is reported paid on the open market in London, the price of gold remaining at 77s. 9d. for bars. In New York $8,100,000 is reported taken for export to Paris and $15,000,000 for London. It is probable that more will go, as there is a strong demand abroad, and New York is just now the most available market.

Imports of Gold in Great Britain six months ended June 30 were £28,934,112; exports, £22,364,842; net imports, £6,569,270, against £6,534,195 last year.

Iridium—On a moderate demand this metal is steady at $76@79 per oz., New York.

Platinum—The market continues quiet and steady here. Current quotations are unchanged at $43@44 per oz. for refined platinum and $46a51 per oz. for hard metal.

Our Russian correspondent writes under date of July 16 that the market is weak, with no sales reported. Stocks have increased, but are firmly held and no concessions are offered. Quotations at Ekaterinburg are 9.50 rubles per zolotnik for crude metal, 83% platinum; at St. Petersburg for the same grade, 36,400 rubles per pood. These prices are equal to $35.72 and $35.67 per oz., respectively.

Silver—The market has fluctuated wildly this week owing to the general disorganized conditions of financial centers. The market for silver has depended on China—one day China Banks selling freely and the next day buying silver. The China market has been ruled by speculators. Indian Bazaars have bought moderately. The market closes at 24d. in London, disorganized and with tendency weak.

Shipments of silver from London to the East, Jan. 1 to July 16, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£4,045,000	£3,946,000	D. £99,000
China	127,000	40,000	D. 387,000
Total	£4,172,000	£3,986,000	D. £486,000

There have been no exports to China since early in the year; in fact, that country has been a seller rather than a buyer for some time.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—July 25

The base price paid this week for 60% zinc ore was $39@40 per ton. The base price paid for 80% lead ore was $47@48 per ton.

SHIPMENTS WEEK ENDED JULY 25

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,858,860	140,790	502,400
Year	86,168,340	3,076,500	22,252,370

Shipped during week to separating plants, 3,168,980 lb. zinc ore.

JOPLIN, MO.—July 25

Blende sold as high as $41.50, the assay base price being $38.50@40 and the metal base $37.50@38.50 per ton of 60% zinc. Calamine is $21@22 per ton of 40% zinc. The average selling price of all grades of zinc is $37.20 per ton. No sale of lead higher than $47 per ton is reported, the base continuing at $46 per ton of 80% metal content, and the average of all grades is $44.80 per ton.

Correct price quotations are hard to make tonight for the reason that the variations are unusual and unique. For instance, ores usually quotable on a metal base, carrying high iron, sold at $41 on an assay base, and ores of 58% zinc and 2% iron sold on a $40 assay base, and yet the best grades sold at $38.50 and $39. It is rumored that three more mines in the Webb City area will close down tonight.

SHIPMENTS WEEK ENDED JULY 25

	Blende	Calamine	Lead	Values
Totals this week..	11,089,820	434,530	1,697,450	$253,490
Totals 7 months.	308,619,810	22,183,430	52,744,240	7,541,165

Blende value, the week, $209,060; 7 months, $6,028,870.

Calamine value, the week, $5400; 7 months, $251,605.

Lead value, the week, $39,030; 7 months, $1,260,695.

IRON TRADE REVIEW

NEW YORK—July 29

The general tone of the iron and steel markets shows an improvement which was hardly to be expected at this season, as July is ordinarily a dull month.

New business is increasing and the mills are working up gradually to a higher percentage of activity than they have shown for some time past.

The advances reported last week in sheets, bars and wire seem to be generally adopted and maintained and have not affected the volume of new business.

Structural steel demand is improving as more building contracts come into the market. Building generally is improving and is on a larger scale.

The pig-iron market is rather behind the rest. Several steel works stacks have been blown in, but the active merchant furnaces are not increasing in number.

The United States Steel Corporation makes the following statement for the quarter ended June 30, net earnings being the surplus over working expenses and ordinary renewals:

	1913	1914
April	$13,072,710	$6,920,879
May	14,554,566	6,845,823
June	13,592,537	6,690,894
Net earnings for quarter	$41,219,813	$20,457,596
Subsidiary company charges		$5,646,170
Interest and sinking funds		7,317,963
Total charges		$12,958,133
Surplus for the quarter		$7,499,463
Dividends declared		12,658,700
Deficit		$5,199,237

The usual dividends were declared of 1¾% on preferred and 1¼% on common stock. The total net earnings for the half year ended June 30 were $38,451,977. The surplus for the half year was $11,448,881 less than the dividends declared.

PITTSBURGH—July 28

Earnings of the Steel Corporation in the second quarter, just reported at $20,457,596, an increase of $2,463,215 over the first quarter, were much larger than expected, as little if any increase had been predicted. While the earnings of ore transportation companies in May and June may have contributed a part of the increase, it is evident that shipments of steel were larger in the second quarter.

The advance in bars, plates and shapes from 1.10c. to 1.15c., made at the beginning of last week by the leading mills in western Pennsylvania and Ohio, has proved effective. The smaller mills have conformed, and even in the Chicago district there have been advances.

Actual shipping orders for steel products received this month are fully equal to the total of June, which makes an excellent showing, as July is usually very much behind June in bookings. The volume of contract business in July has shown a large increase over June, even though the mills are limiting contracts to early deliveries, except at advanced prices.

Business in manufactured steel, such as bolts and nuts, rivets, spikes, shafting, etc., has shown some increase in the past month over June. One large rivet interest reports an increase of 50% in actual shipping orders.

The steel mills are running at an average of 65% of capacity, this being if anything a slightly better rate than obtained in June. Bookings of shipping orders for sheets have been as heavy in July as in June, while contracting has shown a considerable increase. Sheet production in July has been between 50 and 55% of full capacity, many mills being off for repairs.

Pig Iron—There has been an increase in buying of foundry iron of late, and some sellers have found the whole month of July better than June in tonnage booked, while June was better than May or April. Prices on foundry iron are well maintained, and only a few furnaces are selling at the minimum of $13, furnace. Most consumers require several brands to make their mix, and sales of limited tonnages have been effected at $13.25 and $13.50. We quote: Bessemer,

$14; basic, $13; malleable, $13 to $13.25; No. 2 foundry, $13 to $13.50; forge, $12.50 to $13, at Valley furnaces; 90c. higher delivered Pittsburgh.

Ferromanganese—The market remains at $37 for German and $38 for English, at Baltimore, with $2.16 freight to Pittsburgh. While a war involving Russia, now seriously threatened, might decrease seriously the supply of ore from southern Russia, sellers are still willing to contract for early 1915 deliveries at present prices.

Steel—The open market in billets and sheet bars continues very quiet, supplies being arranged under existing contracts, with private adjustment of price. We quote billets at $19 and sheet bars at $19.50, f.o.b. maker's mill, Youngstown, and billets at $19.50 and sheet bars at $20, f.o.b. maker's mill, Pittsburgh. Rods are about $25, Pittsburgh, and very quiet.

FOREIGN IRON

German Steel Production five months ended May 31, in metric tons:

	Basic	Acid	Total
Converter	4,527,943	42,976	4,470,919
Openhearth.....	2,949,916	162,110	3,112,026
Direct castings.. .	102,269	45,243	147,512
Crucible	. . .	37,467	37,467
Electric..	.... .	41,990	41,990
Total .	7,480,128	329,786	7,809,914

No comparisons are possible, as the make of steel has not been reported monthly until this year.

German Foreign Trade in Iron and Steel and manufactures thereof, five months ended May 31, in metric tons:

	Exports	Imports	Excess
Iron and steel.....	2,731,517	222,593	Exp. 2,508,924
Machinery........	225,993	40,063	Exp. 185,930
Total	2,957,510	262,656	Exp. 2,694,859
Total, 1913.	2,947,455	302,026	Exp. 2,645,424

Increase in exports was 10,055 tons, or 0.3%, but there was a decrease of 39,370 tons, or 13%, in imports.

IRON ORE

Shipments of Lake Superior ore are still slow, and few ore boats are in commission outside of those owned by steel and mining companies.

Imports at Baltimore for the week included 6300 tons manganese ore from Bombay, India, and 5900 tons from Batum, Russia.

COKE

Connellsville Coke—The coke market is extremely quiet. Furnaces in blast are well covered, though a few contracts will expire Sept. 1. A few idle furnaces have been considering the question of getting into blast and piling some iron, but their negotiations for coke are not being prosecuted with any vigor. We quote: Prompt furnace, $1.75; contract furnace, $1.85@2; prompt foundry, $2.25@2.35; contract foundry, $2.35@2.50, per net ton at ovens.

Fuel Exports of Great Britain six months ended June 30, long tons:

	1913	1914	Changes
Coal ...	35,526,235	34,586,938	D. 939,297
Coke	499,670	517,609	I. 17,939
Briquettes.....	1,022,232	1,044,360	I 22,128
Steamer coal....	10,087,037	10,182,157	I 95,120
Total	47,135,174	46,331,064	D. 804,110

Imports of coal for the half year were only 13,534 tons in 1913, and 15,775 this year.

CHEMICALS

NEW YORK—July 29

The general market shows no change and remains quiet, as is usual at this season.

Arsenic—The market is quiet, with only a moderate demand. The producers' agreement still holds and there is no change in prices, $3 per 100 lb. being named for both spot and futures.

Copper Sulphate—Business is fair, sales running about as usual. Prices are unchanged. Quotations are $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade in this article is fair for the season. There is a good deal of talk about curtailment of production by the Chilean producers, but so far it has not affected the market here. Prices are unchanged at 2.10c. per lb. for spot and 2.07½c. for futures.

Pyrites—Imports at Baltimore for the week included 7705 tons pyrites from Huelva, Spain.

PETROLEUM

Oil production in California in June is reported at 9,431,863 bbl.; deliveries, 8,816,610 bbl.; stocks June 30 were 52,248,329 bbl. There were 47 new wells completed during the month.

Exports of mineral oils from the United States in June were 216,563,850 gal. For the six months ended June 30 the total exports were 962,474,296 gal. in 1913 and 1,119,082,200 in 1914, an increase of 156,607,904 gal., or 16.3%, this year.

NEW CALEDONIA ORES

Shipment of ores from New Caledonia as reported by the "Bulletin du Commerce," of Noumea, for the five months ended May 31 included 35,580 metric tons of nickel ore, 920 tons of cobalt ore and 22,954 tons chrome ore. Shipments of metals included 1575 tons nickel matte and 24 tons cobalt matte.

COPPER SMELTER'S REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In these cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97+. In computing the total American supply duplications are excluded

	March	April	May	June	July
Alaska shipments.	2,069,960	1,279,537	585,387	1,114,758	....
Anaconda.	23,800,000	22,900,000	23,500,000	23,800,000	.....
Arizona, Ltd...	3,286,000	3,570,000	3,092,000	3,742,000	
Copper Queen. .	7,637,042	7,562,723	8,388,203	7,613,719	..
Calumet & Ariz..	5,875,000	5,450,000	5,495,000	4,630,000	.
Chino.....	5,399,814	5,926,591	5,496,875	5,486,419	.
Detroit. ...	1,973,725	1,790,926	2,105,034	2,129,100	.
East Butte.	1,546,180	1,178,000	1,179,762	1,215,323	.
Giroux. .	287,980	45,948	429,553	...	.
Mason Valley..	1,250,000	862,000	916,000	.	
Mammoth ..	1,800,000	1,850,000	1,750,000	1,725,000	
Nevada Con..	5,218,257	4,880,043	4,929,598	4,483,175	
Ohio......	97,520	610,518	625,000	. ...	
Old Dominion..	997,000	2,779,000	3,302,000	2,937,000	
Ray...........	6,036,908	6,089,362	6,300,817	6,039,710	.
Shannon..	1,082,000	1,012,000	1,056,000	. ..	
South Utah.....	406,381	247,641	55,394	..	
Tennessee... .	1,262,184	1,370,800	1,336,950	.	
United Verde*...	3,100,000	3,000,000	3,100,000	2,900,000	
Utah Copper Co	12,323,493	12,739,757	13,208,483	12,870,063	
Lake Superior*....	11,000,000	13,000,000	12,500,000	16,000,000	
Non-rep. mines*..	8,200,000	8,000,000	8,200,000	8,000,000	
Scrap, etc. . .	2,500,000	2,500,000	2,500,000	2,500,000	. .
Total prod. . .	169,649,444	108,644,846	110,082,077	....	...
Imp., bars, etc.	22,675,605	17,043,191	19,081,487	.....	.....
Total blister...	132,326,049	125,688,037	129,153,564	... .	.
Imp. ore & matte.	7,029,646	10,400,122	10,586,506	.. .	..
Total Amer....	139,355,695	136,088,159	139,750,070	....	...
Miami†.. ..	3,361,100	3,130,772	3,347,000	3,125,750	....
Shattuck-Arizona	1,136,458	1,386,594	1,353,043	1,225,987	.....
Brit. Col. Cos;					
Granby.......	1,775,852	1,692,102	1,669,333	. ..	....
Mexican Cos.:					
Bolco†...	2,535,689	2,201,720	2,213,120	2,204,720	
Cananea .. .	4,260,000	2,632,000	2,222,000	.. ....	..
Moctezuma.....	2,882,884	2,654,926	2,834,616	3,370,800	
Other Foreign:					
Braden, Chile.. .	1,810,000	2,720,000	2,480,000	741,440	.
Cape Cod., S. Af.	660,800	468,160	582,400	732,480	
Kyshtim, Russia.	..			....	.
Spassky, Russia.	896,000	904,960	907,200	....	
Exports from					
Chile . . .	6,944,000	9,072,000	7,616,000	7,840,000	
Australia. .	8,176,000	7,168,000	8,400,000	5,712,000	
Arrivals–Europe†	17,572,800	17,299,520	13,558,720	19,040,000	

†Bolco copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

† Does not include the arrivals from the United States, Australia or Chile.

COPPER STATISTICS

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	....	.....	..... .
VIII '13	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX .	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X. .	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII....	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr., '13	1,622,450,829	767,261,760	869,062,784	. .	.	
I, 1914.	131,770,274	47,956,957	87,955,501	91,438,867	53,916,800	145,355,667
II..	122,561,007	47,586,657	83,899,183	87,296,685	50,108,800	137,405,485
III....	145,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV. .	151,500,531	63,427,633	82,345,216	64,609,319	46,435,200	111,044,519
V... .	142,308,287	55,592,170	72,710,477	70,337,001	52,371,200	122,708,201
VI.	141,345,571	46,227,353	73,350,196	84,342,641	61,062,400	145,405,041
VII				106,110,663	64,220,800	170,331,463
VIII						.. .

Note—Visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev.	Aug. 10	Aug. 31	$0 03
Aurora-Sampson, Ida.	July 18	Aug. 18	0 002
Buffalo, Mon	Aug. 2	Sept. 2	0 004
Challenge Cons., Nev.	July 21	Aug. 11	0.05
Emerald, Utah	July 15	Aug. 18	0.0033
Enterprise, Ida	July 31	Aug. 17	0.002
Evergreen, Utah	July 23	Aug. 22	0.01
Exchequer, Nev	Aug. 13	Sept. 3	0.02
Federal-Ely, Nev.	July 20	Aug. 21	0 005
Four Timbers, Wash.	July 29	Aug. 29	0.0015
Great Western, Nev	Aug. 10	Aug. 31	0 01
Hamburg-American, Ida. post'd	.. ..	Aug. 6	0 001
Holy Terror, Ida.	July 15	Aug. 15	0.0005
Jack Waite, Ida.	July 21	Aug. 18	0 01
Macnamara, Nev.	July 27	Aug. 17	0.03
Moonlight, Ida.	July 13	Aug. 20	0.005
Nabob, Ida	July 20	Aug. 17	0.005
New Hope, Ida.	July 13	Aug. 13	0.002
North Bunker Hill, Ida.	July 18	Aug. 22	0 002
North Star, Ida.	July 10	Aug. 8	0 0015
O. K., Utah.	Aug. 17	Sept. 2	0.005
Old Evergreen, Utah	July 23	Aug. 22	0.01
Oreano, Ida.	July 24	Aug. 24	0.002
Paymaster, Ida.	July 15	Aug. 12	0 002
Reeds Peak, Utah	July 6	Aug. 10	0.005
Smuggler, Utah	July 11	Aug. 11	0.005
Spider, Utah	July 21	Aug. 18	0 0025
Sunrise, Ida.	July 14	Aug. 24	0.002
Wasutch, Utah	July 27	Aug. 31	0 05
Wasatch-Utah, Utah	July 13	Aug. 17	0 01
West Century, Utah	Aug. 2	Aug. 24	0.005

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62 938	57 572	25.887	28.983	26.553
February	59 043	61 642	57 506	27.190	28.357	26.573
March	58.375	57 870	58 067	26.875	26.669	26 788
April	59 207	59 490	58 519	28.284	27.416	26.958
May	60.880	60 361	58 175	28 038	27 825	26.704
June	61.290	58 990	56.471	28 215	27.199	25.948
July	60 654	58 721	....	27.919	27.074	......
August	61.606	59 293	....	28 375	27.335	......
September	63 078	60 640	....	29.088	27.986	......
October	63 471	60 793	....	29.299	28.083	......
November	62 792	58 995	...	29.012	27.263	......
December	63 365	57 760	....	29.320	26.720	......
Year	60.835	59 791	...	28.042	27 576	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16 488	14.223	71 741	64 304	77.750	69 488
February	14 971	14 491	65 519	65.259	71.575	70.188
March	14 713	14 131	65.329	64 276	70 658	69.170
April	15 291	14 211	68.111	64 747	74.273	69.313
May	15 436	13 996	68 807	63.182	74 774	67.786
June	14 672	13.603	67 140	61.336	70.821	66.274
July	14 190	.	64.166	...	69.446	......
August	15 400	...	69 200	.....	74.313	......
September	16 328	.....	73 125	.....	78.014	......
October	16 337	.....	73.383	......	79.250	......
November	15 182	.....	68.275	......	73 825	......
December	14.224	......	65.223	.....	69.583	......
Year	15 269	...	68 335	..	73 740	....

New York, cents per pound, London, pounds sterling per long ton.

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50.298	37 779	238 273	171 905
February	48 766	39 830	220 140	181 556
March	46.832	38 038	213 615	173 619
April	49.115	36 154	224 159	163.963
May	49 038	33 360	224 143	150 702
June	44 820	30 577	207 208	138.321
July	40 260		183 511	.....
August	41 582	.	188 731	......
September	42 410	. .	193 071	.....
October	40 462	.. . .	184 857	.....
November	39 810	....	180 869	.....
December	37 635	. ..	171 786	. ...
Av. year	44 252	.	206 279	.

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4 171	4.011	17 114	19 665
February	4 325	4 048	4 175	3.937	16.550	19 606
March	4.327	3 970	4 177	3 850	15 977	19 651
April	4.381	3.810	4 242	3 688	17.597	18 225
May	4 342	3 900	4 226	3 808	18 923	18.503
June	4 325	3.900	4 190	3 810	20.226	19.411
July	4 353	.....	4 223	.	20 038	......
August	4.624	.....	4 550	.....	20 406	.....
September	4 698	.....	4 579	.....	20.648	......
October	4.402	.....	4 253	......	20.302	......
November	4.293	.....	4.146	......	19 334	......
December	4.047	.....	3.929	......	17.798	......
Year	4 370	....	4.238	.. ..	18 743	......

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6 854	5.112	26 114	21.533
February	6 239	5.377	6.089	5 228	25.338	21 413
March	6.078	5.250	5.926	5 100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5 074	5.256	4 924	24 583	21.393
June	5 124	5 000	4.974	4 850	22.143	21.345
July	5 278	.....	5.128	...	20 592	......
August	5 658	......	5 508	.. ..	20 706	......
September	5.694	......	5.444	......	21 148	......
October	5.340	......	5.188	......	20 614	......
November	5.229	.....	5 083	......	20 581	......
December	5.156	......	5.004	......	21.214	......
Year	5.648	......	5.504	......	22.746	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14.94	$17.35	$13.23	$18.59	$13.90
February	18.15	15.06	17.22	14 12	18 13	14 09
March	18.15	15 07	16.96	13.94	17 53	14 18
April	17 90	14.90	16.71	13.90	16.40	14.10
May	17.68	14.90	15.80	13.90	15.40	14.23
June	17.14	14.90	15.40	13.90	15.10	13.97
July	16.31	14.90	15.13	13.90	14.74	13.96
August	16.63	......	15.00	......	14.88	......
September	16.65	......	15 04	......	14.93	......
October	16.60	......	14 61	......	14.80	......
November	16.03	......	13 91	......	14.40	......
December	15.71	......	13.71	......	14.28	......
Year	$17.09	......	$15.57	......	$15.77	......

STOCK QUOTATIONS

COLO. SPRINGS July 28

Name of Comp.	Bid.
Acacia	.02¼
Cripple Cr'k Con.	.007
C. K. & N.	.06
Doctor Jack Pot	.06
Elkton Con.	.47½
El Paso	1.40
Findlay	.007
Gold Dollar	.03¼
Gold Sovereign	.01
Golden Cycle	1.00
Isabella	.10¼
Jack Pot	.05
Jennie Sample	.03
Jerry Johnson	.03¼
Lexington	.004
Old Gold	.01
Mary McKinney	.50
Pharmacist	.009
Portland	1.09¼
Vindicator	1.01

SALT LAKE July 28

Name of Comp.	Bid.
Beck Tunnel	.03¼
Black Jack	.05
Cedar Talisman	.00¼
Colorado Mining	.11½
Crown Point	.01½
Daly-Judge	5.00
Gold Chain	.10
Grand Central	.73
Iron Blossom	1.42½
Little Bell	.12
Lower Mammoth	.00¼
Mason Valley	1.00
May Day	.05¾
Opohongo	.01
Prince Con.	.18½
Silver King Coal'n	2.80
Silver King Cons.	1.80
Sioux Con.	.02
Uncle Sam	.03¾
Yankee	.02

TORONTO July 28

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.00½	Foley O'Brien	.26
Coniagas	7.00	Hollinger	17.05
Peterson Lake	.31¼	Imperial	.01¾
Right of Way	.02	Jupiter	.06¾
T. & Hudson Bay	35 00	Pearl Lake	.02½
Timiskaming	02	Porcu. Gold	‡.05
Wettlaufer-Lor.	.12	Preston E. D.	.01½
Big Dome	8.10	Hen	.10
Crown Chartered	‡.00½	Swastika	.01
Dome Exten.	.08½	West Dome	.05

SAN FRANCISCO July 28

Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.06	Belmont	6.15
Belcher	.45	Jim Butler	.96
Best & Belcher	.04	MacNamara	.01
Caledonia	.53	Midway	.16
Challenge Con.	.08	Mont.-Tonopah.	.55
Chollar	‡.02	North Star	.20
Confidence	.21	West End Con.	.65
Con. Virginia	.09	Atlanta	.14
Crown Point (Nev.)	.39	Booth	.03
Gould & Curry	.01	C.O.D. Con.	.02
Hale & Norcross	.04	Comb. Frac.	.04
Mexican	.43	Jumbo Extension	.18
Occidental	.75	Pitts.-Silver Peak	.20
Ophir	.08	Round Mountain	.36
Overman	.26	Sandstorm Kendall	.04
Potosi	.01	Silver Pick	.05
Savage	‡.05	Argonaut	‡3.00
Sierra Nevada	.03	Brunswick Con	1.50
Union Con.	.08	Central Eureka	.16
Yellow Jacket	.35	So. Eureka	‡1.37

N. Y. EXCH. July 28

Name of Comp.	Clg.
Amalgamated	59¼
Am.Sm.&Ref.,com	60
Am. Sm. & Ref., pf.	100
Am. Sm. Sec., pf. B	79¼
Anaconda	28¼
Batopilas Min.	¼
Bethlehem Steel, pf.	82¼
Chino	35½
Colo. Fuel & Iron	22¼
Federal M. & S., pf.	33
Great Nor., ore., ctf.	25
Guggen. Exp.	48¼
Homestake	112¾
Inspiration Con.	17
Mex. Petroleum	61¼
Miami Copper	20¾
Nat'l Lead, com.	42
National Lead, pf.	106½
Nev. Consol.	12¼
Ontario Min	2¾
Phelps Dodge	175
Quicksilver, pf.	1½
Ray Con.	18¼
Republic I&S, com.	20
Republic I&S, pf.	81
SlossSheffi'd, com.	22¼
Sloss Sheffield, pf.	81
Tennessee Copper	31½
Utah Copper	53
U. S. Steel, com	55¾
U. S. Steel, pf.	107½

N. Y. CURB July 28

Name of Comp.	Clg.
Beaver Con.	.23½
Big Four	.06
Boston Montana	‡9¾
Braden Copper	7¼
B. C. Copper	1¼
Buffalo Mines	1
Can. Cop. Corpn.	2
Can. G. & S.	.08
Cariboo	.68
Chambers Ferland	.12
Con. Ariz. Sm.	7/16
Cons. Nev.-Utah	‡¾
Coppermines Cons.	1½
Davis-Daly	64
Diam'field-Daisy	.04
Ely Con.	.05½
Florence	.32
Gold Hill Con.	‡7/16
Goldfield Con.	1 7/16
Greene Cananea	29
Kerr Lake	5½
La Rose	13/16
McKinley-Dar-Sa.	.50
Mines of Am.	3
Mother Lode	‡.26
Nevada Hills	.30
New Utah Bingham	‡¾
Nipissing Mines	5¾
Ohio Copper	.29
Oro	.08½
Puebla S. & R.	2¼
Stand'd Oil of N.J.	387
Stand'd Silver Lead	1¼
Stewart	1 5/16
Tonopah	6¼
Tonopah Ex.	2¼
Tonopah Merger	.32
Tularosa	5/16
West End Ex.	.03
Yukon Gold	2¾

LONDON July 17

Name of Comp.	Clg.
Camp Bird	£0 8s 3d
El Oro	0 13 0
Esperanza	0 14 4½
Mexico Mines	4 17 6
Oroville	0 10 9
Santa Gert'dis	0 11 3
Stratton's	0 0 6
Tomboy	1 1 3

BOSTON EXCH July 28

Name of Comp.	Clg.
Adventure	1
Ahmeek	265
Alaska Gold M.	23½
Algomah	.90
Allouez	38
Am. Zinc	13¾
Ariz. Com., ctfs.	3 11/16
Bonanza	.51
Butte-Balaklava	2
Butte & Superior	30¾
Calumet & Ariz.	63¾
Calumet & Hecla	401
Centennial	16
Cliff	1
Copper Range	32½
Daly West	2
East Butte	9½
Franklin	3¼
Granby	73½
Hancock	13
Helvetia	.30
Indiana	3
Island Cr'k, com.	47
Island Cr'k, pfd.	87¾
Isle Royale	18
Keweenaw	3¼
Lake	5½
La Salle	3¼
Mass	4
Mayflower	4¾
Michigan	.60
Mohawk	44½
New Arcadian	3¼
New Idria Quick	‡3½
North Butte	22½
North Lake	1½
Ojibway	.90
Old Colony	4
Old Dominion	48
Osceola	74
Quincy	54
Santa Fe	1½
Shannon	4½
Shattuck-Ariz.	21
Superior	24
Superior & Bost.	1½
Tamarack	32
Trinity	3¼
Tuolumne	.35
U. S. Smelting	33½
U. S. Smelt'g, pf.	46
Utah Apex	1¼
Utah Con.	10
Victoria	1½
Winona	2¾
Wolverine	37
Wyandot	.60

BOSTON CURB July 28

Name of Comp.	Bid.
Bingham Mines	04½
Boston & Corbin	.25
Boston Ely	.25
Butte & Lon'n Dev	27
Calaveras	1¼
Calumet-Corbin	05
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The Engineering and Mining Journal

VOLUME 98 AUGUST 8, 1914 NUMBER 6

Metallurgical Plants Near Salt Lake City

SYNOPSIS—Salt Lake City was the first place in the United States at which an important general smelting business was established. It has maintained its preeminent position as a custom smelting center and draws its supplies from a wide area extending as far westward as California. The equipment of the leading smelting works is listed. The new chloridizing-leaching mills for the treatment of complex ores in the Park City and Tintic districts are an interesting metallurgical development.

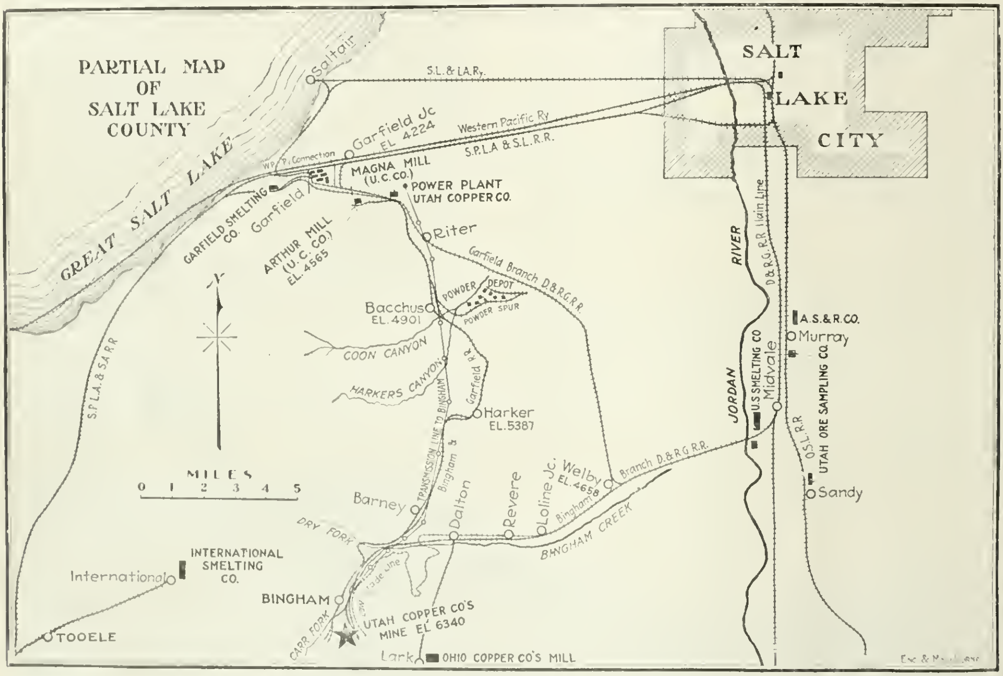
⁂

The opening of rich lead mines in the vicinity of Salt Lake City in 1869 and 1870 resulted in great mining activity and a corresponding stimulus to metallurgical development. Silver-lead smelting at this period was in its infancy, having just been introduced in Nevada; nevertheless the Utah operators did not hesitate to erect furnaces for the reduction of their ores and by 1872 there were 21 lead furnaces in this region. Not all of these were successful and they were gradually supplanted by the plants in the environs of Salt Lake City, where fluxing ores and fuel could be more readily delivered. Salt Lake City thus became the first important general smelting center in the United States. The Germania plant, which perhaps represented the most advanced practice, was visited by many metallurgists of the older generation. It was on a site adjoining the present Murray plant of the American Smelting & Refining Co. The older plans, such as the Germania, the Hanauer, the Horn Silver, and the Mingo have completely disappeared; even the smelting works of a later generation have been succeeded by more efficient plants, or have been dismantled, such as the Bingham Consolidated, which was just north of the U. S. plant at Midvale, the Highland Boy near Murray, the Yampa at Bingham, the Utah at Hot Springs, near Ogden, and the Tintic at Silver City.

General View of International Smelting Co.'s Works, Tooele, Utah

For many years the smelting plants were clustered close about Salt Lake City, but with increased railroad facilities and the growth of the metallurgical operations, there has been a tendency to place the newer plants at a greater distance from the city, thereby reducing the expense for the larger plant sites required and insuring greater freedom from "smoke farmers." The important smelting plants today are situated at Midvale, Murray, Garfield and International (Tooele, P. O.). At the last, both lead and copper smelting is done: at Midvale and Murray, only lead furnaces are operated by the United States Smelting Co. and the American Smelting & Refining Co. respectively; Garfield does copper smelting only.

Three districts, Park City, Bingham and Tintic supply most of the Utah ores. Park City produces silver-lead and silver-lead-zinc ores; Bingham both lead and copper ores, but copper predominantly. The Tintic district in Juab County supplies a variety of ores, mainly oxidized ores high in silica; these usually carry gold and silver and small amounts of copper and lead; some ore is also produced, but in general the output of the Tintic district is too siliceous to be separately smelted. While these camps have for years formed the basis of the smelting operations near Salt Lake, their output is not equal to the present smelting capacity. Increased rail facilities have enabled the smelters to draw supplies from California and Montana, as well as from the neighboring states of Idaho, Nevada, Arizona and Colorado; the Cœur d'Alene district in Idaho is an important source of supply for lead ore; high-grade siliceous ores are shipped from many camps in Nevada and iron flux, containing small amounts of the more valuable metals, is now obtained from Eureka, Nev., itself the scene of important early operations in silver-lead smelting.

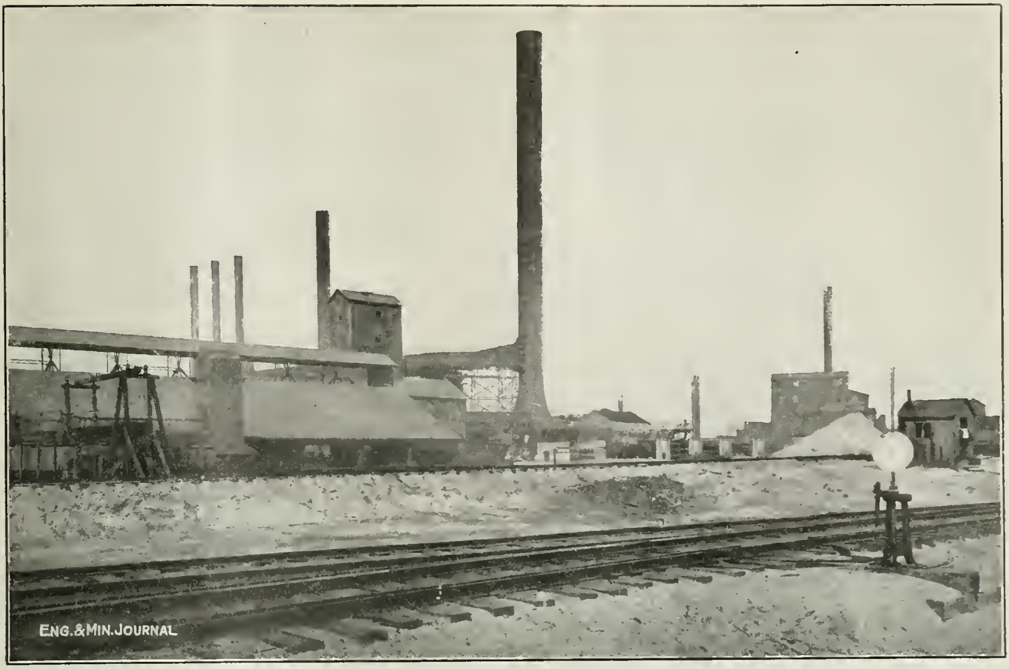


Metallurgical Plants near Salt Lake City, Utah

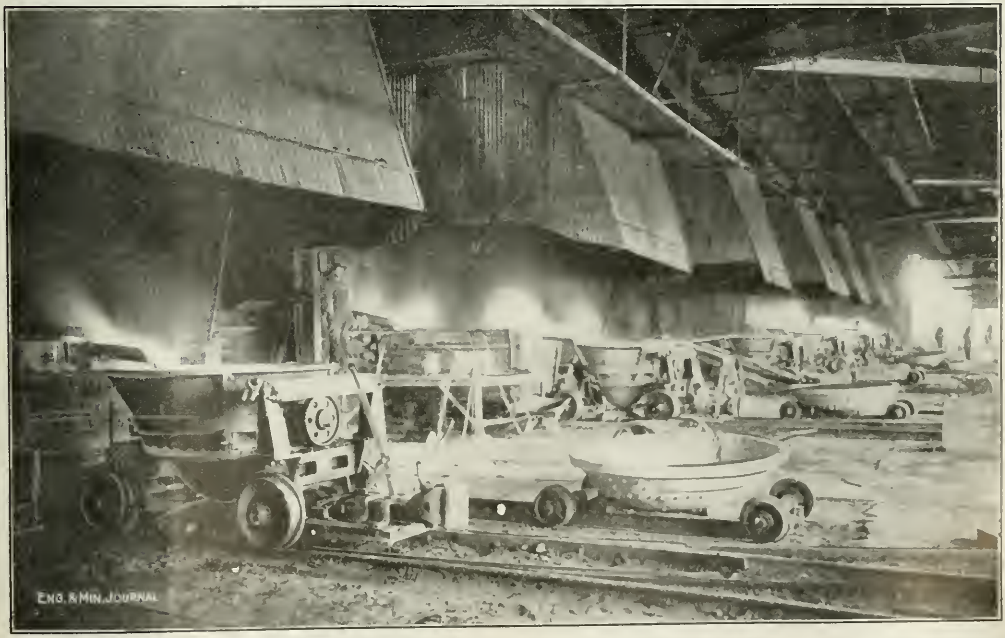
In the three important districts in Utah, the small producers are encouraged by custom sampling works and occasional shippers from Nevada and other states can avail themselves of the sampling mills near Salt Lake City at Sandy and Murray; all of the smelting companies now maintain modern mechanical sampling mills to which most of their regular customers send their ores to be sampled under the supervision of their own representatives.

New Chloridizing-leaching Mills

Some of the present smelting companies have built concentration mills to supplement the smelting works, as at Midvale where the United States Smelting Co. has a wet concentrating mill, and a Huff electrostatic plant for zinc separation. In a few instances the mining companies have built dressing plants near the smelting works. The most noteworthy mills at present are the two mills of the Utah Copper Co., the Magna and the Arthur, situated near the Garfield smelting works, the ore being transported from Bingham Cañon over the company's own railroad. The Ohio Copper Co. transports its Bingham ore through the Mascotte tunnel, concentrates it in a mill at Lark and ships the product to Garfield. There are other important mills in some of the outlying camps near Salt Lake City. In the Park City district, the silver-lead and silver-lead-zinc-copper ores are treated in simple concentrating mills and also in more complex works, such as those of the Mines Operating Co., and of the Park City Milling Co. In the Tintic district, another mill has been erected to treat the base ores; this plant at Silver City is backed by Jesse Knight and uses the process developed by N. C. Christensen. In this mill, as well as in the plant of the Mines Operating Co. at Park City, the ores are given a chloridizing roast and the gases are drawn into a condensing tower; the



Midvale Works, Showing Main Stack Free from Fume after Filtering Blast Furnace and Roaster Gases



Tapping Floor, Lead Blast-Furnace Department, U. S. Smelting Co.

acid formed is used in leaching the roasted ore; the metals are precipitated on scrap iron.

The most interesting feature of these new mills is the method of roasting whereby the ores are chloridized without losing valuable metals, as heretofore. The principal difficulty with the process has been in securing a proper roast, new furnaces having been developed for this part of the operation. Theodore P. Holt[1] has described the process as applied in the Mines Operating Co.'s plant installed in the old concentrator of the Ontario Silver Mining Co. The stope fillings of the Ontario mine contain from 6 to 14 oz. of silver, 0.01 to 0.015 oz. gold, 1 to 2 lb. copper and some zinc and lead. The low-grade fillings are crushed, mixed with coal dust and salt, and then roasted in a shaft furnace by the combustion of the contained fuel and an air blast. The gases pass to the condenser and at times supply all the acid required in the leaching; when there is little pyrite in the ore, sulphuric acid is added as required. The roasted charge is sluiced out of the furnaces with mill solution, raised to about 90 ft. by three Pohle air-lifts. The roasted ore is leached for about 24 hr.; in winter the solution is warmed by blowing in steam. Precipitation is accomplished by scrap iron with a consumption of about one pound per ton of product. The various metals are deposited in the order of their electromotive force but not sufficiently segregated to make commercial separations. The precipitate is brushed off the scrap iron, washed, filtered and dried. It is then sacked and shipped to a refinery, although experiments are being made with a view of separating the metals on the premises.

An accompanying map shows the situation of the mills and smelting plants near Salt Lake City; the principal equipment of the latter works is listed below:

UNITED STATES SMELTING CO.

[Lead and Copper Smelting Works at Midvale, Utah]

Sampling Mill

1	20x10-in. Blake crusher
1	42-in. Snyder sampler, $\frac{1}{5}$ cut
2	14-in. bucket elevators
1	No. 2 Gates crusher, Style D
1	42-in. Snyder sampler, $\frac{1}{5}$ cut
1	14x27-in. Davis rolls
1	27-in. Snyder sampler, $\frac{1}{5}$ cut
1	14x26-in. Colorado Iron Works rolls
1	27-in. Snyder sampler, $\frac{1}{5}$ cut
1	50-hp. General Electric motor

Sulphide Sampling Mills

1	20x10-in. Blake crusher
2	14-in. bucket elevators
2	16x36-in. Allis-Chalmers rolls
1	27-in. Snyder sampler, $\frac{1}{10}$ cut
2	27-in. Snyder samplers, $\frac{1}{5}$ cut
1	50-hp. General Electric motor

Converter Roasting Department

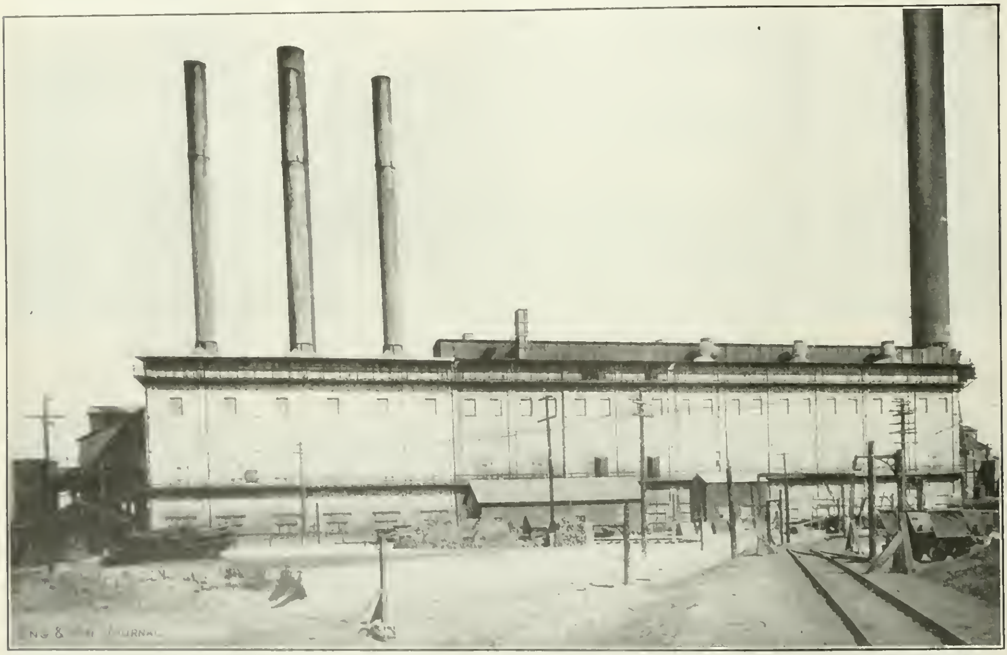
1	18-cu.ft. Smith concrete mixer
1	14-in. bucket elevator
19	6x6x4-ft. box roasters
1	6x6x4-ft. box roaster (priming furnace)
1	24x36-in. Farrel crusher
1	76-cu.ft. skip hoist
1	20-ton Whiting crane
1	Ram car
1	American blower
1	100-hp. General Electric motor

Mechanical Roasting Department

2	21-ft. 6-in., seven-hearth Wedge furnaces
2	21-ft. 6-in. seven-hearth Wedge furnaces (under construction)
1	16-in. belt conveyor
2	16-in. belt feed conveyors
1	Link Belt pan conveyor
1	8-ft. 6-in. balloon flue

Dwight-Lloyd Sintering Plant

1	16-in. belt conveyor
4	42x264-in. straight-line sintering machines
1	5-ft. 6-in. balloon flue
1	three-hearth ZnO neutralizing furnace



THE ENLARGED BAGHOUSE AT MIDVALE, UTAH

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[1] July, 1914, Bull. A. I. M. E. Cf. also pp. 253 and 254.

Lead Blast-Furnace Department

6 48x160-in. blast furnaces
3 140-cu.ft. charge cars, 6-ft. gage
3 130-cu.ft. charge-weighing larries, 6 tons capacity
4 10-ton electric locomotives
20 28-cu.ft. Stearns-Rogers slag pots
3 Remelting kettles
3 12- and 24x36-in. Nordberg Corliss tandem engines, each connected to
3 175-cu.ft. Connersville blower

Baghouse

1 122-in. American fan, Wedge furnace and Dwight-Lloyd flues
1 13-ft. 6-in. Sturtevant fan, roaster gases
1 15-ft. Sturtevant fan, blast-furnace gases
1 50-hp. motor, 122-in. fan
2 100-hp. motor, 13-ft. 6-in. and 15-ft. fans
1462 18-in. by 30-ft. woolen bags, blast-furnace gases
1878 18-in. by 30-ft. woolen bags, roaster gases
21 9-in. screw conveyors and dust hoppers

Arsenic Plant

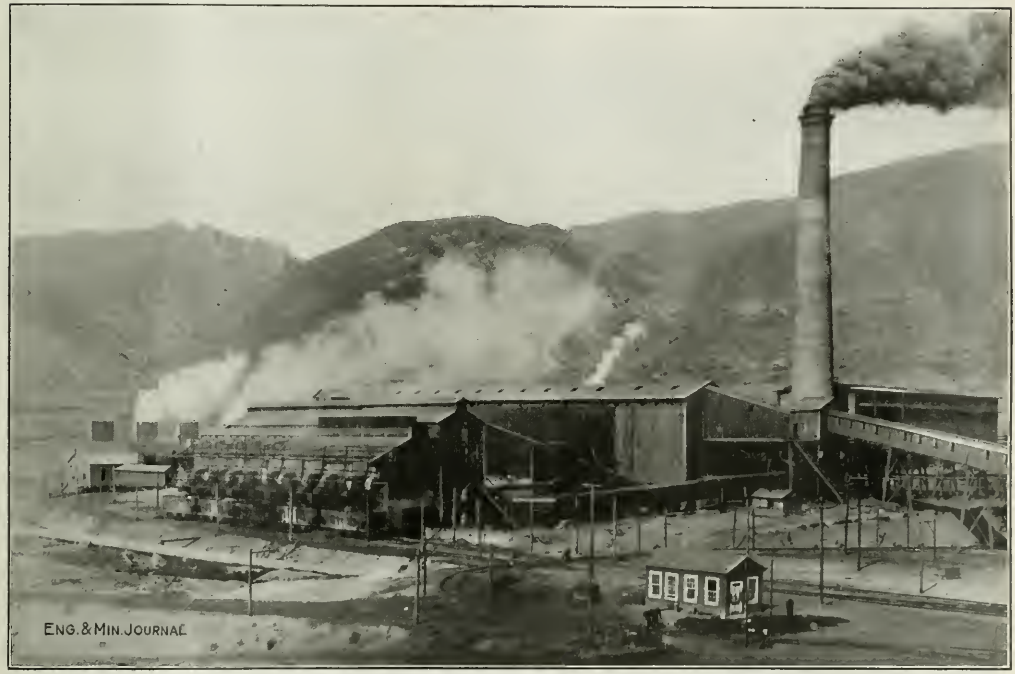
2 14½-ft. Brunton revolving-hearth furnaces
2 Crude-arsenic chambers, 16x200 ft., one section in operation

Wet Concentrator

1 9x15-in. Blake crusher
4 30x12-in. Allis-Chalmers rolls
7 Three-compartment single Harz jigs
10 Overstrom tables
17 Wilfley tables
3 Isbell vanners
1 Craven slime table
1 Sherman slime table
18 Slime-settling tanks
8 3x6-ft. trommels
3 3½x6-ft. trommels
1 5x14-ft. Denver Engine Works tube mill
2 75-hp. motors
1 50-hp. motor
1 30-hp. motor
1 25-hp. motor

Electrostatic Zinc Mill

1 5x30-ft. Ruggles-Cole dryer
2 6x6-ft. Newago screens
21 Huff electrostatic machines, Style D
1 Huff electrostatic machine, style E



LEAD SMELTING WORKS OF INTERNATIONAL SMELTING CO., TOOELE, UTAH

1 Steel-plate fan
36 18-in. by 25-ft. woolen bags, 18 on each chamber
1 10-hp. motor
1 10x20-ft. reverberatory refining furnace
1 refined arsenic chamber, 10x175 ft.
1 Steel-plate fan
18 18-in. by 25-ft. woolen bags
1 5-hp. motor

Copper Blast-Furnace Department
(Inoperative)

6 46x186-in. blast furnaces
1 17x58-ft. reverberatory furnace
5 84x126-in. copper converters
1 20-, 36- and 44x48-in. Allis-Chalmers converter blowing engines
1 20-, 42- and 44x48-in. Nordberg cross-compound condensing engine
3 15-, 30- and 63x42-in. Allis-Chalmers blowing engines, blast-furnace air
2 14- and 28x36-in. Nordberg cross-compound condensing engines each connected to
2 300-cu.ft. Roots blowers

Stacks

1 245x16½-ft. steel stack, brick lined, lead plant
3 100x6½-ft. steel stacks, baghouse
1 210x16½-ft. steel stack, brick lined, copper plant
1 150x7-ft. steel stack, reverberatory
1 200x8-ft. steel stack, converters

2 25-hp. motors
1 10-hp. motor
2 7½-hp. motors
1 Motor-generator set with rectifier equipment

INTERNATIONAL SMELTING CO

[Lead and Copper-Smelting Works at International (Tooele, P. O.) Utah]

Receiving bins, 30x300 ft.; capacity, 15,000 tons ore, 2000 tons coal

6 30-in. belt conveyors and two automatic feeders

Sampling Mill

8 20-in. belt conveyors, to copper-plant bins
2 20-in. belt conveyors, to lead-plant bins
2 24x12-in. Blake crushers
6 20x10-in. Blake crushers
8 Brunton oscillating time samplers, ⅛ cut
4 18-in. bucket elevators
2 16-in. bucket elevators
2 54x24-in. crushing rolls
2 42x15-in. crushing rolls
2 48x12-in. crushing rolls
2 26x15-in. crushing rolls
2 4x14-ft. trommels
2 4x7-ft. trommels
1 12-in. belt man elevator
1 Platform elevator

Lead-Smelting Department

Sintering Department

Building, 42x160 ft
10 42x264-in. Dwight-Lloyd sintering machines
5 Motor-driven fans, direct coupled
10 Variable-speed, d.c. motors, machine drives
20 Rotating sinter-charge apportioning tables and control apparatus
1 Rotating charge mixer
2 20-in. belt conveyors, sinter charge to mixer
3 18-in. belt conveyors, sinter charge to sinter-machine feed hoppers

Blast-Furnace Department

2 48x180-in. lead blast furnaces
3 60x180-in. lead blast furnaces
2 16-in. belt dust conveyors
5 200-cu.ft. electric-driven charge cars
1 12x38-ft. slag settling furnace
6 5-ton slag-pot cars
12 7-ton slag-pot cars
4 12-ton electric locomotives
1 30-ton drossing kettles
2 Bullion-weighing scales
1 Howard press compressed-air operated
2 Motor-driven jacket-cooling-water pumps
1 Cooling tower jacket-cooling water
Steel flue, balloon type to baghouse fan
Blast furnace charge bins, 32 compartments arranged with suspended charge-weighing hoppers for all blast-furnace charge materials, railway tracks and belt conveyor to bins
1 Coke charge bin 750-ton capacity arranged with suspended charge-weighing hoppers
1 30-in. belt conveyor coke supply to bin

Baghouse

Building, 56x160 ft., 10 sections with burning chambers
1 No. 20 Sirocco centrifugal fan
1 100-hp. motor belted to fan
1440 18-in. by 31-ft. cotton and woolen bags
1 No. $4\frac{1}{2}$ Sirocco reversed-current fan for shaking bags

Copper Smelting Department

Roaster crushed-ore bins, 5000 tons capacity
Miscellaneous crushed-ore bins, 3000 tons capacity
4 20-in. belt conveyors to roaster plant
5 20-in. belt conveyors and trippers
32 16-ft. six-hearth McDougal roasters
5 19x102-ft. reverberatory furnaces
4 750-hp. Stirling waste-heat boilers
1 750-hp. Stirling stoker-fired boiler
5 8x12½-ft. barrel-type converters
1 60-ton Morgan electric crane
2 25-ton Morgan electric crane, slag return to reverberatory furnaces
1 350x25-ft. brick stack
1 150x15-ft. brick converter stack
1 30-ton electric casting crane

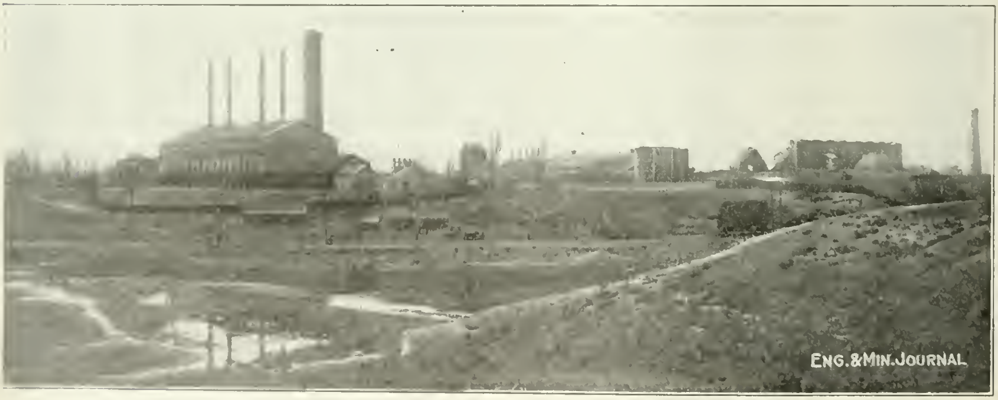
Converter Baghouse

960 18-in. by 30-ft. woolen bags
1 No. 20 Sirocco fan, belt driven by
1 100 hp. motor
1 No. $4\frac{1}{2}$ Sirocco reversed-current fan and motor
8 Spiral-screw conveyors for fume
2 16 in. belt conveyors for fume

Power Plant

2 350-hp. Corliss-valve engine direct connected to
2 250-kw. d.c. generators

Copper Smelting Works at Garfield, Utah



Murray Plant of American Smelting & Refining Co.—Baghouse in Left Foreground

1 750-hp. 11-lb. converter blowing engine
1 600-hp. 11-lb. converter blowing engine
1 90-lb. 350-hp. steam driven air compressor
1 90-lb. 175-hp. electric-driven air compressor
2 No. 10 Roots blowers, direct coupled to corliss engines
3 350-hp. Stirling water-tube boilers
3 Le Blanc condensers
2 1000-kv.a. 2200-volt electric generators, direct coupled to triple-expansion engines
1 1000-kv.a. 2200-volt electric generator, steam-turbine driven

AMERICAN SMELTING & REFINING CO.

[Lead-Smelting Works at Murray, Utah]

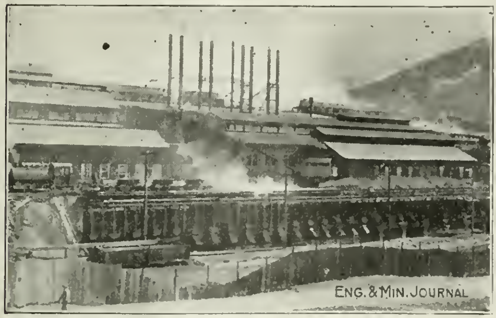
4 Sampling mills
3 Seven-hearth Wedge roasting furnaces, 22 ft. 6 in. diam.
5 Godfrey roasting furnaces, 26-ft. diameter
2 42x264-in. Dwight-Lloyd sintering machines
4 7-ft. cast-iron mixing tables, 1½ r.p.m.
23 9-ft. Huntington-Heberlein pots
1 20-ton traveling crane
8 48x168-in. blast furnaces
4 35-ton drossing kettles
3 Sweater kettles
1 90x216-ft. baghouse
1 18x6-ft. fan
4032 18-in. by 30-ft. raw-wool bags
1 18-38x42-in. tandem-compound engine, driving
1 No. 10 Connersville blower
2 20-40 and 68x68-in. Dixon cross-compound blowing engines
2 18-36x36-in. cross-compound engines, driving
2 400-kv.a. generators
1 80-lb. single-stage air compressor
7 250-hp. marine boilers
3 94,000-gal. water-storage tanks

GARFIELD SMELTING CO.

(American Smelters Securities Co.)

[Copper Smelting Works at Garfield, Utah]

Lands, 30,000 acres
Plant site, several hundred acres
Standard-gage track, 16 miles
Belt-conveyor system, 8675 ft.
Concentrate bins, 25,000 tons
Daily consumption of materials: Concentrates, 1500 tons, representing about 25,000 tons of crude ore; ores, 1500 tons; lime rock, 800 tons; coke, 200 tons; coal, 30 tons; oil for reverberatories, 1300 bbl.
Employees, 1200



Slag-Casting Equipment at Garfield

Sampling Department

2 Buildings, 83x70x72 ft.
2 Oxide sampling mills
2 Sulphide sampling mills
Combined daily sampling capacity, 2400 tons

Roasting Department

16 Six-hearth McDougal roasters, 18 ft. diameter
14 Six-hearth McDougal roasters, 19½ ft. diameter
4 Seven-hearth Herreshoff roasters, 19½ ft. diameter
Total daily capacity, 2400 tons

Smelting Department

Main smelting building, 305½x840 ft.
4 42x240-in. blast furnaces
4 15x25-ft. oval settlers
(Dust chamber is 300 ft. long with cross-sectional area of 920 sq.ft., having wires suspended at intervals of 1⅝ in. and arranged with mechanical shakers)
4 19x112-ft. reverberatory furnaces
1 20½x112-ft. reverberatory furnace
1 20½x120-ft. reverberatory furnace
(Five of these furnaces are oil fired and one is at present being fired with pulverized coal as an experiment)
12 350-hp. Stirling waste-heat boilers
6 10x24-ft. Peirce-Smith converters
3 60-ton Shaw electric cranes
1 25-ton copper-pouring ladle
2 24-ft. Walker copper-casting wheels
170 17x60-in. converter-slag molds, 4 in. deep, mounted on rockers over receiving bins
24 5-ton charge cars
5 6-ton General Electric locomotives
36 10-ton slag cars
15 10-ton converter slag cars
4 General Electric locomotives
6 2-ton "basket" cars
3 3-ton General Electric locomotives
15 Atlas larry cars
1 15-ton Browning locomotive crane
2 15-ton Bay City locomotive cranes
2 26-ton American saddle-tank locomotives
1 45-ton American saddle-tank locomotive
10 50-ton Ingoldsby standard dump cars
1 Cottrell fume-condensing chamber, 105 ft. long, designed to handle 250,000 cu.ft. of gas per minute
2520 5-in. pipes, 10 ft. long, with a wire through the center charged at 20,000 volts.
1 22x350-ft. brick stack
1 30x300-ft. brick stack
2300 ft. of brick blast-furnace flue, area, 320 sq.ft.
620 ft. of steel blast-furnace flue, area, 215 sq.ft.
600 ft. of brick blast-furnace flue, area, 360 sq.ft.
1600 ft. of brick roaster flue, area, 320 sq.ft.
1200 ft. of brick reverberatory flue, area, 320 sq.ft.
775 ft. of brick reverberatory flue, area, 360 sq.ft.
900 ft. of steel converter flue, area, 227 sq.ft.

Power Department

2 17-34x36-in. Nordberg cross-compound engines
1 15-30x36-in. Nordberg tandem-compound engine
1 14-28x36-in. Nordberg tandem-compound engine
1 15-30x36-in. Allis tandem-compound engine
1 15-30x36-in. Allis cross-compound engine
3 23-50 and 54x48-in. Nordberg cross-compound blowing engines
2 400-kw. 250-volt General Electric generators
1 250-kw., 250-volt Westinghouse generator
1 500-kw. Curtis turbo-generator, four-stage, 4000-volt, 1800 r.p.m.
3 300-cu.ft. Connersville blowers
1 250-cu.ft. Roots blower
1 500-cu.ft. Leyner two-stage cross-compound air compressor
1 1400-cu.ft. Chicago Pneumatic two-stage cross-compound air compressor
1 20x20¼x24-in. Sergeant straight-line compressor
8 350-hp. Stirling boilers (power-house battery)

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Organization of the Bureau of Mines

The following is the organization of the Bureau of Mines, as of July 24, 1914.

Director, Dr. J. A. Holmes.

Assistant director, Van. H. Manning.

Technical assistants reporting direct to the director: A. H. Fay; D. A. Lyon; W. E. Gibbs; A. G. White; J. T. Singewald; W. D. Ryan; H. D. Hibbard; C. A. Davis; Samuel Sanford; F. B. Laney.

Division of mineral technology: Chief, Charles L. Parsons.

Technical assistants: Oliver Bowles; Robert Back; H. W. Gillett; J. M. Lohr; K. L. Kithil; J. A. Davis; F. W. Horton.

Petroleum division: Chief, William A. Williams.

Technical assistants: J. H. G. Wolf; R. W. Andrews; A. G. Heggem; I. C. Allen; W. P. Rittman.

Mining division: Chief, George S. Rice.

Technical assistants: J. W. Paul; J. J. Rutledge; H. J. Smith; H. M. Wolflin; L. M. Jones; Charles Enzian; E. B. Sutton; J. C. Roberts; S. S. Smith; Edward Higgins.

Mechanical division: Chief, O. P. Hood.

Technical assistants: S. B. Flagg; Henry Kreisinger; H. H. Clark; C. E. Augustine; C. D. Smith; George S. Pope; W. F. Hausstein.

Chemical division: Chief, G. A. Hulett.

Technical assistants: G. A. Burrell; H. C. Porter; S. P. Howell; W. A. Jacobs; A. C. Fieldner; R. Thiessen; F. K. Ovitz; E. J. Hoffman; C. G. Storm; J. D. Davis; J. K. Clement; D. J. Price.

Administration and special investigations: Chief, H. M. Wilson.

Technical assistants: J. H. White; J. R. Fleming; Lawson Stone.

⁂

Graphite Produced in the United States in 1913 amounted to 4775 tons of natural graphite, and 6817 tons of manufactured, according to the U. S. Geological Survey. Imports amounted to 28,879 tons.

Early Mining in Utah*

The first lead mined and smelted in large quantities in the great country to the west of the Rocky Mountains came from Nevada. The opening of the deposits in Utah followed soon afterward. The existence of argentiferous lead ore in those territories had been known for several years previous; to some extent since the Mormon occupation of Utah and the hegira overland to California soon after 1849; to a more extent since the movement to the Comstock lode in the years succeeding 1859, and to a still more extent since the march of Gen. Conner's California volunteers in 1863, the members of which were enterprising prospectors, and devoted much time to looking for mineral in the country they traversed, which, be it said, was to the subsequent trouble of legitimate miners. The lack of transportation facilities, however, practically precluded the development of the deposits until the completion of the Pacific railway. In studying the history of the lead industry of the West, we have fortunately a minute and authoritative contemporaneous record in the annual volumes of the series entitled "Mineral Resources of the States and Territories West of the Rocky Mountains."

In the first volume of the "Mineral Resources," treating of the year 1866, such references to the known existence of lead ore as the following are to be found:

> Utah is known to abound in many of the useful and, it is believed, also in the precious metals. Both lead and iron have been produced for many years past by the Mormons living in the southern counties.
>
> * * * * * *
>
> A number of large lodes heavily charged with argentiferous galena have been opened at Rush Valley, a short distance southwest of Salt Lake City, and being tested by the smelting process proved rich in both lead and silver. A number of furnaces were erected there two years ago, since which they have been kept part of the time in operation, and with suitable appliances it is thought a considerable amount of silver bullion might be produced from these mines.
>
> * * * * * *
>
> At Minersville, in the western part of Utah, are mines of lead and copper, which contain some gold and silver. One of the mines has been worked to a depth of 90 ft. At this point copper predominated, and the working of the mine for lead was suspended. The lead was smelted to supply the territory. While lead prevailed working of the mine was remunerative. No effort was made to recover the silver, although in many countries this would have been profitable.
>
> * * * * * *
>
> The Rush Valley district, Utah, abounds in veins containing argentiferous galena and copper. In 1865 there was considerable excitement about these mines. Companies were organized by officers of the army at Salt Lake City, and some developments were made. Smelting works were erected at the mines, but the smelting failed to extract the metal in a satisfactory manner.
>
> * * * * * *
>
> Cottonwood Cañon, about 27 miles southeast from Salt Lako City, contains several silver mines. A Mr. Hirst is running two furnaces there at present. They are not on an extensive scale, but the results are satisfactory. This is a valuable lead-mining district.

The above extracts indicate clearly the character of the knowledge as to the silver-lead deposits of Utah at the end of 1867 and outline the practice in exploitation of such of them as were worked. The prospectors of that time and the seven years immediately preceding were anxious to find lodes of gold and silver ore that could be beneficiated by the processes of plate or pan amalgamation. Lead-bearing ores were not wanted, being valuable only for their precious-metal contents, which could be only extracted at greatly increased cost as compared with those ores that were amenable to amalgamation. The occurrence of such ores at numerous localities was known, however, and their future value, when the Pacific railway should be completed, was appreciated. Rich argentiferous galenas were smelted at several places, the metals being reduced to a base silver-lead bullion, from which the gold and silver were refined by cupellation. The furnaces were doubtless small and crude affairs, similar to what the Mexicans used to employ, and still do. At Oreana, Nev., and Cottonwood Cañon, Utah, there were more important constructions. Of the lead-bearing localities mentioned in "Mineral Resources" at the end of 1867 the more part failed to prove of any great importance, but certain of them became the greatest lead producers in the United States during the next decade. Thus both Eureka, Nev., and Cottonwood Cañon, Utah, had been discovered previous to the end of 1867, and at the latter, smelting had already been begun. Bingham Cañon, Utah, also had been discovered.

The earliest knowledge of lead ore in Utah was possessed by the Mormons, who settled at Salt Lake City in 1846. They produced such lead as they required for their purposes for many years previous to 1866, but the leaders of this people discouraged the searching for mineral, it being contrary to the policy of the church to have its disciples engage in mining pursuits, wherefore but little was known of the mineral resources of Utah until the soldiers stationed at Salt Lake began to unearth them. It is doubtful if the Mormons had any knowledge of the silver content of the galenas which they smelted; if they did, they did not regard it as worth while to separate, a process involving the conversion of the lead to litharge and a resmelting of the latter to regain metallic lead which would have been profitable only with a bullion rich in silver. Certainly the ore at Minersville was smelted only for lead to supply the territory, with no attempt to separate silver. Dr. R. W. Raymond, then special commissioner of mineral statistics for the Treasury Department, had an interview with Brigham Young and several leading members of his church. They expressed a willingness to have all the natural resources of Utah developed and utilized, and disclaimed any hostility to mining, but admitted that they had discouraged their own people from engaging in it because they thought that agriculture would be far more profitable. Mr. Young expressed the opinion that the ores of Utah had never yet been skillfully treated. "What we used to call lead," said he, "and dig and melt up into bullets, these fellows call silver now! But if anybody is fool enough to come and mine for it, he may do so, and welcome."

The year 1869 is especially noteworthy in the history of silver-lead mining west of the Rocky Mountains. The great event was the connection of the Central Pacific and Union Pacific railways, making an uninterrupted transcontinental line. The silver-bearing lead ores, which formerly had been ill favored because of the greater cost and difficulty of extracting their precious-metal value, could then be worked to advantage, inasmuch as it was possible to send the base bullion east or west for refining and marketing. The occurrence of lead-bearing ores was therefore not so much deplored as only

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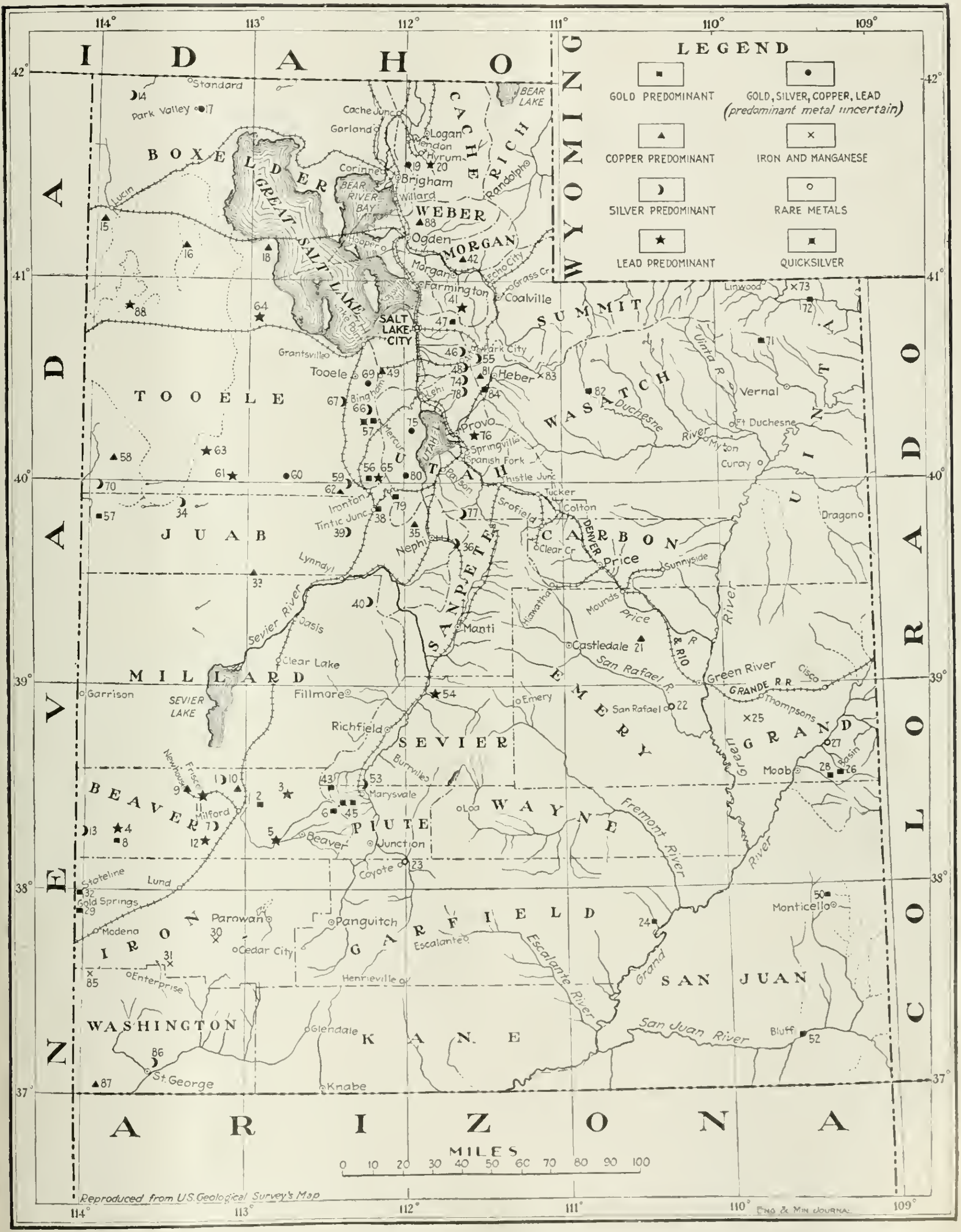
*Slightly condensed from "Lead and Zinc in the United States," by W. R. Ingalls.



MAP OF UTAH, SHOWING MINING DISTRICTS

a year or two previous, the erection of furnaces was talked of more nonchalantly, and a considerable number of furnaces were actually built during the year. It is to be remarked, however, that up to this time none of the great lead deposits of Nevada and Utah had been discovered. The abundant occurrences of lead ore which had been previously noted, and to a small extent exploited, were after all of trifling importance. It is true that mines had already been discovered at Eureka, Nev., and in the Cottonwood and Bingham cañons, in Utah, but the great orebodies which afterward made those places famous had not yet been uncovered.

The completion of the Pacific railway, which for several years had been looked forward to with such great expectations, was followed by a feeling of disappointment, the freight rates being much higher than was anticipated. In Utah, mining did not advance much in 1869, even the completion of the Union Pacific railway failing to stimulate general activity. Numerous veins had been located in the Cottonwood Cañon district, but not much mining was in progress there, and the smelting experiment that had previously been undertaken had apparently been abandoned. In Bingham Cañon also nothing but trifling work was done. The Rush Valley mines were again attracting attention, and a furnace was erected there, with which exception there does not seem to have been any smelting done in Utah in 1869. Dr. Raymond, in summarizing the results of the year, wrote thus: "On the whole, it may be said that so far Utah cannot be classed among the mining states and territories. The developments made are all very slight and unimportant, and no shipments of any consequence of the precious metals have ever been made."

The early mineral discoveries in Utah were chiefly of what was at that time called "base-metal ores," i.e., ores containing a comparatively large proportion of copper and lead. The difficulty experienced in the treatment of such ores, together with the high cost of transportation and the opposition of the Mormon authorities, caused the earlier mining enterprises to languish and fail. In 1868 and 1869 Dr. Raymond found no mines in productive operation except the placers of Bingham Cañon, which were worked on a small scale. In 1869, however, a few parties were preparing to take advantage of the railway, and experiments of a metallurgical character were in progress at Salt Lake City. In 1870 there was a sudden and extensive development of the mining industry in Utah.

This was due to several causes. The Pacific railway had been completed, furnishing greatly improved transportation facilities. The treatment of silver-lead ores had already been accomplished successfully on a large scale at Eureka, Nev. The opposition of the Mormon Church had been withdrawn, the market of an active mining population close at hand being welcomed to replace the lucrative traffic that the railway had practically put an end to, interrupting to a large extent the Mormon trading trains, carrying grain and vegetables far into the mining districts of other territories, and diverting the procession of wayfarers across the continent who had previously paid great tribute to the farmers of the Salt Lake Valley. Finally, it was in 1870 that the famous Emma mine, in Little Cottonwood Cañon, was discovered, and the opening of its bonanza, "a lake of mineral of vast extent," which yielded a clear profit of nearly $120 per ton on shipments of ore to Swansea, Wales, "gave an impetus to mining in Utah that surpasses all other efforts made in that direction put together," these quotations being from a contemporaneous writer.

The Emma mine became a large producer in the first year of its operation. One firm of brokers in Salt Lake City reported shipments during the six months ending Dec. 31, 1870, of 4200 tons of galena ores, of an average assay of 35% lead and $182 silver per ton, the average net value being $125 per ton. Almost all of this was from the Emma mine. The total shipments of the Emma mine for the year were 5293 tons of ore, of which 2968 went to the Atlantic coast and 2325 to the Pacific, and 8.5 tons of base bullion, the aggregate value being estimated at $967,000, reckoning the ore at $182 per ton and the bullion at $400. The cost of transportation (by team to Salt Lake City, 28 miles, and thence by rail to New Jersey) and the expense of treatment amounted to $90 per ton.

The prices paid in Salt Lake City by California buyers for Utah ores in January, 1871, were as follows: Ore containing 30% lead and 50 oz. silver per ton, $22; 40% lead, $30.60; 50% lead, $38; 60% lead, $45; 70% lead, $53; 80% lead, $61; for each 10 oz. of silver in excess of 50 oz., $10 per ton additional.

The costs of labor in Utah at this time were not high. In Bingham Cañon, first-class miners received $3 per day; second-class, $2.50; surface laborers, $2. Lumber cost $40 per M., mining timber $6 per cord, wood for fuel $4 per cord, common powder $5 per keg, quicksilver 80c. per lb.

Outside of Little Cottonwood, prospecting was done in the adjacent cañons, Big Cottonwood and American Fork; at Stockton and in East Cañon, respectively 40 and 55 miles southwest of Salt Lake City; at several places in the Tintic Valley, about 70 miles southwest of Salt Lake City, where some valuable discoveries of silver-lead ores were made, and in the West Mountain district, Bingham Cañon, about 25 miles southwest of Salt Lake City, where a large number of veins of argentiferous galena had already been discovered. All of these districts were naturally tributary to Salt Lake City, which was thus marked by its location as a logical point for smelting. Woodhull Bros. built a furnace there in 1870, and other works were projected. Dr. Raymond summarized the results of mining in Utah in 1870 in the statements that the most productive mines were deposits of argentiferous galena in limestone, that the business of mining and smelting required considerable capital, and that the abundance of supplies, cheapness of labor and facility of transportation rendered it a highly inviting field for operations on a large scale, the accuracy of which forecast was borne out by the rapidity of the development during the next few years.

Even so soon as 1871 there was a great influx of prospectors, miners and speculators into Utah, and the remarkable increase in activity was manifested in the increased production of ore and bullion. The shipments of the year were estimated to be 2378 tons of base bullion and 10,806 tons of ore, of which 2185 tons of bullion and 8880 tons of ore were consigned eastward, the remainder westward. During the summer, shipments of ore were restricted by an increase in the schedule of freights. The rates were subsequently reduced, though not to the former point. They were then $18 for ore and $20 for bullion per ton from Salt Lake to Omaha.

The Emma mine continued to be the principal producer. Up to August, 1871, it had yielded from 10,000 to 12,000 tons of ore, averaging about 160 oz. silver per ton and from 45 to 50% lead. The total value of this ore, at the cash price paid for a large part of it in Liverpool, namely, £36 per ton, was about $2,000,000. The mine had been sold to an English company for £1,000,000, a price which was contemporaneously criticised as unjustified by the appearance of the mine, and was subsequently proved to be greatly in excess of the actual value. The Flagstaff mine, near the Emma, also became a producer of rich lead ore during 1871.

Outside of Little Cottonwood Cañon, important developments were made in American Fork Cañon, where the Miller mine was worked; in Bingham Cañon, in the Tintic district, where rich smelting ores were mined in Eureka Hill, and in the Ophir and Rush Valley districts. Smelting furnaces were erected in all of these districts, their number in the latter part of the summer being reported as follows: Ophir, 5; Stockton, 2; Tintic, 2; Cottonwood, 3; Salt Lake, 4; Bingham, 2; American Fork, 2; Corinne, 1; total, 21. One plant was equipped with a reverberatory furnace for the treatment of galena ores, but the others had mostly small shaft furnaces, smelting chiefly oxidized ores and using charcoal as fuel. Most of the charcoal was brought into Utah by rail from Truckee, in the Sierra Nevada, though a considerable quantity was burned in the Wasatch Mountains, and in piñon districts farther south. The Truckee charcoal was delivered at a cost of 25c. per bushel. The Utah charcoal cost 22 to 30c., but was apt to be inferior in quality, while, moreover, its supply was precarious.

The smelting practice was very bad, the furnaces being run for the most part in an ignorant manner, with the natural results of very brief and intermittent campaigns, frequent freeze-ups, high costs and large losses of lead and silver. In many cases more than half of the lead contents of the ore were probably lost. Ores assaying 30 oz. silver per ton and 30% lead could hardly be treated at a profit. The percentage of lead recovery was estimated at 66⅔; of silver at 80.

The early history of lead mining in Utah has been related with this detail in order to show clearly the causes and manner of its development. It will be observed that the great contributory cause was the completion of the Pacific railway, furnishing an outlet to the markets east and west. Before the building of the railway, the cost of transportation was $250 and $300 per ton to the Pacific coast, and $300 and $100 to the Atlantic, which was a prohibitive charge on either ore or base bullion. By 1872 the cost of shipping bullion from Eureka, Nev., including the cost of refining and other charges, had come down to $78 per ton. With the possession of the transcontinental line, the determinative factor in the production of lead from these new sources was the opening of the great deposits of ore, which were previously known to a considerable extent, and were rich enough in silver, gold and lead to stand the high cost of imperfect mining and smelting methods and local transportation. The prices for both lead and silver were high at that time, wherefore the ores were better able to meet the high costs, which naturally were extremely variable in the different districts. In their subsequent history the dominating factors were the improvement in transportation facilities by the construction of branch lines of railway to the mining districts and the reduction in cost of mining and smelting by improvement in technical methods. The mines became thereby able to make an increased production though mining a lower and lower grade of ore, and in the face of a gradually declining price for silver and a generally downward tendency in the price for lead. Save for the exhaustion of some of the principal ore deposits, there was no cause acting greatly to restrict production until prices fell very low during the monetary panic in 1893.

While Nevada and Utah became contemporaneously large producers of lead, the conditions in the two states were widely different. The large production of lead in Nevada was derived almost entirely from the mines of Eureka. These were the only really important lead mines ever discovered in Nevada, and when they were exhausted the lead production of the state dwindled to insignificance. The ores of Eureka were self-fluxing and could therefore be smelted at comparatively low cost, and being also mined easily and cheaply, they were exploited at great profit, the principal companies of the district being large dividend payers from almost the beginning.

In Utah the principal mining districts are situated in the Wasatch and Oquirrh ranges of mountains, lying, respectively, east and west of the valley south of Salt Lake, into which their gulches debouch. All of these districts are within a comparatively short distance of Salt Lake City, and within less distance of the points eight or ten miles south of the city which were early determined to be advantageous locations for smelteries. Lines radiating from that center reach Bingham, the Cottonwoods, Park City and Tintic in comparatively short distances. In the first stage of mining in Utah, the general idea was to smelt the ores at or near the mines where produced. Few or none of those mines, however, had ores of character that made them self-fluxing, and the cost of bringing in the necessary fluxes by the imperfect means of transportation of that time was high, and the cost of smelting was consequently high, on which account many of the early attempts proved failures. After the Utah Central railway was completed to Salt Lake City (in December, 1869,) and extensions were continued to the various mining camps of that time, especially Alta, Bingham and Tintic, it became possible to bring ores of different character together at a central point, near Salt Lake City, where smelting could be profitably conducted.

Utah, on the other hand, was a region of many lead-mining districts, none of which, until the development of the San Francisco or Horn Silver district, was in any way comparable industrially with Eureka. There was none of the early mines which in magnitude, richness and ease of exploitation approached the Eureka and Richmond properties, and none which was so profitable. Many of the best mines, like the Emma and Flagstaff, were the subjects of inflated promotions, bad financiering and eventual disaster, thus impeding industrial progress. The ores of the various districts were not self-fluxing and were incapable of successful reduction save at a suitable central point. When that was recognized and the construction of railways radiating from Salt Lake City made such practice possible, the production of lead in Utah was put on a sound basis, and a great industry, lasting to the present time, was established upon it. Salt Lake City became the first point in the United States where a general smelting business of magnitude came to be conducted, and its practice was the prototype after which that of Denver, Pueblo and El Paso was fashioned.

In Utah there was a noteworthy increase in the output of lead in 1872, the product of base bullion amounting to 8125 tons, while 10,347 tons of ore were shipped out of the state for smelting elsewhere. Estimating the yield of the ore shipped at 40%, the total lead product of the state in 1872 was 12,335 tons, which is probably an underestimate rather than an overestimate. The major part of this output was derived from the Cottonwoods. The Emma mine alone shipped 4000 tons of ore to England during the first eight months of the year, and subsequently sold 6300 tons in the open market, a total of 10,300 tons, which averaged 45% lead and 69 oz. silver per ton. The Flagstaff mine produced 3000 tons of base bullion, obtaining one ton of bullion from 3.5 tons of ore. The Miller mine produced 1536 tons of base bullion, smelted from very rich ore. The Winnemuck mine of the Bingham district produced 1232 tons of base bullion, smelted from an ore which averaged 38% lead and 56 oz. silver per ton. Smelting at the Winnemuck works was very expensive. Charcoal cost 30c. per bushel; limestone, $7 per ton; iron flux, $22.50 and $25 per ton. The iron flux had to be obtained from Rawlins, Wyo., and the firebrick from Golden, Colo. The furnace charge consisted of 13 parts ore, 4 parts iron flux, 5 parts limestone, 2 parts old slag and 6 parts charcoal. There were two furnaces, each smelting about 11 tons of ore per day. At the works of the Utah Silver Mining & Smelting Co., also in Bingham Cañon, the cost of smelting per ton of ore was $6.96 for fluxes, $15.80 for charcoal, $4.27 for labor and $5.30 for roasting, a total of $32.33 per ton. The construction of the railroad up Bingham Cañon, which would enable the ores of that district to be taken to meet the ferruginous ores of the Cottonwoods, was eagerly awaited.

Both the miners and smelters of Utah in 1872 reaped great advantage from the fierce competition for ores and bullion among the Eastern smelters and refiners, especially of St. Louis and Chicago, who bid up prices to a point which left dangerously small margins. The freight rate on ore from Salt Lake to Chicago at this time was $25 per ton; on bullion, $28.50 per ton. The Selby Smelting Co., of San Francisco, was also a buyer in this market, and the refining of base bullion was begun at the Germania works at Salt Lake City, this being the first refinery in the Rocky Mountains. Altogether there were in Utah in 1872 smelting works to the number of 21, of which six had roasting furnaces; the total number of blast furnaces being 36 and of roasting furnaces seven. The Wahsatch works had begun with a Flintshire reverberatory furnace and a slag hearth, but those had been abandoned. These works, which were situated just south of Salt Lake City, were showing the advantage of a central location since they were able to mix the siliceous lead ores of Bingham with the ferruginous lead ores of the Cottonwoods and dispense with the use of costly iron flux. The cost of smelting in the blast furnace was $13 per ton of ore; of slag roasting in reverberatory furnaces, $1 per ton, lignite being employed as fuel. Coke was used in the blast furnace instead of charcoal. It cost $30 per ton delivered, and as compared with charcoal at 30c. per bushel was reckoned to be about $4 cheaper per ton of ore smelted. All the above values are currency. A comparison of these figures with those which have previously been given for smelting at Bingham will explain why the smelters in the Salt Lake Valley soon displaced those of the mines.

In Utah the operation of many of the mines and smelting works was stopped in 1873 by the panic, wherefore the lead output did not show any large increase over the previous year. The English companies suffered the worst and most of them fell into serious financial difficulties. Bingham and the Cottonwoods continued to be the chief lead-producing districts, and in the latter the Emma mine was still the largest shipper, but at the end of the year it was practically exhausted and never afterward was it of importance except as a memory. It has been a hope in Cottonwoods lasting to this day that someone would discover an ore deposit like the famous Emma bonanza. The Miller mine, of American Fork Cañon, was also exhausted this year.

Many new smelting works were erected in 1873, and the importance of the Sale Lake Valley as a smelting center incerased materially. A narrow-gage railway was completed from Sandy, on the Utah Southern railway, to the Winnemuck smelting works in Bingham Cañon, thus affording a cheaper outlet for the lead ores of that district. Dressing works were erected at Bingham Cañon, inaugurating a system of preliminary treatment of the ore that furnished to the smelters an improved class of smelting material. In general the smelting industry in Utah continued to be characterized by bad metallurgical practice, save at the Germania works, which were better managed than the others, and began to take a distinct place in the lead industry of Utah.

There was a very considerable increase in the lead production in 1874, which was chiefly due to the Bingham district, then the most important lead-producing district of the territory. A large output was still made, however, by the Cottonwoods, especially by the Flagstaff mine, which produced 11,767 tons of ore. There was a noteworthy increase in the number of dressing works in the Bingham district.

The production of lead in 1875 also remained substantially at a standstill. This was apparently due, to a considerable extent, to the great competition among the smelters for ore which prevailed during the year, extinguishing their profits and compelling many of them to shut down. The year was marked also by the completion of a narrow-gage railway to Alta, in the Cottonwoods, reducing the freight from Alta to Sandy to $2.50 per ton. Coke from the San Pete district of Utah was also used this year by the smelters of Utah for the first time.

Subsequent to 1875, the lead production of the Cottonwood and Bingham districts of Utah fell off, but the decrease in the output from these sources was much more than compensated for by the great yield of the Horn Silver Mining Co., which began to come into prominence about 1878. The mines of this company were situated in San Francisco mining district, near the town of Frisco, 240 miles from Salt Lake City. The output of the district was made almost entirely by two companies, the Horn Silver Mining Co., owning the Horn Silver mine, and the Frisco Milling and Smelting Co., owning the

Cave and Carbonate mines. Both of these companies smelted their own ore. The Horn Silver Milling Co. originally had a plant at the mines, but that proving to be uneconomical, a new plant was erected at Francklyn, near Salt Lake City, and a refinery was also erected at Chicago, Ill. For about five years the production of the Horn Silver Mining Co. was very large, as appears in the following table:

Year	Ore Smelted, Tons	Lead Assay	Bullion Produced, Tons	Lead Sold, Tons	Average Price per Cwt.
1879	51,758	36.12%	16,915	1,556	$4.07
1880				3,900	4.53
1881				7,893	4.61
1882	48,551	37.79	16,127	14,568	4.60
1883	42,663	36.83	15,008	14,991	4.20
1884	39,185	30.91	11,603	10,976	3.50

The price for lead in the above table is what was realized in Chicago. Besides the ore smelted the company sold 6150 tons to other smelters. Previous to the sale of the property to the Horn Silver Mining Co., there had been smelted 16,299 tons of ore assaying an average of 38.49% lead, which produced 5180 tons of pig lead. The total output of this famous mine up to the end of 1884 was 204,607 tons of ore, which yielded 69,380 tons of base bullion and 7,260,566 oz. of fine silver.

The cost of mining in 1884 was $5.07 per ton of ore. Miners were paid $3.50 per day and laborers $3. The smeltery at Francklyn had five furnaces, which reduced 39,185 tons of ore at a cost of $13.29 per ton, but the total quantity of material smelted, including fluxes and fuel, was 103,079 tons. The cost of refining base bullion at Chicago was $8 per ton.

In 1885 the Horn Silver production declined greatly, and in 1886 the mine became practically dead. Subsequent to this time, the chief lead-producing districts of Utah were Bingham Cañon and Park City, the latter, discovered in 1871, having attained prominence in 1873 when the famous Ontario mine was opened, but as a lead producer it did not become of great significance until about 1884, when the Crescent mine was a large producer. Subsequent to 1884 the lead production of Park City increased very largely, and at the present time it is the most important lead-producing district of Utah. The mines at Tintic, Stockton and Alta have been continuously worked, but during the last 20 years the major portion of the lead production of Utah has been derived from the mines of Bingham Cañon and Park City.

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Utah Apex Remodeled Mill

SALT LAKE CITY CORRESPONDENCE

The Utah Apex Mill at Bingham, Utah, has lately been remodeled and now is the largest mill treating lead ore in Utah. It is treating over 300 tons of lead ore per day, or at the rate of 10,000 tons per month. The mill was designed and built by the General Engineering Co. of Salt Lake City.

Ore passes over a 4-in. grizzly to a 700-ton storage bin, then to a hand-picking belt and then to the crushers. Coarse crushing is done by Blake-type crushers. Fines go to coarse jigs and oversize, over $\frac{1}{2}$ in., to 16x36-in. Allis-Chalmers rolls, and is crushed to $\frac{1}{4}$ in. Product from rolls is sized into four sizes by Callow screens which take place of trommels. Oversize goes to fine rolls and is crushed to two millimeters, $\frac{1}{12}$ in. Undersize from Callow screens goes to fine jigs. Tailings from coarse jigs are reground in two Hardinge mills. Part of undersize from screens is sent to hydraulic classifiers. Sands from classifiers are treated on Wilfley tables, and fines and slimes pass to Callow tanks, and are treated on Isbell vanners. Mill is equipped with automatic samplers both for crude ore and tailings. Woodbury jigs are used. Ratio of concentration is 4:1. First-class ore is cobbed on a picking belt between storage bins and crushers, and 10 to 12 tons of first-class ore is picked out daily. Ore reserves are at present largest in mine's history.

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The Mines Operating Co., Park City, Utah

By G. H. Dern*

The plant of the Mines Operating Co., at Park City, Utah, is of unusual interest because of the new methods that have been successfully applied. Although it has been in operation nearly two years, we have preferred not to give out information regarding the process and results until our various problems had been solved and the whole scheme demonstrated as a success.

The Mines Operating Co. has a lease on the Ontario mine down to the 900-ft. level and is milling the old stope fillings. These fillings assay from 6 to 14 oz. silver, averaging 9 to 10 oz. They also carry very small amounts of gold, copper and lead. The ore is not amenable to cyanidation and could not be profitably worked until the present process was introduced. In the treatment, the ore is given a chloridizing roast, after which it is leached in open vats with an acid salt solution and the dissolved metals precipitated upon scrap copper and iron. The novel part of the process, and the key to the situation, is the method of roasting. It is believed that this is the first time internal-combustion roasting has been successfully used in conection with lixiviation, and that it promises results of far-reaching importance.

OLD ONTARIO MILL, PARK CITY, UTAH
(Now used by the Mines Operating Company)

The ore is crushed dry by means of rolls, to pass a $\frac{5}{8}$-in. screen. It is then mixed with about 7.5% salt and 2.5% coal dust and properly moistened. The mixture is then roasted in a shaft type of roaster, a columnar charge being ignited at the bottom and roasted through by means of a blast of air. Eight of the roasters now in use are of the hand-operated, intermittent type, and are crude in many respects. However, they are operated at a cost of less than $1 per ton, including salt, and even with the coarse crushing that experience has proved most economical in the present installation, an extraction of about 80% of the silver is obtained.

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*General manager, Mines Operating Co., Park City, Utah.

Since the foregoing furnaces were built, a continuous, mechanically operated roaster, called the Holt-Dern roaster, has been perfected, and one of these has been in operation for six months. Test runs in this roaster on ore crushed to 1/4 in. show an extraction of 90%. A careful estimate shows that in a good-sized installation this roaster can be operated for close to 15c. per ton, exclusive of the salt. The company is now getting ready to tear out its old roasters and install Holt-Dern roasters in their stead.

The advantages of the roasting process employed in this plant over old styles of roasting furnaces are claimed to be as follows: (1) Volatilization losses, which have always been the bugbear of chloridizing plants, have been totally eliminated. (2) The roaster makes no dust, hence there is no loss from this source. (3) The fuel cost is low, because the cheapest grade (coal dust) is used, and a very small percentage is required. (4) Fine grinding is not necessary to get high extractions. Owing to the depth of the charge, the heat is retained in intimate contact long enough to fracture and thoroughly chloridize comparatively coarse pieces. (5) Slimy ores are converted into a permeable, readily leachable product, thereby simplifying and cheapening the subsequent treatment. (6) The roaster gases are readily condensed for leaching purposes. When the ore carries the proper percentage of sulphide, the leaching solution is a byproduct of the roast, and no additional reagents are required.

After roasting, the ore is leached in wooden vats, 20 ft. in diameter by 12 ft. deep. This depth of column leaches very freely and rapidly, and could just as well be deeper. Wooden pipe lines are used, and the solutions are handled by means of air-lifts. The solutions are extremely corrosive, and one of the hardest problems to solve was the pumping. The present method of handling solutions is entirely satisfactory.

The pregnant solution is first conducted to the silver precipitator. This is a concrete apron, set at an angle, looking like an immense amalgamating plate. It is covered with a thin layer of scrap copper, and as the solution flows over it the silver and gold are precipitated upon the copper, making a gray precipitate carrying 50 to 60% silver. As the silver is precipitated, about an equal quantity of copper goes into solution. The silver precipitator was only recently installed, but has proven efficient and economical. The head solution assays about 3 oz. and the tail solution 0.2 oz. silver. The solution then goes to the iron boxes, which look like large zinc boxes, and are filled with scrap iron. Here the copper, part of which is extracted from the ore and part dissolved on the silver precipitator, is precipitated in the head compartments, the lead coming down in the lower compartments. Precipitation is practically complete, the iron-box tail solution showing only a trace of silver. The iron-box precipitate runs about 65 to 70% copper and 500 to 600 oz. silver. It is dried and shipped to the smelter. The silver precipitate is dried, fluxed and smelted directly into bullion, running about 975 fine.

The plant is treating 150 tons per day, and the total cost of milling in May was $2.07 per ton, including repairs and general and overhead charges. It is anticipated that the proposed remodeling will reduce the costs at least 10c., and that on an increased capacity the whole operation could be carried on for $1.50 per ton. The cost of operating the process will of course vary with the location. When chloridizing is to be used, the cost of salt will always be one of the main items. Under favorable conditions, the process could be carried out on a large scale for $1 per ton or less. Theo. P. Holt, one of the inventors of the process, is superintendent.

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Park City Milling Co.

By George H. Seibird*

Operations will be started at the custom-milling plant of the Park City Mills, at Park City, Utah, about Aug. 15. The first unit of the plant is a 50-ton chloridizing-leaching installation, so arranged that its capacity may readily be doubled. An additional unit is to be a concentrator to handle the heavier sulphide ores.

The leaching plant will follow established practice, the ore being dry crushed with rolls to pass a 0.1-in. aperture. It will then be roasted with salt and pyrite to form chlorides of the metals, lead, copper and silver, the gold being taken care of in the leaching tanks. After the roast the ore is leached with an acid solution of common salt, to which is added bleaching powder in sufficient quantity to chlorinate the gold. Precipitation will be effected by the use of scrap sheet iron and copper. The copper throws down the silver and gold, and the iron recovers the copper and some of the lead.

The ore, while still hot, is charged into the leaching tanks from the after-chloridizing bin, the result being that the first leach is made with a boiling solution, thus effecting a rapid extraction of the metals. All solution lines are, of course, of wood, as the solution rapidly corrodes any metal. Air lifts are used to elevate the solutions, this form of pump being particularly suitable under the conditions.

The mill will be operating on ore from the American Flag mine for a number of years, at the present capacity, but it is the intention of the company to enlarge the plant in the near future to meet the needs of the camp. However, recent developments in the American Flag mine have been so favorable that it is not improbable that the enlargement of the mill will be necessary to handle the output of this property. The concentrator unit will be supplied by the same mine, which has a considerable tonnage of gold, silver, lead, zinc ore blocked out in readiness.

The leaching plant will handle only the siliceous ores from the mine, as lime is harmful in the process. Experimental work has demonstrated the fact that the American Flag ores are particularly suitable for the process. The officers of the company are: George H. Short, president; M. W. Kishman, vice-president; George H. Seibird, treasurer and manager, and John Cain, secretary.

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A Safe and Sane Fourth Celebration can most properly include a first-aid field contest. Such a contest formed part of the program on July 4 this year at Ely, Nev. The officials of the Bureau of Mines rescue car, which was just finishing its work in the district, helped in carrying it through. Of the two teams in the mine-rescue contest, the Nevada Con. Veteran-mine team defeated the Coppermines team, 86 to 85, out of a possible 100, according to the Nevada Con. bulletin "Safety First." Both these scores were high. In a competitive exhibition drill of first-aid crews, nine crews were entered from the various works of the two companies. The team from Copper Flat got first place and two teams from the Steptoe concentrator, second and third. In a special contest a Greek team worked against a Japanese, both making excellent showings.

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*Manager, Park City Milling Co., Park City, Utah.

Details of Practical Mining

Energy of Hammer Drill Blow*

No mine in the country pays more attention to its drilling practice than the North Star at Grass Valley, Calif. The Paynter rock-drill tester developed here was described in the JOURNAL, Nov. 1, 1913. It is a remarkably ingenious and useful machine, by means of which a graphic record of a drill's hitting ability is obtainable. In a recent paper, the North Star management describes a series of experiments conducted with the machine from which interesting conclusions were drawn. The machine registers the intensity of the drill's blow and makes it possible to count the number delivered per minute.

To express the energy of the blow in foot-pounds, the tester was calibrated by allowing a sphere of known weight, suspended as a pendulum, to fall through measured distances against the plunger of the tester. The corresponding distentions of the diaphragm, which controls the movements of the recording pencil, were noted. By forcing oil into the system with a pump, the diaphragm was distended to each of these points in turn, and the static pressure corresponding to each was read on the gage. A curve was then constructed with foot-pounds as abscissas and pounds of static pressure as ordinates. The strength of any blow, recorded on the graph, can be measured by pumping oil into the system until the distention of the diaphragm moves the recording pencil out the corresponding distance. The pressure in the system at this point is read on the gage. The foot-pounds corresponding to this can then be taken directly from the curve. Since the areas of the plunger and of the diaphragm do not change, equal blows will produce the same pressure, even though permanent straining of the diaphragm may result in their producing unequal distentions. Errors which might be caused by these inequalities of distention are avoided by thus expressing strength of blow in terms of equivalent static pressure instead of magnitude of distention.

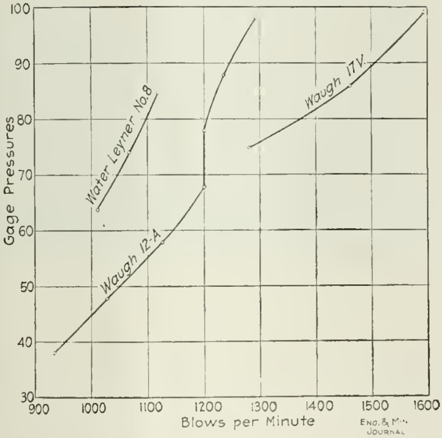

FIG. 1. CHARACTERISTIC CURVES OF TYPICAL MACHINES, SHOWING INFLUENCE OF GAGE PRESSURE UPON BLOWS PER MINUTE

From the graphs taken by testing a drill at different gage pressures, characteristic curves may be constructed, as shown in Figs. 1 and 2. There are also given the results of tests made to determine, if possible, the relations existing between drilling speed, blows per minute and foot-pounds per blow.

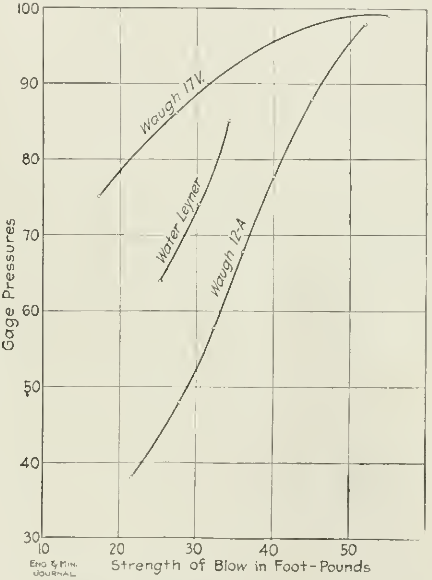

FIG. 2. CURVE, SHOWING EFFECT OF GAGE PRESSURE UPON STRENGTH OF BLOW

Table I compares: *a*. Three drills striking a hard blow; *b*. two drills striking a medium blow. These were tested in extremely hard ground with holes at an inclination of 25°, 1¼-in. cross steel with 2¼- and 2-in. bits being used: conditions, however, were kept the same for each test, which lasted 5 min.

TABLE I—COMPARISON OF DRILLING SPEEDS

	Foot-Pounds	Blows per Minute	Drilling Speed, Feet per Minute
a	52	936	0.126
	52	1320	0.165
	55	1584	0.250
b	40	1260	0.108
	42	2352	0.195

These results indicate that drilling speed varies approximately with the blows per minute, the strength of the blow remaining constant.

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*From paper by Robert H. Bedford and William Hague prepared for the Salt Lake meeting of the A. I. M. E.

Table II compares drilling speed with varying strengths of blow. The conditions of test were: Ground only medium hard; length of each test 5 min.; 1¼-in. cross steel with 2-in. bit; holes at an inclination of 45°; drill, air-feed stoper.

TABLE II—CHANGES IN STRENGTH OF BLOW

Blows per Minute	Foot-Pounds per Blow	Feet Drilled per Minute
1272	48½	0.378
1222	43	0.447
1200	38½	0.308
1170	34½	0.250
1090	30½	0.188

A test under the same conditions as that of Table II, except that the inclination of the holes was 20°, gave the results shown in Table III.

TABLE III—RESULTS WITH FLAT HOLE

Blows per Minute	Foot-Pounds per Blow	Feet Drilled per Minute
1272	48½	0.251
1222	43	0.206
1200	38½	0.198
1170	34½	0.135

A test was made under the following conditions: Ground hard; length of each test, 5 min.; drill, No. 8 water Leyner, 1⅛-in. hollow steel with 2¼-in. bit; holes nearly horizontal. In this test varying strengths of blow were obtained by means of stops of different lengths screwed into the ends of the valve chest. The results are shown in Table IV. Test *a* was first made and the results confirmed with test *b*.

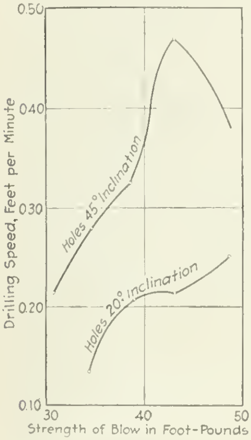


FIG. 3. INFLUENCE OF STRENGTH OF BLOW ON DRILLING SPEED OF AIR-FEED STOPER

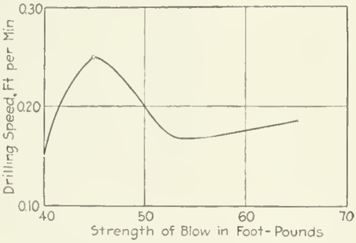


FIG. 4. INFLUENCE OF STRENTH OF BLOW UPON SPEED OF WATER LEYNER NO. 8

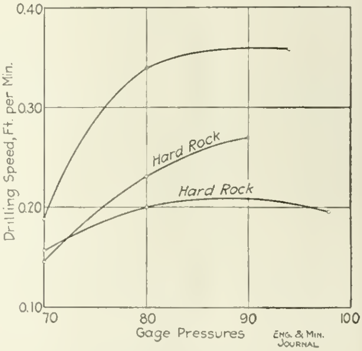


FIG. 5. INFLUENCE OF GAGE PRESSURE ON DRILLING SPEED

TABLE IV—LEYNER TESTS

	Blows per Minute	Foot-Pounds per Blow	Feet Drilled per Minute
a	1368	40	0.162
	1272	45	0.234
	1260	52	0.119
	1212	65	0.129
b	1368	40	0.135
	1272	45	0.224
	1260	52	0.183
	1212	65	0.195

As already stated, Table I indicates that for blows of equal strength the drilling speed is approximately proportional to the number of blows, even when these differ as much as 10%. In constructing the curves of Figs. 3 and 4 from Tables II, III and IV, where the maximum variation in the number of blows is 15%, the drilling speed has been arbitrarily adjusted according to the results obtained from Table I, so that the effects of the strengths of blow may be comparable.

These curves all show the same tendency to flatten at above a certain strength of blow, which in this ground happens to be about 45 ft.-lb. It will be noticed that the curves for the Leyner and for the stoper at 45° inclination are almost exactly similar. This is thought due to the fact that in each case the face of the hole is clear of cuttings. In the cases of the flat holes, which do not clear themselves, the drilling speed is not only lower, but does not show the same peak. This suggests that where holes can be cleared of cuttings a 45-ft.-lb. blow is sufficient to obtain the fastest drilling, whereas, in holes where the deadening effect of cuttings exists, the limit of effective blow is higher. This also emphasizes the desirability of a stoper with water feed to the face of the hole.

From these tests, and others giving similar results, it has been decided that for conditions existing at this mine, stoping drills should strike a minimum of 40 ft.-lb. As none of these drills has yet been found that strikes over 55, it remains solely a question of maintenance to keep them at this point.

The Leyner, with blows as high as 65 ft.-lb., presents a different problem. In this type the valve was so adjusted by means of standard plugs screwed into the ends of the valve chest, as to give at average gage pressure, blows in the neighborhood of 45 ft.-lb. It is hoped that this reduction in strength of blow will result in lessened breakage of steel, decreased repair costs, and maximum drilling speed. The adjustment has not been in use long enough to give any figures on the first two points.

The effect of setting the minimum strength of blow in the stoping drills at 40 ft.-lb. has been to increase the breakage of steel by 1 lb. per drill-shift, and the cost of repairs by 27c. per drill-shift. The footage drilled, however, has been increased 15%, reducing the cost per foot of hole drilled from 20.3 to 18½c. The output per drill shift has increased 10% during the same period, but this figure is complicated by the width of stope broken, and is therefore not quite comparable.

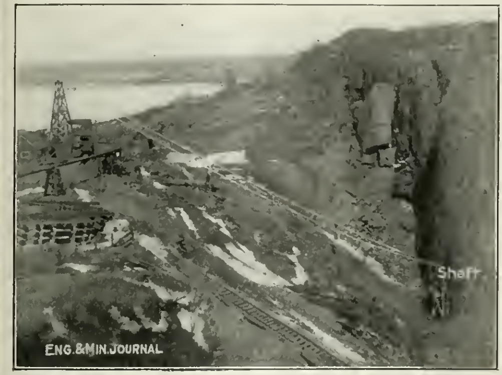
Examination of Table II shows the decrease in drilling speed that may be expected with a stoper striking 30 ft.-lb., as compared with 45 ft.-lb. Of this point it may be stated that many confirmatory tests have been made. Unless the drills are maintained at their best, the strength of blow drops rapidly (sometimes after 100 drill-shifts), with resulting decrease in drilling speed. The cost per drill-shift, however, remains practically the same. It is obvious what the result will be.

⁂

Cableway-and-Carrier Bucket Hoist

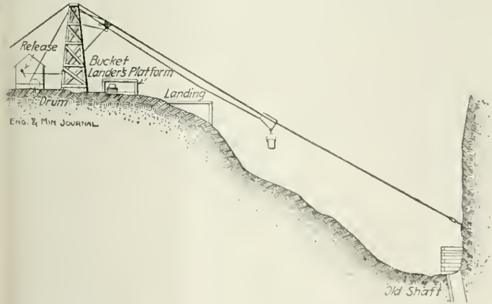
By R. B. Wallace*

An unusual hoisting arrangement is in use for some small-scale work at the property of the Republic Iron Co., Republic, Mich. A cable is stretched across an old openpit from the tower to a point over the shaft opening, which lies on the other side and at the bottom of the pit.



Relation of Hoisting Equipment to Openpit and Shaft

A cableway carriage runs across the pit on this cable and carries the bucket; at the lower end it automatically releases the bucket and drops it into the shaft. This shaft descends at about 85°, and enters some old workings where floors and pillars are being cleaned up.



Layout of Cableway, Headframe, Hoist and Shaft

The hoisting is done by electricity and the bucket is landed by the engineer. At the completion of a hoist, the carriage is automatically held stationary while the bucket is allowed to descend to the lander's platform. When the bucket has been hoisted up to the carriage again, the moving of a lever in the engine house releases the carriage. Two buckets are used, one being filled while the other is hoisted. The diameter of the track rope is 1⅛ in., and of the hoist rope, ⅝ in. The capacity of the bucket is 0.6 ton. In an awkward situation, such as this, where the quantity of ore does not warrant an elaborate hoisting plant, this scheme works satisfactorily.

In the photograph the track leading toward the observer goes to the rock dump, while the stockpile trestle leads back over the hill. The topographic conditions are shown in the photograph and the general arrangement in the diagrammatic drawing.

⁂

Increasing Compressor Capacity by Cooling Inlet Air

By L. D. Anderson*

In the installation of air compressors, a method of increasing their capacity is often overlooked, although well recognized by engineers. It may be stated that the capacity of a compressor with inlet air at 90° F. is only about 95% of its capacity with an inlet temperature of 60° and about 90% of what it would be if this temperature were 32°. Frequently the air for compression is drawn from the engineroom itself or from the sunny side of the building.

At the Centennial-Eureka, Utah, the master mechanic, James Knowles, hit upon the scheme of drawing his inlet air from an old tunnel extending into the hill alongside the compressor house. In the tunnel the air in the summer time was always much cooler than outside. The use of this cool air resulted in a perceptible increase of compressor capacity, the machine running noticeably slower after the innovation was adopted.

Undoubtedly many mines could obtain for their air compressors a similar source of cool air. If the tunnel be any distance from the compressor house, it is advisable that the air conduit be a wooden box to avoid heating, with a cross-sectional area large enough to eliminate losses due to the possible creation of partial vacuums, as might happen in smaller conduits; it should probably be equal to the area of the piston. The adoption of such a scheme will help to keep up the air pressure in the day time when all the drills are running and may besides save some fuel.

⁂

Leyner vs. Piston Again†

For the Leyner drill, the cost of sharpening, breakage, and repairs, makes a high cost per drill shift. Comparison with a type of machine in which these items are low is valuable, as it proves that the expense is justifiable. A 5x7-ft. drill in the North Star mine requires 11 holes, aggregating 43 ft., to break a round. A 2¼-in. reciprocating drill, striking 40 to 50 ft.-lb. blows, 600 to 800 times per minute, used to require two drill shifts for drilling the round, at a cost of $4.45 per drill shift, or 20½c. per foot of hole. The Leyner does this in one drill shift for 15½c. per foot of hole.

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*Mining engineer, Republic Iron Co., Box 82, Republic, Mich.

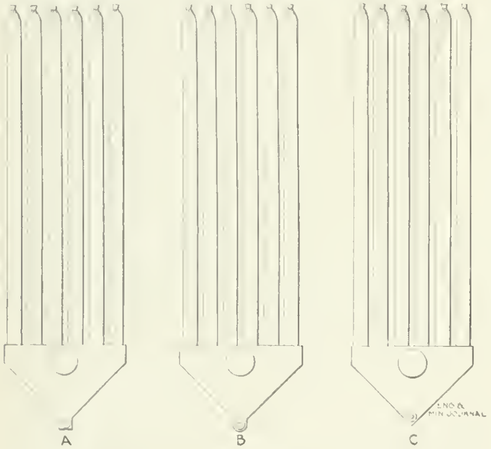
*Superintendent U. S. Smelting Co., Midvale, Utah.

†From a paper by Robert H. Bedford and William Hague, presented at the Salt Lake meeting of the A. I. M. E.

Details of Milling and Smelting

Collecting Baghouse Dust

In the baghouse at Midvale, Utah, the filtered products are caught from the bags in V-shaped steel hoppers, through the bottom of which run 9-in. screw conveyors, delivering the baghouse dust into tram cars. This, according to L. D. Anderson[1], is better than putting the conveyors in the bottom of a rectangular chamber or in a hopper having a small rectangular or semicircular cross-section. The baghouse dust is inclined to "hang up" and hence there is a likelihood that the screw conveyors may not be entirely effective when applied in rectangular chambers; with the small square or semicircular boxes, the worms will invariably get choked up. The arrangements shown in the accompanying illustrations in *A* and *B* are not recommended. A better arrangement is shown in section at *C*. This gives the dust a chance to relieve itself on the side instead of choking up and breaking the screws.



Arrangement of Conveyors in Baghouse Hoppers
A and B not good. Arrangement C approved

⁂

Roasting in Wedge Furnaces without Fuel

In discussing the roasting of lead matte in the Journal of July 11, L. D. Anderson commented upon the use of the Wedge mechanical furnace at Midvale, Utah, where it was found that the lead matte could be roasted without the fuel necessary with the old furnaces used for this purpose. At the United States Smelting Co.'s works, four seven-hearth Wedge furnaces, 21 ft. 6 in. in diameter, have been installed. In the treatment of lead matte in these furnaces, a preroast is all that is desired, as it is followed by sintering on Dwight-Lloyd machines. Care must be taken to leave a sufficient percentage of sulphur in the product to promote ignition on the sintering machines. When first started, at Midvale, fuel was used with the Wedge furnaces. In an effort to prevent too great elimination of sulphur, the speed of the rabbles was increased and a larger tonnage fed to the furnaces; the fuel was gradually lessened until it was entirely cut off, yet the matte kept on roasting and gradually the operators were able to control the operation with sufficient skill to eliminate fuel regularly after the furnace was satisfactorily started. Three Wedge furnaces are used for a similar operation at the American Smelting & Refining Co.'s plant at Murray; these furnaces, like Midvale furnaces, have seven roasting hearths and a dryer hearth, but are 22 ft. 6 in. in diameter.

Previous to the installation of these furnaces, lead matte was roasted either in single-hearth mechanical furnaces, such as the Godfrey, or in hand reverberatory furnaces, the fuel consumption ranging from 12% up to as high as 25%, in some cases. Wedge furnaces are being installed for similar roasting operations at the lead-smelting plants of the Ohio & Colorado Smelting & Refining Co., at Salida, Colo., and of the American Smelting & Refining Co., at Leadville.

Roasting without fuel in Wedge furnaces is also being done at copper works, such as at the Consolidated Arizona Smelting Co., at Humboldt, Ariz., where a White-Howell roasting furnace was formerly used with fuel. Now about 110 tons per day of copper concentrates, limerock and basic ore, having an average sulphur content of 22%, is roasted down to 5% S. Wedge furnaces will be installed at the new copper works of the International Smelting & Refining Co., at Miami, Arizona.

⁂

Cross Sections of Smelting Buildings

By Percy E. Barbour*

The accompanying illustrations show a panel of each of two typical copper smelters. One is a strictly blast-furnace plant and the other a reverberatory- and blast-furnace plant. In the case of the latter works, the reverberatory- and blast-furnace panels are shown in separate figures.

The Tennessee Copper Co. has a strictly blast-furnace plant which, of course, makes the length of panels much shorter than would be the case if long reverberatories had to be housed. The Garfield smelting works has both types of furnaces. The converter craneway section in this plant is the same for both the blast and reverberatory sections, but is shown in the illustration only in connection with the long panel.

The cranes in the two plants are naturally of different capacities and the consequent crane columns and crane girders are interestingly different, in one case as to weight

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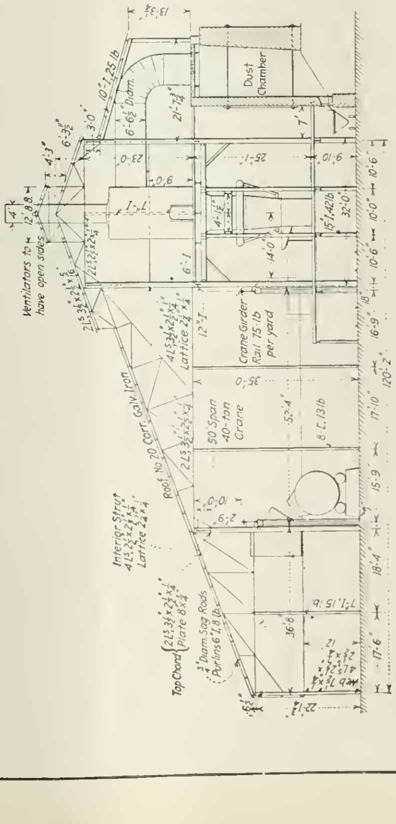
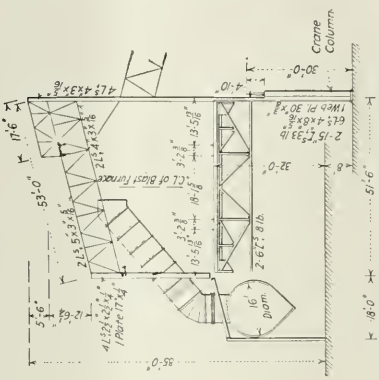
[1] "Effects of the Baghouse on the Metallurgy of Lead." Bull. A. I. M. E., July, 1914.

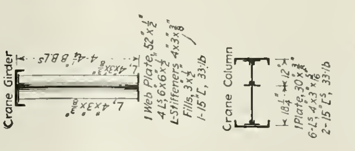
*Mining engineer, 887 Middle St., Bath, Maine.


Ventilators to have open sides
Top Chord {2L^s 3½x2½x¼ Plate 8x¼
¾ Diam. Sag Rods Purlins 6" I, 8 lb.
Interior Strut 4L^s 2½x2½x¼ Lattice 2¼x¼
Roof No. 20 Corr. Galv. Iron
50' Span 40-ton Crane
Crane Girder Rail 75-lb per yard
6'-6½" Diam.
10" I, 25 lb
Dust Chamber
15" I, 42 lb
8" I, 13 lb
7" I, 15 lb
12" I
120'-2"
32'-0"
35'-0"
52'-4"
36'-8"
17'-6"
18'-4"
15'-9"
17'-10"
16'-9"
10'-6"
10'-0"

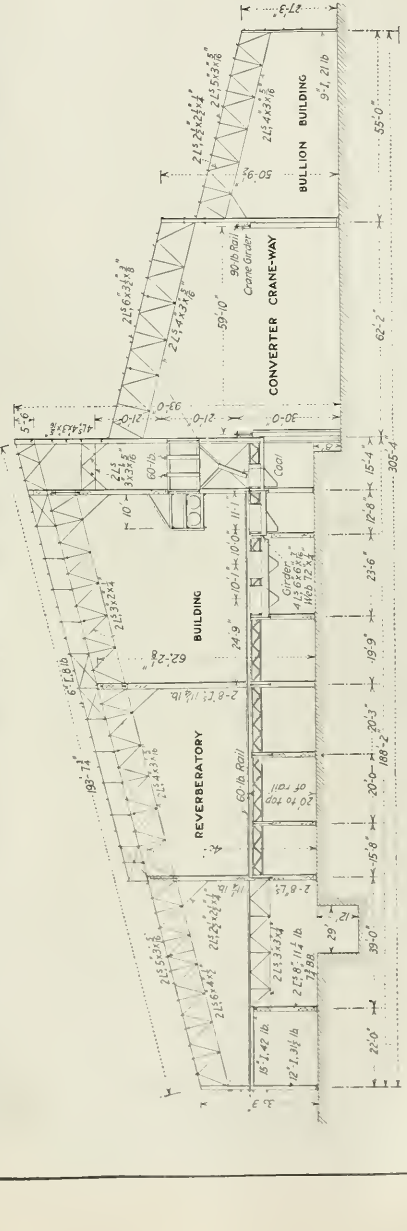
SECTION THROUGH SMELTING BUILDING OF TENNESSEE COPPER CO., COPPERHILL, TENN.



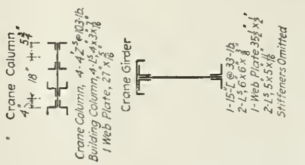
BLAST FURNACE PANEL AT GARFIELD, UTAH



GARFIELD CRANE GIRDER AND COLUMN



SECTION THROUGH SMELTING BUILDING (REVERBERATORY, CONVERTER AND BULLION PANELS) OF GARFIELD SMELTING CO., GARFIELD, UTAH.



SECTION OF T. C. Co. CRANE GIRDER AND COLUMN

Eng & Min Journal

of cross-section and in the other case as to difference in built-up cross-section. The Tennessee works uses a 40-ton crane of 50-ft. span. Garfield uses a crane with 60-ton capacity on main hoist and 10 tons on the auxiliary. The crane span is 59 ft. 10 in. In both plants the crane girders are built up of similar sections, differing only in weights, each consisting of a channel, four angles and a web plate. The crane columns, which are built together with the building columns, are of quite different types. The Tennessee column is made up of four 4in., 10.3-lb. Z bars, and the building column of four 4x3x$\frac{7}{16}$-in. angles with a common web plate, 27x$\frac{5}{16}$ in. The Garfield crane column is made up of one 15-in., 33-lb. channel, four 4x3x$\frac{5}{16}$-in. angles and the building column of one 15-in. channel and two 4x3x$\frac{5}{16}$-in. angles with a common web plate, 30x⅜ in.

The length of bays, or distance from center to center of the panels, should be given in order to give proper value in considering the weights of the two panels if comparisons are made. This length is 18 ft. 1 in., at the Tennessee plant, and 30 ft. at the Garfield plant.

Intermittent Shaft Roasting Furnaces at Park City

In the new chloridizing-leaching mills in Utah, the crucial part of the process was to secure a satisfactory roast without the loss of valuable metals, the operation in other respects being similar to former practice. A number of the mills have been experimenting with roasting furnaces. At the Mines Operating Co.'s plant, in Park City, the Holt-Dern continuous roaster has supplanted the original intermittent furnaces, which are described by Theodore P. Holt in the July bulletin of the American Institute of Mining Engineers.

Eight shaft roasters of the intermittent type were originally installed. The shaft furnaces are 10x10 ft. inside the walls, which are of reinforced concrete 10 in. thick. About 2 ft. above the bottom there is an inclined wooden grate supporting a layer of coarsely crushed rock; the space below this grate forms an air chamber. The tops of the furnaces have a sheet-iron cover, the gases being drawn off below this cover. The method of operating is as follows:

A special starting "mix" of about one ton is prepared in front of the roaster. A layer of coal dust mixed with oil is then spread over the gravel floor of the roaster. This is ignited and sufficient blast admitted to burn it rapidly to glowing coals. The special mix is then shoveled evenly over the surface. By the aid of the air blast, the coals ignite the fuel in the ore, which begins to roast. When the starting layer has roasted through, so that the fire appears on top, the air is shut off for a few minutes, while the first charge of about five tons is dropped from the mixed-bin gate into the roaster. This is spread out by hand and the air again turned on. The roast is allowed to proceed until the surface on the charge glows. Then a second charge of about 10 tons is dropped on and four hours later a final charge of about the same amount. This brings the total depth of charge up to about 7 ft. Under normal conditions, this will roast through in 8 to 12 hours.

When the roasting zone has reached the surface at all points, the air blast is shut off. The discharge door is opened and a sluicing apron inserted, to connect with the launders. The hot roasted ore is then sluiced out with mill solution. The sluicing nozzle is made of hardwood and has a 1⅛-in. nozzle opening. It operates under a head of 45 ft. The nozzle is suspended in position in front of the discharge door. The operator stands at one side, to avoid the numerous steam explosions, and directs the nozzle with a long rod. Under normal conditions it takes from one to three hours to sluice out a roaster charge of 24 tons. From the roasters the hot ore mixed with mill solution passes by means of launders to leaching tanks, 20 ft. in diameter by 12 ft. deep.

During 1913, the Holt-Dern continuous roaster was developed at this mill to overcome the difficulties experienced with the old furnaces. A commercial-size roaster was installed in December, 1913, and except for a few brief delays for changes has been in continuous operation ever since. In the Holt-Dern furnace, a column of ore moves down at intervals as the roasting zone proceeds upward. As the air blast travels in an opposite direction to the ore, it becomes highly heated when it reaches the roasting zone where active combustion of the fuel in the charge is taking place. It finally passes through a layer of moist, unroasted ore and leaves the roaster fairly cool and free from dust. A comparison of the costs with the old and new furnaces showed $0.539 for the intermittent furnaces, as against $0.165 for the Holt-Dern roaster, which has reduced hand labor to a minimum.

Nodulizing Flue Dust

In the JOURNAL of May 24, 1913, p. 1037, reference was made to the experiments in nodulizing blast-furnace flue dust in a 60x6-ft. cement kiln at the copper-smelting works of the United States Metals Refining Co., at Chrome, N. J. Some further details of these experiments are contributed by Lawrence Addicks in a paper to be read at the Salt Lake meeting of the American Institute of Mining Engineers.

The kiln, which had a 6-in. brick lining, was set at an inclination of ⅝ in. to the foot and made 1½ r.p.m. The kiln was fired with oil except during a short period when the fuel-oil market ran away, the top prices reaching nearly 6c. per gal.; then a large firebox for coal, similar to those used in reverberatory practice, was tried, but did not operate satisfactorily, owing to the impossibility of keeping an even temperature at the mouth of the kiln when firing. Most cement kilns are now fired with pulverized coal, but the nature of the Chrome experiment did not permit of the considerable investment required for coal drying and pulverizing. Fuel oil is an ideal fuel for such work when its costs are low and at the time these experiments were begun, it was selling at about 2½c. per gal. The oil consumption was lower than had been indicated by preliminary experiments with a smaller test kiln. With the 60x6-ft. kiln, a granular sand could be made with about 8 gal. per ton, a first-class smelting nodule with 12 gal. and great chunks with 16 gal. per ton.

When perfectly clean, 75 tons of flue dust could be nodulized, but with a choked-up shell, only about half this output was made. There is a decided tendency to form accretions within the shell, and it took some time for the operator to acquire the necessary skill to control the formation of the rings. Steady conditions of flame are necessary; if the kiln is overheated, semi-molten material forms on the walls and a subsequent overchilling will plaster the sand on rapidly. Various mechanical contrivances for removing accretions were tried and abandoned; spraying with a hose was more effective; with reasonable care on the part of the attendants, and a few hours' work for two or three men once in two weeks, accretions were kept down to a point so that the cylinder delivered an average of 50 tons per day without difficulty.

The normal operating condition of the kiln is to have the first 40 ft. next the flue, acting simply as a preheater, without any real nodulizing action. The material then begins to stick and ride around, which is the first step toward the formation of nodules. The actual nodulizing should be completed in the next 15 ft., leaving the last 5 ft. for hardening to nodules in the cooler zone back of the flame. This is to keep the nodules from sticking together in a semi-fused mass when they drop into the receiving car. Nose rings will be confined to the 15-ft. nodulizing zone, where they are readily accessible from the end when the firing hood is rolled away. No trouble was experienced from flue dust blowing out of the kiln. It was expected that a considerable saving would result by delivering red-hot nodules to the blast furnace, but they smelted so much faster than the rest of the charge that better results were obtained by feeding the nodules cold. This probably would not be true in the case of nodulizing ores where the product was not self-fluxing. About 25% of the flue dust fed would pass 100 mesh, and a screen test when making small nodules gave the following results: Between ½ and ¼ in., 54.21%; between ¼ and $\frac{3}{16}$ in., 23.16%; between $\frac{3}{16}$ and $\frac{1}{16}$ in., 20.6%; between $\frac{1}{16}$ in. and 80 mesh, 1.9%; through 80 mesh, 0.08%. The oxidizing action, though marked in a small test kiln, was much less so in the larger kiln, nodules having 4.95% S being obtained from flue dust containing 11.86% S or an elimination of 58 per cent.

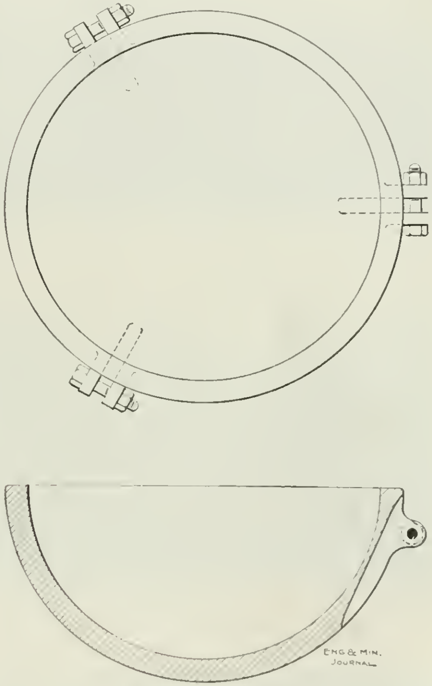
While nodulizing is comparable with blast roasting, the two processes have different limitations, much as in the case of a comparison between blast furnace and reverberatory smelting. Sintering requires a properly balanced internal fuel supply, while nodulizing is entirely independent of this. To nodulize properly, a material must have a sufficient interval between the temperature of becoming sticky (incipient fusion) and that of actual melting to give a practical range of operating flame temperatures. As a nodule is formed from individual grains stuck together, every piece has a solid structure and there are no defective ones full of unsmelted material. Mr. Addicks believes that the kiln is deserving of a wider application in the metallurgical field than it has as yet obtained, but the extent of this expansion can only be determined by experiment. While these notes cover but a single material, blast-furnace flue dust, and that from but a single plant, yet this material is much more like ore than pyrites cinder and other refractory products. It would be advisable to use a kiln 7 or 8 ft. in diameter to lessen the nose-ring difficulty, and this is in line with the experience in other classes of work. As to length of kiln for low-temperature work, 60 ft. is probably long enough; for refractory materials calling for a greater unit fuel consumption longer kilns will pay in fuel saving. As far as operating cost goes, the crux of the whole matter lies in the cost of fuel. A single operator can attend to the firing of several kilns.

It may be mentioned in passing that experiments have indicated the nodulizing kiln to be well adapted to the agglomeration of flotation concentrates for subsequent blast-furnace smelting. An experimental kiln has been shipped to the Braden Copper Co. for this purpose. The disposal of flotation concentrates has been something of a problem at those smelting plants where they have been received, both on account of their high moisture content and on account of the fineness of the material.

⁂

Saving Speiss Pots

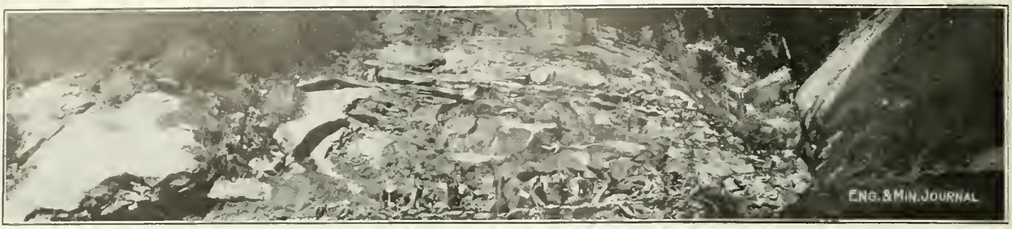
Running speiss from the blast furnace into pots is likely to crack them after a short time, and it has been difficult to find an iron that would give an economical life. At the plant of the Deloro Mining & Reduction Co., Deloro, Ont., an attempt has been made to increase the life of the pots by a change in design. In place of casting them of even thickness, three channels are cast at equally distant points on the sides, the channels reaching about halfway down the side of the pot. The thickness of the iron at these points is reduced to about $\frac{1}{8}$ in. At the sides of the channels lugs are cast, provided with bolts. The idea is that if the iron cracks, it will do so at these weakest points, and then the bolts can be tightened up, bringing together the edges of the crack, which can also be luted to prevent leakage.



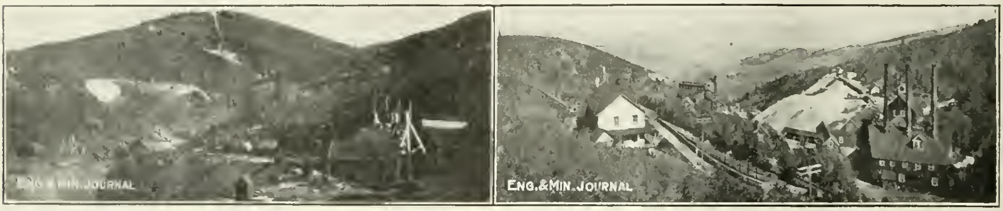
SPEISS POT WITH CHANNEL

The pots have not been in use long enough to definitely prove the value of this design, but so far there seems to be some advantage. The pots hold about 750 lb. of speiss.

Photographs of Utah Mines

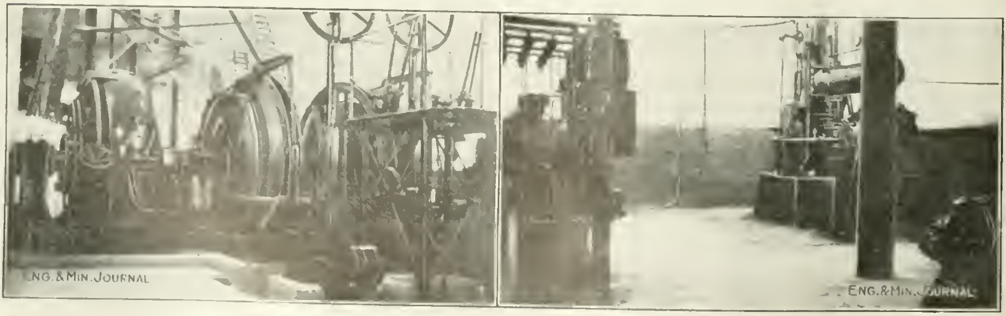


Outcrop of Rock Asphalt above Sunnyside, Carbon County
Some streets in Salt Lake City have been paved with this material

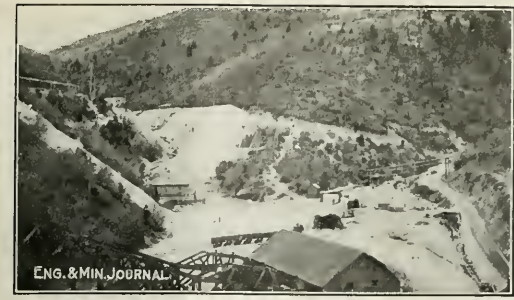


Ontario Mine and Silver King Mine in Summit County
Two lead-silver ore producers of Park City

Mines Operating Co.'s Mill and Daly Judge Mill at Park City
The Mines Operating Co. uses a chlorination process and recently made its first shipment of bullion; previously shipped product having been a precipitate

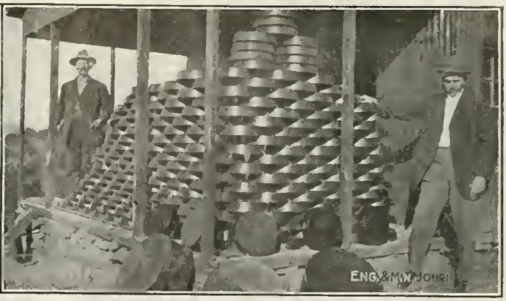


Underground Hoist and Compressor at Silver King Coalition Mines
This installation on the Alliance Tunnel level was completed in May



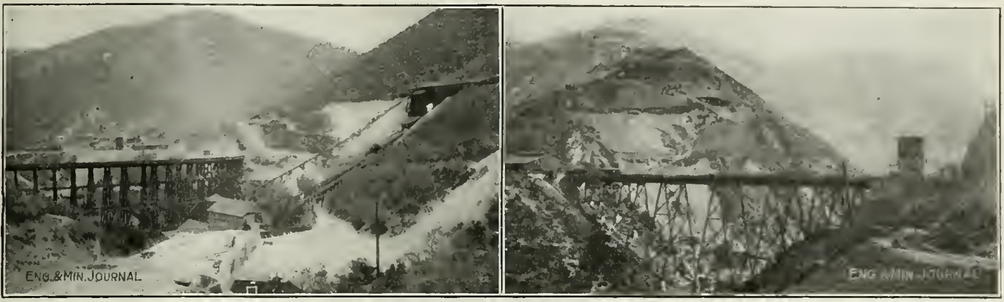
OLD TELEGRAPH MINE DUMP

The Old Telegraph is one of the oldest mines in Bingham



OZOCERITE READY FOR SHIPMENT

A hydrocarbon mineral product of Emery and Uintah Counties



U. S. MINING CO.'S TRANSFER HOUSE AND UTAH COPPER MINE AT BINGHAM

Bingham has been a producer, first of gold, then silver-lead and now principally copper ores

EUREKA AND MAMMOTH IN THE TINTIC DISTRICT

A large number of small and moderate size mines keep up the production of this silver-lead district

PLANT OF THE EAGLE & BLUEBELL MINE AT EUREKA

One of the steadily producing mines of the Tintic district

Electrostatic Ore Separation

By I. C. Clark*

SYNOPSIS—Electrostatic ore separation is based upon the principles of static electricity and the relative conductive powers of minerals. The Huff electrostatic separator is used almost universally in the process. The feed must be warm and dry and some system of dust collection should be installed. The electrical equipment is comparatively simple and is independent of atmospheric conditions. Flowsheets vary according to the class of ore treated. In order to obtain satisfactory returns from a mill, exhaustive tests should be made on the minerals before erection of a plant.

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The basic principles of electrostatic ore separation are those of static electricity. When two electrical conductors of like polarities are made to approch each other, they are mutually repelled; conversely, conductors of opposite polarities will attract each other. The force of this repulsion or attraction depends upon the conductive power of the bodies and the strength of the current with which they are charged. The conductors always remain separated by a nonconducting medium called the dielectric. Examples of such a nonconducting medium are air, mica, glass and rubber. The dielectric constant of air is assumed to be unity, and the constants of other dielectrics are obtained by comparison with it. The principles of electrostatic ore separation are entirely distinct from those of electromagnetic ore separation. These two processes must not be confused, for in reality they are totally different.

Conductivity of Minerals

Every mineral will conduct electricity through its body or over its surface if subjected to an electric current of sufficient voltage. A great difference exists, however, between the relative conductive powers of various minerals. Many metallic sulphides and some other minerals are comparatively good conductors. Most gangue-forming minerals and a few metallic sulphides are poor conductors. The following substances fall into one or the other of these classes, the good conductors being native metals, pyrite, chalcopyrite, chalcocite, pyrrhotite, galena, argentite, tetrahedrite, pyrargyrite, molybdenum, tellurides, garnet, magnetite, hematite, hornblende, biotite, graphite, black sands, most sulphides, and most copper, iron, silver and manganese minerals, while the poor conductors comprise quartz, quartzite, sandstone, granite, porphyry, feldspar, epidote, garnet, calamine, spinel, slate, fluorspar, monazite, calcite, limestone, dolomite, siderite, sphalerite, smithsonite, barite, gypsum, most siliceous minerals, most carbonates and most sulphates.

If a mixture of minerals containing good and poor conductors in a neutral state be allowed to fall upon a conductive surface charged to a high potential, the good conductors will immediately become charged with like polarity and be repelled with more or less force. The poor conductors however, will require considerable time to become similarly charged. They may either fall from the conductive surface by their own weight or be repelled with only a slight force. Let this same mixture of minerals be charged with electricity opposite in polarity to that of the conductive surface, and the operation repeated. The good conductors will immediately reverse their charge of electricity upon contact with the surface and be repelled as before. On the other hand, the poor conductors will be strongly attracted to the conductive surface, being charged with electricity of the opposite kind. Some time is required for the poor conductors to lose their initial charge and receive a charge similar to that of the conductive surface. Even then these minerals would either be repelled with only a slight force or merely fall from the surface by gravity.

Similar minerals from different places often possess different units of electrical conductivity. Sphalerite or blende is generally classed as a poor conductor. Occasionally this mineral will contain appreciable quantities of iron or manganese chemically combined with it. These impurities may alter the conductive power of the mineral in a marked degree. Instead of remaining a poor conductor, it may become a fairly good conductor, depending upon the relative amounts of combined impurities. Theoretically, an electrostatic separation may be made between minerals having only a slight difference in conductive powers. Practically the process is quite a delicate operation. In order to insure a clean separation the minerals treated must have a marked difference in conductive power. Much trouble has been experienced in separating minerals where combined impurities alter their conductance. Careful watching is required when such minerals are treated in electrostatic separators.

Some minerals may be changed from poor to good conductors by electrochemical action. This is the practice at Ouray, Colo., to a limited extent. Zinc sulphide, sphalerite, is immersed in a solution of copper sulphate, its surface becoming coated with a film of copper sulphide. After being dried this mineral is treated as a good conductor. Heat is also used to alter the conductive properties of minerals. Carbonates of poor conductivity may be changed to oxides of good conductivity in this way.

The Huff Separator

The Huff separator is used almost universally in electrostatic separation plants. The principles of operation of this machine are illustrated in Fig. 1. The framework is made almost entirely of iron and is grounded to prevent shocks to the operators by contact with it. This grounding of the framework also assists in the separation by increasing the difference in potential between the charged and neutral electrodes, which will be explained later. The charged electrodes to the left in the diagram are maintained at a potential of 20,000 volts and are carefully insulated from the iron framework. The neutral electrodes, to the right in the diagram, readily form a portion of that series of guides which are grounded with the framework of the machine. A dielectric of air separates these two series of electrodes, forming an exceedingly strong electrostatic field between them. All lines of force emanating from the electrodes are confined to this comparatively limited field.

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The ore in a neutral state is fed continuously on the machine by a revolving roller beneath the feed hopper. The feed is regulated by an adjustable feed gate and by the speed of the roller. After passing over the roller the minerals fall on a series of metal guides which direct them between the electrodes. While thus falling between the electrodes the minerals are subjected to the intense action of the electrostatic field. The good conductors are immediately charged with electricity similar to that of the electrodes and are repelled to the left as indicated in the diagram. The poor conductors require a much longer time to absorb this charge of electricity and fall through the machine by gravity before any appreciable repulsion takes place.

On some varieties of ore minerals three or more products may be obtained by making more than one split. In such a case the best conductor would be repelled farthest to the left and be collected in a hopper suitably placed. The poorest conductor would fall directly through the machine and be collected below, as indicated in the diagram. Minerals of intermediate conductivity would be collected in hoppers placed at intervals between these two. This triple operation is not often feasible, for in most cases a clean separation can be made between only two products. The majority of static mills now in operation make but one or two shipping products.

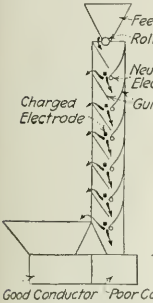

FIG. 1. DIAGRAM OF HUFF ELECTROSTATIC SEPARATOR

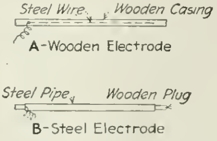

FIG. 2. TYPES OF ELECTRODES

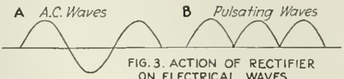

FIG. 3. ACTION OF RECTIFIER ON ELECTRICAL WAVES

Eng & Min Journal

Electrodes, Two Types Being Used

The electrodes on all of the Huff machines are adjustable, thus permitting a wide variation in the strength of the electrostatic field. In order to accomplish uniform mechanical work, the upper electrodes are placed far apart and the lower electrodes are held quite close together. The upper electrodes having first "pull" at the mineral particles will repel the good conductors with the greatest force. Consequently they are placed at a considerable distance apart, this distance being determined by experiment for every class of ore treated. The lower electrodes have the hardest work to perform, cleaning the poor conductors from last traces of good conductors. They accomplish this work by being placed closer together. The adjustment of electrodes can be determined only by careful experiment and will vary with each class of ore treated.

Two general types of electrodes are in common use in electrostatic mills, as illustrated in Fig. 2. The first type is made of wood, coated with shellac and inclosing a steel wire. This wire is directly connected to the electrifying apparatus. The second type consists of a hollow steel-rod, insulated from the framework of the machine by wooden plugs or supports, and connected to the electrifying apparatus. The wooden electrode was the type first used, though at present the metal electrodes are largely replacing them. The wooden casing is generally covered with a coating of shellac. After remaining in use for some time these electrodes become heated, due to the intense electrical action and the warm feed. The shellac coating becomes somewhat sticky and the falling mineral particles will adhere to it. This adhering mass may become large enough to form a short-circuit between the charged electrode and the grounded framework. In this case all the current generated would be immediately grounded and the minerals would fall directly through the machine, no separation taking place. Adhering mineral particles might still do damage without causing a direct short-circuit. All lines of electrical force will concentrate at the points of least resistance between the electrodes. A mass of adhering mineral particles will decrease the resistance of the dielectric between the electrodes at that point. The concentration of electrical action at this point will cause sparking and may eventually burn out the electrode. Dust is liable to collect at the ends of the hollow-steel electrodes. This layer of dust may bridge over the wooden insulating plugs, thus grounding the charged electrode through the iron framework of the machine. Drops of oil or grease are apt to fall on either type of electrode. Dust and mineral particles will collect at such places with the above deleterious effects. All electrodes must be kept free from grease and dirt, and constant attention is necessary to insure this. This is one of the most important features of the process and carelessness here may lead to serious results. A single charged electrode on one machine becoming grounded will ground all the remaining electrodes in the mill. In case the electrodes become grounded, the feed to all machines should be immediately shut off until the trouble can be remedied. An ample supply of new electrodes should always be kept conveniently at hand.

It is common practice in electrostatic mills to ground the neutral electrodes. This aids the separation by insuring the maximum difference in potential between the charged and neutral electrodes. The earth is always assumed to be at zero potential and everything connected with it will have a like potential. If not grounded the neutral electrodes might accidentally be maintained at a considerable potential above that of the earth. This would decrease the difference in potential between them and the charged electrodes, thus materially hindering the separation.

How Moisture Interferes with Separation

In order to obtain a good separation all machines must be fed with warm, dry ore. The feed, necessarily crushed to a comparatively small size, would cause endless trouble by mechanically clogging the machines, if much moisture were contained. Dampness would also cause the mineral particles to stick together, thus resisting the separating action of the electrostatic field. A moist feed would render the electrical features of the process absolutely useless. The electrodes would be grounded almost immediately, the electricity generated being wasted before any work is accomplished by it. Even a small percentage of moisture in the feed hinders the separation materially. Water is a good conductor of electricity. A poorly conductive mineral might readily be changed to a good conductor by a film of moisture adhering to its surface. This increase in conductivity might be sufficient to cause the supposed poor conductors to be repelled with the good conductors, the value of the products formed being materially decreased. The dielectric of air between the electrodes should also be free from moisture, as damp air is a partial conductor of electricity. If this dielectric consisted of damp air sparking might ensue, current be wasted, and the lines of electrical force weakened. The electrical equipment of an electrostatic plant in itself may be independent of atmospheric conditions, but the process as a whole is not. The more moisture contained in the atmosphere the hotter must the drier be fired in order to insure a warm, dry feed to all machines. This will prevent water from condensing on the mineral particles or on the machines and dry the dielectric of the electrostatic field. The drier should be maintained at a temperature between 300° and 600° F., depending upon atmospheric conditions and the character of the minerals treated.

TREATMENT OF DUST

Large quantities of dust are formed during electrostatic separation, which is readily understood from the nature of the process. This is particularly true when a considerable percentage of the minerals treated is finer than 200 mesh. When falling between the electrodes the finer particles have an excellent opportunity to float off into the air. This dust, if not confined, represents a loss of mineral and impairs the health of the machine operators. At best the machine room of an electrostatic mill is an extremely dusty place in which to work. The operators generally wear respirators.

In order to reduce the bad effects from large quantities of dust formed, ventilators are placed over each machine. These ventilators are connected with a baghouse, suction being provided by an electric fan. A large percentage of the total dust formed may be recovered in this manner. A baghouse equipped with a dozen 30-ft. bags, 12 in. in diameter, is large enough to handle all the dust from a fair-sized mill. These bags must be shaken and emptied every few weeks. A suction fan is usually necessary in the flue, in order to maintain a good draft through the drier. Large quantities of dust are given off here and a chamber for collecting it should be built below this fan. This dust chamber should be cleared once a month or oftener, as required. Without the installation of a system of dust collection, mineral losses from this source may reach a surprising figure during a month's run. Sanitary considerations alone will require the installation of such a system sooner or later.

All minerals require some sizing before becoming amenable to electrostatic separation. The extent to which close sizing is required depends entirely upon the character of the ore treated, and can only be determined by extensive tests upon it. Many combinations of sizing should be tried until the one giving maximum recoveries is plainly evident. A coarsely mineralized ore requires less initial crushing than a finely crystallized variety. Some ores require no sizing below 12 or 16 mesh, while others demand close sizing down to 150 mesh. As a rule, from four to six distinct sizes are necessary to insure a clean separation. The following examples give the average sizing required for different grades of material:

1. Through 4 on 8 mesh. Through 20 on 50 mesh.
   Through 8 on 20 mesh. Through 50 on 100 mesh.
   Through 100 mesh.
2. Through 20 on 40 mesh. Through 60 on 80 mesh.
   Through 40 on 60 mesh. Through 80 on 100 mesh.
   Through 100 mesh.
3. Through 40 on 60 mesh. Through 80 on 100 mesh.
   Through 60 on 80 mesh. Through 100 on 150 mesh.
   Through 150 mesh.

No. 1 is coarsely crystalline, No. 2 of medium texture and No. 3 finely granular.

Sizing is often accomplished by means of inclined "toboggan" screens. After being discharged from the drier the ore is immediately elevated to a series of these screens. Motion is imparted to the screens by revolving hammers striking against projections on them and opposed by springs, or revolving cams at the sides of the screens, also opposed by springs. Ample screening surface should be provided to make a sharp division between sizes. These screens discharge the ore into chutes or conveyors leading to the machines treating their respective sizes.

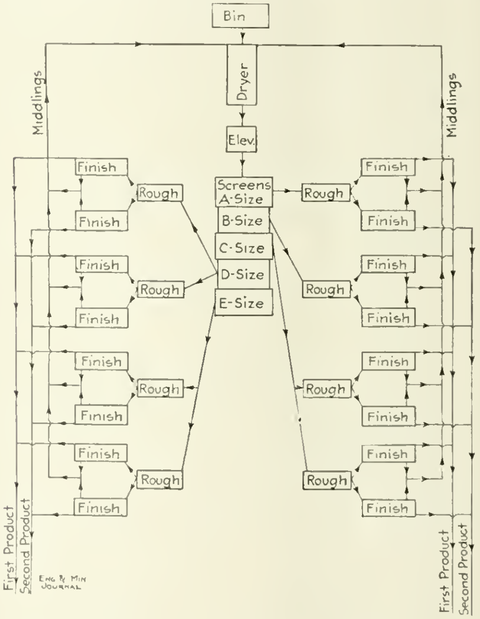

FIG. 4. TYPICAL FLOW SHEET

The necessity for sizing is apparent. In the separation of a good from a poor conductor, the good conductor is repelled with considerable force. If much difference exists between the various sizes of mineral particles, a large particle of the good conductor might mechanically carry off one or more smaller particles of the poor conductor. If, however, the particles are all of approximately the same size, mechanical entrainment is less apt to happen.

The electrical equipment required for the operation of a static mill is comparatively simple. It consists in the main of an alternating-current generator driven by a small motor, a resistance box and a rectifier. The generator produces an alternating current of high potential but of low amperage. From the generator the current passes through the rectifier, which changes the negative alternating-current waves to positive pulsating waves, as indicated in Fig. 3. This pulsating current is necessary so that the electrodes will receive only a positive charge of electricity. If charged with ordinary alternating current the mineral particles would be successively attracted and repelled, thus causing a poor separation. The speed of the generator is regulated by a resistance box, so that the terminal voltage may be varied at will. The electrical equipment of a static mill is itself independent of atmospheric conditions, although the process as a whole is not.

Every electrostatic mill shows some variation in its flowsheet. In all cases, however, the ore passes through a drier, is elevated to the screens, where two or more sizes are made, and then passes over the different machines. In some instances one pass over the machine may be sufficient to form finished products for each size. Generally, however, it is necessary to re-treat each product from the roughing machine on a finishing machine, thus forming two or more finished products and a certain amount of middlings. One rougher and two finishers are now built in combination, performing the work of the three smaller machines, but requiring less space. The middlings from the finishers may either be returned again through the entire mill or simply be reheated and treated on small middling machines. Fig. 4 represents a typical flowsheet in a somewhat simplified form. We will assume the proportion of sizes given in the accompanying table:

Size	Through Mesh	On Mesh	Percentage of Feed	Machines	
				Rougher	Finisher
A	20	40	10	1	2
B	40	60	15	1	2
C	60	80	20	2	4
D	80	100	25	2	4
E	100	..	30	2	4

This flowsheet has been simplified so that the general features of the mill are not disguised. All middling products formed are returned to the drier and pass through the entire mill again. This feature is objectionable, as these products have already been dried and sized, their return through the mill causing a waste of power and screening surface. It is always poor policy to return a middling product back over the same machine that first produced it. Such a process will eventually crowd the machine with middlings and, in order to prevent this, the grade of the finished products must be lowered. If necessary, the middlings should be separately heated again and re-treated on middling machines placed beneath the regular machines, the different sizes being treated on their respective machines. Any middlings made on these last machines would either be negligible, or, if returned through the reheater again, would be so small in amount as not to interfere seriously with the separation. Other changes would be necessary to meet local conditions, but in all cases the general arrangement of the mill would be similar to that shown in Fig. 4.

The Huff electrostatic process was originally introduced on zinc ores and the separation of blende from pyrite is still its broadest field of usefulness. It must not be thought, however, that this separation is only adapted to such materials. Practically no limitations can be placed with regard to the minerals treated provided they possess a sufficient difference in electrical conductivity. The process has already been successfully tried on many types of minerals, some of which might be mentioned here: Zinc, lead and iron middlings; chalcopyrite in quartz; pyrite and chalcopyrite in various gangues; chalcopyrite and bornite in granite; zinc, iron and silver ores; native copper in sandstone; pyrite concentration for sulphur; silver ores from a quartz gangue; molybdenite from gangue minerals; mica from graphite flake; slate from coal, etc. Electrostatic mills are now in successful operation in several places in the United States and a few in foreign countries. A broad field has already been opened to this process and the future will no doubt extend its scope.

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Cyaniding in Utah

Great as Utah is as a mining state, the cyaniding process has never been widely applied, a fact which is due solely, of course, to the nature of its ore deposits. The great orebodies have been silver-lead, copper and zinc combinations, to which cyanide processes have not been considered particularly applicable.

Notwithstanding these adverse conditions, Utah has had one of the most famous of cyanide plants within her borders. This refers to the plant of the Consolidated Mercur Mines Co., a plant which, first and last, has been a useful one to the profession in general. Its value has been due to the difficulty of treating the Mercur ores, and the necessity for breaking into unexplored metallurgical fields to secure a profitable process, a proceeding that was probably much more interesting to the professional public than to the Mercur management.

The original Mercur ores, for which the district was first worked in about 1869, were silver-lead combinations, with silver chloride and silver-lead carbonate. Later the large gold veins were discovered, and a serious time followed in the endeavor to make the ores profitable. Roasting and amalgamation proved altogether unsatisfactory, and the proposition was considered almost hopeless until the advent of the cyanide process. This was early applied, and in spite of dubious results at first it was soon demonstrated that with experienced operators the ores would pay very well.

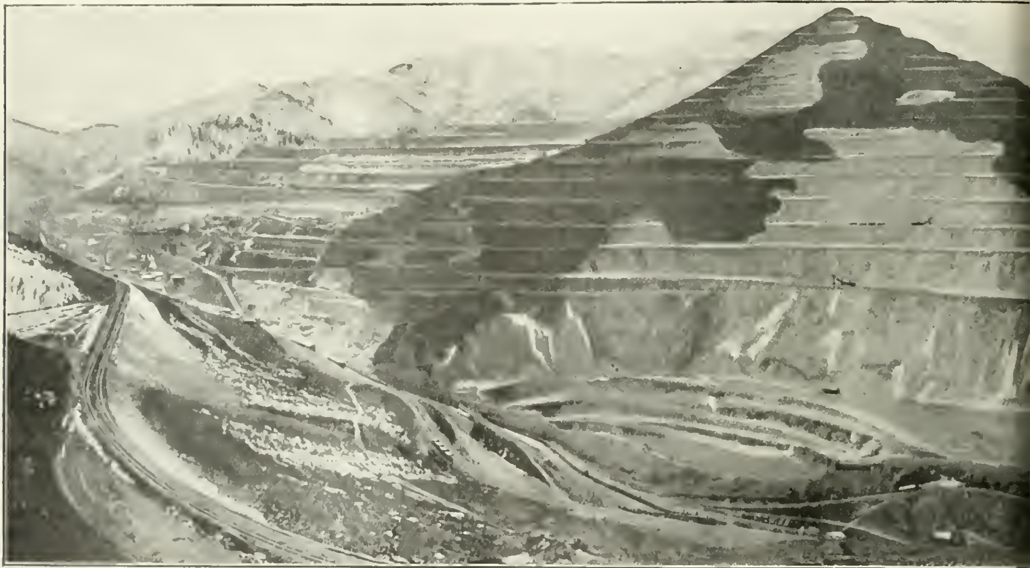
At this time only the oxidized ores were mined, these being siliceous limestones which were coarse and friable. The first leaching experiments showed that the ore could be broken to a comparatively coarse state and leached with success. This was due to the passage of solution through the cleavage planes of the ore in which the gold was mainly deposited. The gold itself was so fine as to be entirely invisible to the naked eye and only discernible upon recourse to chemical methods. Many difficulties were encountered in leaching, because if any fine grinding or crushing was resorted to, slimes were produced to such an extent that percolation was a physical impossibility. Thus it was that a separate sand and slime treatement had to be inaugurated, and much original work was done before success was attained.

It was at the Mercur that the Moore filter process was first put into practice, and in conformity with most Mercur experiments, it seems, failure was the first product. Nevertheless, the process has since been perfected, and some credit is due to the old Mercur for her first efforts. Here also zinc dust was first used as a precipitant for the cyanide solutions, with the usual unsatisfactory result. The difficulties were determined, however, and with these in view success has since been brought out of the older failures.

Dividends Equal 20% of Production

The fact that in a total production of something over $17,000,000, dividends amounting to $3,445,313 have been paid, from first to last, gives the Mercur a record which may be pointed to with pride by the operators who have brought it about in spite of all the discouraging and disappointing experimental periods which had to be gone through.

Aside from the Mercur mine, cyaniding has had practically no place in Utah, although there have been from time to time various small and unimportant plants working more or less intermittently. At the present time there are known to be only two small plants using cyanidation. One is at the Bully Boy mine, at Marysvale, which has a 100-ton plant running on gold ore and separating sulphides by concentration, followed by cyaniding of the tailings. Another is the plant operated by Griggs, Castleton & Carter, who have bought the May Day dump in the Tintic district and are treating it by cyanide. Their tonnage is from 50 to 75 tons per day. Other mills which have been in operation, but which are now idle, are those of the Norma Gold Mining Co., the Sheep Rock Mining & Milling Co. and the Utah Leasing Co. It is possible that the latter may resume work some time this year.



The Mountain Utah Copper Co. Is Devouring—

Utah Copper Co.

To sum up the results of operations of the Utah Copper Co., Bingham, Utah, as shown by its annual report, before going into details of the report itself, the following figures are given: At the end of 1912 the company had on hand a balance of quick assets amounting to $1,688,799 and at the end of 1913 this balance had increased $1,727,103 and totaled $3,415,902. During the year $4,747,710 was paid in dividends. Taking the net gain in quick assets and dividend payments we have a net balance of $6,474,813 over all expenditures. This was the actual amount from 1913 operations available for dividends and must not be confused with the $8,513,105 net profit for the year shown in the report. The calculations that follow were made to show clearly the difference between net profits as figured in the report and net balance available for dividends, and with no intention of criticizing the bookkeeping methods of the Utah Copper Co.

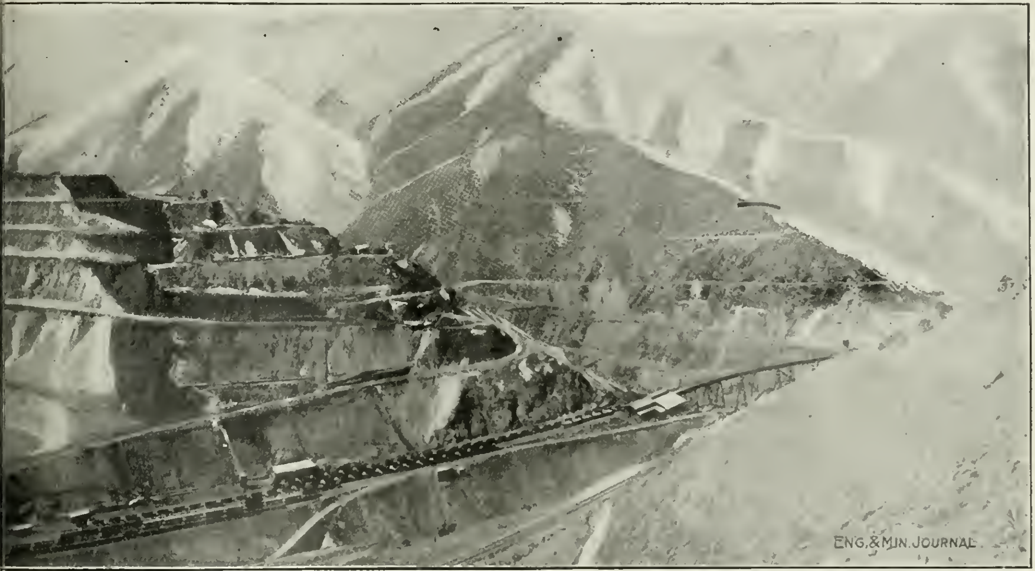
SUMMARY OF FINANCIAL STATEMENTS GIVEN IN REPORT

Receipts from the sale of:		
113,942,834 lb. of copper @ 14.976c.		$17,063,635
28,121.244 oz. of gold @ $20		562,425
285,589.35 oz. of silver @ 59.582c.		170,158
Miscellaneous mine-operating receipts		1,346
Total operating revenue		$17,797,564
Dividends on investments (not including $2 per share on 1,000,500 shares of Nevada Consolidated)		175,000
Income from rentals, interest, royalties, etc.		94,200
Total income from operations and investments, excluding Nevada Consolidated dividends		$18,066,764
Expenditures for operations	$11,494,341	
Expenditures for deferred operations	1,493,242	
Expenditures for plant and equipment	817,428	
Expenditures for interest paid	60,318	
Total expenditure for operations and deferred charges		13,865,329
Balance of income from operations over all expenditures		$4,201,435

Other receipts:	
From increase in capital stock	40,400
From exchange of stock for Bingham & Garfield Ry. bonds	161,600
From decrease in investment account	70,378
Total	$4,473,813
Income from 1,000,500 shares of Nevada Consolidated Copper Co. stock at $2 per share	2,001,000
Total net balance of Utah Copper Co. for 1913 over all expenditures	$6,474,813
Dividends paid	4,747,710
Increase in quick assets as shown in statements	$1,727,103
To balance with profit as shown in report:	
Amount from 1913 operations available for dividends	$6,474,813
Spent for deferred charges	1,493.242
Spent for plant and equipment	817,428
Total	$8,785,483
Less receipts from increase in capital stock, exchange for bonds, and decrease in investment account	272,378
Net profit for 1913 shown in report	$8,513,105

It is evident from the figures just given that the net amount available for dividends before crediting the Nevada Consolidated dividend was about 3.92c. per lb. of copper. With copper selling at 14.976c. per lb., this gives total expenditures of about 11c. per lb. of copper. Crediting Nevada Consolidated dividends, its net balance over all expenditures was about 5.7c. per lb. (For details of receipts and expenditures see table on p. 270.)

The report states that no underground work was done on the original Utah Copper Co. group. On the original Boston group 24,812 ft. of tunnels, drifts and raises were driven, making total underground workings, for both properties, 83.23 miles. However, only 24.56 miles of these workings remain accessible, the remainder having been destroyed by surface and underground mining. Four development drill holes were deepened and 14 additional holes drilled, the total footage of this work was 10,153 ft. The total combined footage of development holes drilled up to the end of the year was 37,471 ft., or an average of 506 ft. for each of 74 holes.



As It Looked on Jan. 1, 1911

The cost of underground development was 17.72c. per ton of ore mined underground, or 1.59c. per ton mined on surface and underground. Churn-drilling development was 0.75c. per ton on all ore produced. The total of underground development and surface development was 2.34c. per ton mined compared with 4.51c. in 1912. This charge is included in the mining cost charged to operators. Additional stripping operations have furnished data for changing the estimate of the average thickness of the capping of the developed portion of the entire property from 110 ft. to 114 ft. There was 4,835,479 cu.yd. of capping removed, making 22,125,207 cu.yd. removed to date. Of this total 14,946,276 cu.yd. was removed from the Utah group and 7,178,931 cu.yd. from the Boston group. Stripping operations were extended over an additional 15.43 acres so that the total area over which this work is now being carried on amounts to 171.13 acres. It is estimated that 59.57 acres is now completely stripped of capping. Based upon 114 ft. as the average thickness of capping, there is 183,920 cu.yd. of stripping per acre, therefore, the total capping removed is equivalent to stripping completely 120.30 acres, or, as the report states, is also equivalent to stripping 180,000,000 tons of ore. Of this tonnage about 16%, or 28,720,231 tons, has been mined and shipped to the mills. It is now estimated that the ratio of waste to ore, after considering the grades of the slopes, will be about one to three.

It is expected that underground operations will be completed by May 1, 1914, and thereafter all development work will probably be done by drilling. Of the total ore mined in 1913, 91.02% came from the steam-shovel pits as compared with 77.81% in 1912. The average cost of steam-shovel work was 29.26c. per ton of which 8.32c. represents stripping, prospecting and general charges, leaving 20.94c. for actual working costs. Underground mining costs were 69.52c. per ton, including 17.72c. for development. The combined working cost at the mines per ton of ore was 23.04c.; to this is added 9.8c. for development and prospecting, including 7.5c. for fixed charges for stripping, making total mining costs 32.88c. per ton.

Both mills will be finished when a small amount of construction work now underway is completed. The Magna plant treated 4,142,700 tons and the Arthur plant 3,376,692 tons, a total of 7,519,392 tons of ore milled. The average grade of this ore was 1.25% compared with 1.36% in 1912. It is stated that this decrease was due to mining a large percentage of low-grade ore from the northern limits of the deposit. The average mill recovery at the Magna plant was 63.78% and at the Arthur plant 64.18%. The average for both was 63.95%, or 15.95 lb. of copper per ton of ore. The final recovery in refined copper was 15.2 lb. per ton of ore. The cost of milling at the Magna plant was 35.59c. and at the Arthur plant, 38.20c.; the average for both plants was 36.76c. per ton.

The ore reserves were increased 16,000,000 tons in addition to the tonnage mined and estimates at the end of the year indicate 332,500,000 tons of ore averaging 1.47% copper. The capacity of the mills on normal-grade ore is about 21,000 tons a day.

Operating costs and other expenditures and receipts may be summarized as follows:

	Amount	Per Lb. Cu.
Total tons of ore treated	7,519,392	
Copper produced, pounds	113,942,834	
Net yield in pounds of copper per ton ore	15.2	
Operating expenditures:		
Mining and milling	$4,553,222	4.00c.
Treatment and refining	6,086,880	5.34c.
Selling commissions	170,636	0.15c.
Stripping ore	563,954	0.50c.
Mine development	119,649	0.11c.
Total operating expense as charged	$11,491,341	10.10c.
Less gold and silver contents	732,583	0.65c.
	$10,761,758	9.45c.
Less other operating income except Nevada Consolidated dividends	270,547	0.24c.
	$10,491,211	9.21c.
Interest paid	60,319	0.05c.
Net operating total	$10,551,530	9.26c.
Spent on deferred operations	1,493,242	1.31c.
Spent on plant and equipment	817,128	0.72c.
	$12,862,200	11.29c.
Less receipts from stock transactions, and decrease in investments	272,378	0.24c.
	$12,589,822	11.05c.
Less Nevada Consolidated dividends	2,001,000	1.76c.
	$10,588,822	9.29c.
Receipts from copper produced	17,063,635	14.97c.
Net balance over expenditures	$6,474,813	5.68c.

⁂

Salt Production in the United States in 1913 amounted to 34,399,298 bbl. of 280 lb., according to the U. S. Geological Survey. Bromine, produced as a byproduct of the salt industry in Michigan, Ohio, Pennsylvania and West Virginia, amounted to 572,400 lb., and calcium chloride, also a byproduct, to 19,611 tons.

International Lead Refining Plant*

The Parkes-process lead refinery of the International Lead Refining Co., at East Chicago, was built to treat the lead bullion produced by the Tooele plant, Utah. Ground was broken Apr. 16, 1912, and exactly six months later the plant was in operation and lead was being cast. The capacity of the plant running 25 days per month is 5000 tons. The four products of the plant are: Common, corroding and antimonial lead, and doré bullion.

The plant is so arranged that all the principal operations are performed in one main building. This is a steel and concrete structure, 480x180x50 ft. Three broad-gage railway tracks enter the building, and two 15-ton electric cranes, one 28-ft. and one 77-ft. span, travel the entire length.

The main battery consists of the following apparatus:

	Capacity Tons
Two sample kettles	45
Two liquating kettles	60
Two softening furnaces (inside dimensions, 13 ft. 6 in. by 28 ft. 2 in. by 2 ft. 7 in. deep)	300
Two desilverizing kettles	100
One refining furnace	300
One molding furnace	200

INTERNATIONAL LEAD REFINING CO.'S PLANT, EAST CHICAGO, IND.

Flue in foreground, baghouse at right.

View from opposite corner.

The arrangement is such that the lead flows by gravity from one piece of apparatus to the next and is finally hand-molded and loaded by trucks into cars.

For the treatment of byproducts resulting from the main refining operations, the following equipment is provided:

	Capacity
Three residue furnaces, each 8x16 ft. by 20 in. deep (inside measurement)	30 tons each
Two circular blast furnaces, each 42 in. in diameter at tuyeres by 14 ft. high, with five 3-in. tuyeres	40 tons each
Eight retort furnaces	1300 lb. each
Two tilting cupels, Rhodes type	5 tons each

Common lead is further refined to yield a product suitable for corroding by the Hulst crystallizing process. The equipment of this department consists of the following:

	Capacity
Two crystallizing kettles	60 tons
Four heating kettles	20 tons
One press	

Gases from the cupel, residue and blast furnaces are conducted through brick and steel flues to a single bag house. The bag house is a building of brick and steel, 50x65x50 ft. The interior is divided into four separate chambers, each containing 144 woolen bags, 18 in. in diameter and 30 ft. long. The bags are shaken by an electric driven automatic shaking device. The gases are delivered to the bag house by an 8-ft. American Blower Co. fan, driven by a 35-hp. motor.

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*An abstract for a paper by G. P. Hulst, read at the Salt Lake meeting of the A. I. M. E.

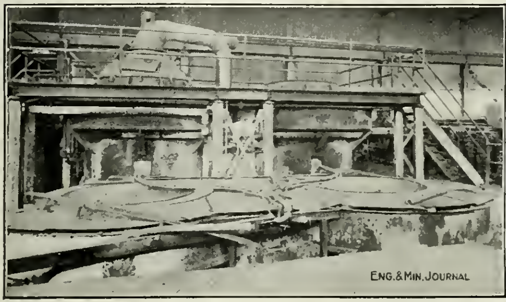
The change house is a brick building, 35x85 ft. It is equipped with sanitary toilets, wash basins and lockers. One room is arranged as a lunchroom for the men. The offices and laboratory are housed in a brick building 36x128 ft.

Lead bullion from Tooele containing about 99.5% lead, 65 oz. silver, 0.4 oz. gold, and varying amounts of copper, antimony, arsenic, zinc and bismuth, is received at the refinery in sealed cars and after being weighed is delivered into the softening furnaces by means of a steam-driven conveyor, constructed by Howe Scale Co. The sides and ends of these softening furnaces are water jacketed from the base plate to 3 in. above the slag line.

The products of the softening furnace are first skims; second skims and softened bullion. The first two are sent to residue furnace No. 1. The bullion flows to the desilverizing kettles. The copper skimmings are charged into the softener. In the desilverizing kettle bullion is treated with zinc and skimmed, yielding zinc skims and desilverized lead.

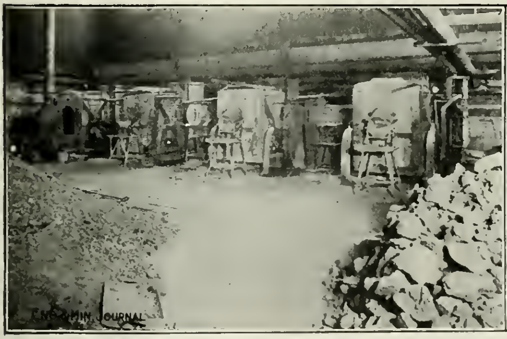
The zinc skims go to the retorts and the desilverized lead to the refining furnace. The products of the refined furnace are lead-zinc oxide, refinery skim and refined lead. The first product, depending on its composition, is treated in one of the residue furnaces or in the blast furnace. The skimmings go to residue furnace No. 3. The refined lead, in part, goes to the Pattinsonizing kettles for further treatment, and the remainder passes to the molding furnace.

At the molding furnace the lead is siphoned into molds arranged in the arc of a circle, as shown. The bars are removed from the molds and stacked by hand and are placed in stock ready for shipment.

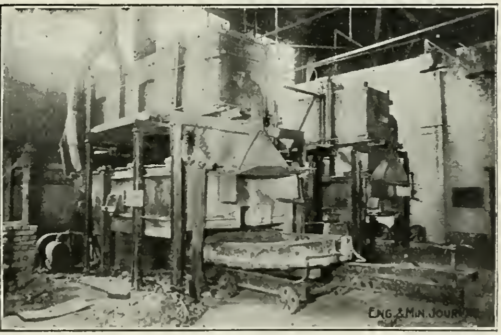


Lead Kettles

Mold Ring for Refined Lead



Zinc-Crust Distillation Furnaces



Cupeling Furnace

In the treatment of byproducts, the zinc skim produced at the desilverizing kettles is treated in four tilting retort furnaces, using oil as fuel. The products of this operation are retort zinc, retort breakings, blue powder and retort bullion. The retort zinc is returned to stock to be used again at the desilverizing kettles. Retort breakings are sent to the ore blast furnace. Blue powder is shipped to zinc smelters for treatment.

The retort bullion passes to two Rhodes-type cupel furnaces. These produce test breakings, copper litharge, yellow litharge and doré bullion. The test breakings go to the ore blast furnace, the two litharge products go to residue furnace No. 2 and the doré bullion is molded into anodes and shipped to the Raritan Copper Works for refining. The Pattinsonizing kettles are equipped for the Hulst crystallizing process.

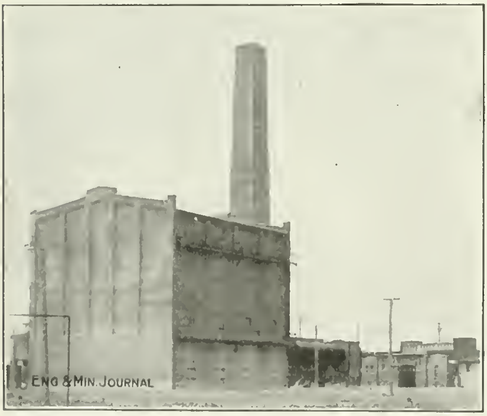
The lead received at the kettles from the refining furnace contains from 0.08 to 0.12% Pi. One crystallization reduces the bismuth from 0.08 to 0.05% and less. For lead containing 0.12% Bi, two crystallizations are necessary, if the crystals are drained by gravity; one is sufficient if crystals are pressed. With such a low-grade product subsequent treatment for the recovery of bismuth is not profitable. This department will produce 150 tons of refined corroding lead per day, with a bismuth content of 0.05% or less.

Residue furnace No. 1 receives sample-kettle dross, softening-furnace skims, flue dust from all sources and galena (80% Pb). The charge is weighed in over a small charging scale, and is so proportioned as to yield products of fairly constant composition. The products are bullion, refinery matte and antimonial slag. The bullion is returned to the softening furnace. The matte is shipped to the smelter for treatment and the antimonial slag goes to the antimonial blast furnace.

Residue furnace No. 2 receives only the litharge products from the cupel furnaces and galena. Its products are bullion, slag and refinery matte. The bullion is returned to the softening furnace, the slag goes to the No. 1 residue and the refinery matte is shipped to the smelter.

Residue furnace No. 3 treats the skimmings and dross from the refining furnace and from the Pattinsonizing kettles. These yield lead and skimmings. The former goes to the refining furnace, the latter to the antimonial blast furnace.

The ore blast-furnace charge is made up of lead ores, coke and flues, and the following byproducts: Retort breakings, test breakings and slag from residue furnace No. 3. The three products are slag, matte and bullion.



BAGHOUSE, INTERNATIONAL LEAD REFINING CO.

The slag goes to the dump, the matte is shipped to the smeltery and the bullion is returned to the softening furnace.

The antimonial blast-furnace charge consists of ore, coke and fluxes, and, in addition, antimonial slag from residue furnace No. 1 and skimmings from residue furnace No. 3. The charge weighs 1150 lb. The coke used is 12% of the weight of the charge. The products are slag, matte and antimonial lead. If no ore is used, the charge contains no sulphur and no matte or speiss is formed. The charge is carried low in the furnace under a light blast pressure (5 to 6 oz.). Arsenic is burned off and recovered in the flues and bag house.

The slag produced is sent to the dump. It has the following analysis:

	Per cent.
SiO_2	24.0 to 26.0
Al_2O_3	10.0
FeO	36.0 to 38.0
CaO	10.0 to 12.0
ZnO	12.0 to 14.0
Pb	1.5 to 2.0

Matte, when produced, is shipped to the smelter.

The antimonial lead is run to a liquating kettle, from which it is cast into bars for shipment. Consumers of this product commonly specify that the lead should contain: Antimony, 15 to 18%; arsenic, less than 1%; copper, less than 0.5 per cent.

⁂

July Mining Dividends

Thirty-five mining companies making public reports paid $7,654,337 in dividends in July, as against $7,234,529 paid by 38 companies a year ago. Steel, smelting and holding companies paid $3,320,245, a variation of a few dollars only; and Mexican and Canadian companies paid $1,605,950, as compared with $3,107,528 last year.

Company	Situation	Per Share	Total
Ahmeek...	Mich.	$2.00	$100,000
Arizona, c..	Ariz.	0.24	369,335
Anaconda, c	Mont..	0.75	3,474,375
Argonaut, g	Calf.	1.50	300,000
Kendall, g	Mont.	0.06	30,000
Brunswick, g. .	Calif.	0.06	23,717
Bunker Hill & Sullivan, l.s..	Ida.	0.25	81,7500
Bunker Hill, g .	Calif.	0.02	10,000
Camp Bird, pf. g.	Colo.	0.17	100,565
Continental, z. .	Mo.	0 50	11,001
Center Creek, z.	Mo.	0 05	5,000
Daly Judge, s. l.. .	Utah	0.15	45,000
Fremont, g.	Calif.	0 02	4,000
Golden Cycle, g.	Colo.	0 03	45,000
Hecla, l. s.. .	Ida.	0 02	20,000
Homestake, g.	So. Dak.	0.65	163,254
Iron Blossom, s. l. g	Utah	0.10	100,000
Mary McKinney, g..	Colo.	0.02	26,185
North Butte, c	Mont.	0.50	205,000
Old Dominion Cop. M. & S. Co., c.	Ariz.	1.25	202,500
Osceola, c.	Mich.	1 00	96,150
Pittsburgh-Silver Peak, g.	Nev.	0 02	55,800
Portland, g...	Colo.	0 04	120,000
Ray, c.. .	Ariz.	0.37$	543,964
Silver King Con., s.	Utah	0 10	62,000
Shattuck-Arizona, c...	Ariz.	0.50	175,000
Tonopah-Belmont, g.s..	Nev.	0.25	375,000
Tonopah Extension, g. s.	Nev.	0.05	70,769
Tonopah Mining, g. s.	Nev.	0 05	250,000
Utah Consolidated, c.	Utah	0.50	150,000
United Globe, c.	Ariz.	4 00	92,000
Vindicator, g...	Colo.	0 03	45,000
Wasp No. 2, g.	So. Dak.	0.01	5,000
Tom Reed, g. .	Ariz.	0 06	54,573
United Verde, c...	Ariz.	0.75	225,000
Yellow Aster, g..	Calif.	0.03$	5,000
Yosemite, g	Calif.	0.01	2,400

Iron, Industrial and Holding Companies	Situation	Per Share	Total
Am. Smelter's Sec., pf. A.. ..	U. S.	$1 50	255,000
Am. Smelter's Sec. pf. B	Mex.	.125	375,000
Bethlehem Steel..	zenn.	1.25	186,350
Cambria Iron.	Penn.	2.00	169,360
Guggenheim Expl.	U.S., Mex	0.87$	727,768
Old Dominion, c	Ariz.	1.00	293,353
Penn. Salt ...	Penn.	3.00	150,000
Republic Iron & Stee...	U. S.	1.75	357,296
Sloss-Sheffield, s. & I...	Ala.	1.75	117,250
U S Sm., Ref. & Min., com..	U S.	0.75	263,332
U S Sm., Ref. & Min., pfd.....	Mex.	0.87$	425,536

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Beaver, s .. .	Ont.	0 03	59,989
Buffalo, s.	Ont.	0 05	50,000
Canadian Goldfields, g..	B. C.	0 0011	50,000
Con Min & Sm... ..	B. C.	2 00	116,088
Crown Reserve, s. .	Ont.	0.02	35,376
Hollinger, g . .	Ont.	0.15	90,000
La Rose, s ...	Ont.	0.25	374,656
Lucky Tiger, g. s..	Mex.	0.09	64,380
McKinley-Darragh, s..	Ont.	0.06	134,861
New York & Honduras Rosario, g..	C-A.......	0.30	60,000
Nipissing, s	Ont.	0.25	300,000
Nova Scotia, S. & C. pf	N. S.	2 00	20,600
Nova Scotia, S. & C., com.	N. S.	1.50	90,000
Porcupine Crown, s	Ont.	0 03	60,000
Standard, s. l	B. C	0 02$	50,000
Tretheway, s	Ont	0 05	50,000

Dividends for the first seven months of the year are: Mining companies, $40,580,220 in 1914; $45,450,722 in 1913; metallurgical and holding companies, $45,034,348 in 1914; $44,419,761 in 1913; Canadian, Central American and Mexican companies, $11,500,862 in 1914; $13,879,295 in 1913.

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An Ingenious Smoke and Fume Recorder is described in "The Electrician," June 5, 1914. It appears that flue gases are highly ionized when free from smoke and solid fume. Where these are present ionization falls off. Spark gaps are arranged inside and outside the stack. If fume is present the discharge takes place outside, and actuates a bell by means of a coherer.

Editorials

The Copper and Silver Markets

In interviews with all of the leading agencies selling electrolytic copper, six in number, on Aug. 3, it was certified unanimously to me that at present there is no market for copper. There being no transactions, it naturally follows there can be no quotations based on transactions; and we are obliged to suspend our record of the market for the reason that there is none.

Similarly there are no quotations for silver.

W. R. Ingalls,
Editor.

The Great Calamity

The greatest calamity in the history of modern civilization has come. All that will happen from it no one is wise enough to prophesy. We see how the United States already is suffering, although it is a non-participant in the armed conflict of Europe. We regard it as a wicked thing and look upon it with sickening horror. But so closely is the world now knit by ties of commerce that no country doing business with Europe can escape the consequences of the crisis there.

The first manifestation in America was Europe's liquidation of American securities, precipitating huge declines in the New York stock market. The manner in which this was met for several days, after the bourses of the Continent had been closed and business had practically ceased in London, was impressive testimony of the inherent soundness of American finance.

On the afternoon of July 30, there was a wave of hysterical liquidation which sent prices to their lowest. The London Stock Exchange had practically suspended and the selling of securities from all parts of the world was focussed on New York with the result of drawing America's gold resources and completely upsetting the normal conditions of the rates of international exchange. The principal bankers of New York met that night but decided that conditions were not yet serious enough for drastic action.

On Friday morning, however, the news from Europe was worse and the opening of the New York Stock Exchange was awaited with forebodings bordering on terror. News came of the formal closing of the London exchange. The governors of the New York exchange were hastily summoned together. While they were in session came the news that the German Emperor had decreed a state of war to exist. Immediately afterward, about 9:50 a.m., the statement flashed over the wires that the New York Stock Exchange would not open and there was a murmur of relief. A panic had been averted. Immediately afterward it was reported that all other exchanges in the United States would be closed. The declaration of war by Germany upon France and Russia was made on Sunday, Aug. 2.

Commercially, there has resulted a stoppage of business, not only in Europe but also to a large extent in the United States. At the moment we cannot export our cotton, copper or wheat and have our surplus of those commodities piling up on us. The copper producers took the bull by the horns and the leaders ordered curtailment of production even before war was declared. If they had not, the banks would have refused to finance their surplus. It is probable that all of the principal producers will reduce their output 50%, which presumably will about adjust it to the requirement of the American market.

War is declared in Europe and men are thrown out of employment in Butte, and Broken Hill, far away in the antipodes, is disturbed. American steel makers are troubled by checking of their supply by manganese ore from Russia. Silver miners all over the world are rendered idle by there being no market for silver.

These are some of the ways wherein the American mining industry has already been seriously disturbed. Probably many others will develop or have already done so and have not yet been reported. Nobody yet can surely tell the consequences of this wicked, sickening war either in big things or little things.

There is one feature in this country that is highly satisfactory and that is the immediate sinking of selfish interests in patriotic coöperation for the general welfare. The brokers did nobly in promptly closing the stock exchanges, the bankers exhibited their patriotism in refusing to call loans, Washington swiftly forgot what only a few days ago was regarded as persecution of big business and loyally joined hands with the exponents of big business, the Interstate Commerce Commission tempered its rate decision, the Western railway men averted the threatened strike. All of this is as it should be and must be. In these troubled waters every American must pull together; we are all in the same boat. We may not profit from Europe's trouble. We ought not to want to. But we thank God that we are not suffering bloodshed and the destruction of property and we hope to pull into calm waters ere long.

The Situation of the Metals

All previous calculations have been upset by the war in Europe. As nearly as we can diagnose the immediate situation, it is as follows:

The little revival in iron and steel that became noticeable about the middle of July has probably been checked by the shock, but after its first effects are over there may again be a start forward.

Silver is chiefly a matter of the London market, whereof the New York market is but a shadow. The suspension of quotations in London was necessarily followed by a suspension in New York. For the moment the silver business is at a standstill. If Britain secures mastery of the sea the business in silver with India and China probably would be resumed and exports of American silver also.

Next to silver copper is hit hardest. A few months ago we were congratulating ourselves that the international character of the copper market was its saving feature; while domestic demand was slack, the European was absorbing our supply. Now that very condition is our weakness. The only thing is for our mines to curtail their output to about the domestic requirement. Already they are doing that. At present there is no market for copper, but soon there will be, we hope, and some day we shall once more witness a big demand. We may only pray that it will not be delayed too long.

Our lead is chiefly marketed at home, but during the last six months our demand has been poor and we have exported about 20,000 tons to Europe, whose supply was shortened by the absence of the Mexican output. Just before the outbreak of the war, things had straightened out in northern Mexico, so that the American Smelting & Refining Co. was considering resuming smelting there. We should think that plan might now be delayed. Anyway, we are likely to have some accumulation of domestic lead pending the self-adjustment of business to new conditions, although a demand for this metal has continued right through these evil days.

The producers of spelter have been carrying the largest stocks in the history of their industry. Immediate conditions may cause some of them to want to realize. The spelter market is more a domestic market than any other and it is not unlikely to make the best showing during the war. Important European spelter producing districts are in the war zone. The German army invading France is passing right through the Liège district in Belgium, while the zinc mines and smelteries of Upper Silesia are only a few miles from the Russian frontier. The war may be expected to interfere with the Belgian and German production and American spelter may conceivably be needed in Europe and in other parts of the world that Europe has heretofore supplied.

We may be hampered about our supply of tin by the interruption to ocean traffic. In this and in our foreign trade in other metals we must await the development of some working arrangement in international exchange and the assemblage of ocean carriers that may sail under neutral flags or such control of the sea by Great Britain as will permit her ships to run.

Saving in Milling

The percentage of mill recovery is one of the ancient problems of the metallurgical industry. We read monthly statements from the big mining companies, porphyry coppers and otherwise, to the effect that their extraction was 71.26%, or some similarly specific figure, and we accept it as being something absolute, not pausing to consider whether it be accurate or not; in other words, nobody is concerned in going behind the returns, except a few specially interested persons, say the consulting engineer who is making a physical examination in the interest of bankers who may be contemplating lending money on the property. In fact, however, the determination of mill extraction is about the most difficult of metallurgical problems, and it is one that has never yet been quite satisfactorily answered.

Broadly speaking, there is just one way of determining positively the percentage of extraction from any ore by any process, and that is represented by the formula $X = B \div A$, in which X is the percentage of extraction, B the quantity of metal that is in the concentrate coming out and A the quantity of it in the ore going in. The difficulty of this method is that while B is ordinarily closely determined in the natural course of the business, A cannot commonly be any more than guessed. It is only in the larger and more modern mills that the input is weighed and sampled, and even so there is a good deal of guesswork about the moisture content and the allowance that should be made for it. However, assuming accuracy in the determination of input, the quotient X may be fairly determined only when the figures for A and B represent a rather long time.

The figuring for a smelting works is in some respects easier than for a mill. The input is carefully determined because it is bought and paid for, and the output because it is sold. However, we know of plenty of instances where in trying to figure the performance of one furnace for one day $X = +100$; and we know of instances where the monthly figures for a works persistently ran 89 to 91%, while the annual figure was about 87%, which agreed with the accountant's ledger. Manifestly, there was error in the metallurgist's figuring, but it was not easy to put the finger on it. A troublesome condition of any computation of this sort is the status of between-products and the difficulty of reckoning them exactly.

Another method of estimating mill extraction is represented by the formula $X = B \div (B + C)$, in which C is the metal escaping in the tailings. This method evades the difficulty of determining the input by assuming that the sum of the products is equal to what is put in. Manifestly, this method falls down completely in figuring the extraction in some new plants, wherein a good deal that is put in does not come out, but is absorbed in the apparatus, "salting" it in the vernacular. The extraction of a zinc smeltery could never be figured in this way by reason of the zinc absorbed by the retorts, which are constantly being replaced, and by reason of the vapor escaping uncondensed, which can neither be weighed, measured or sampled. Such an experience as the cleaning up of the old Anaconda copper-smelting plant several years ago indicates that it would be inapplicable to any smelting plant.

In the simpler process of milling, however, this method may be usefully employed, either as a check upon the other method, or as the sole index of results in those cases where input cannot be determined. Thus, in the mining and milling practice of the Joplin district, we cannot conceive of any practicable way of measuring and sampling the mill feed. The commercial conditions of the district do not permit of it. However, the Joplin mills as run at present do not permit of the other method either, a *sine qua non* of which is the discharge of the tailings through a single spout. Joplin mills usually discharge through a half a dozen, or more, spouts, on all sides of the building, seeing which the testing engineer throws up his hands in despair. This is one reason why no one knows, even at this late day, what is really, or nearly, the milling extraction of that district. There is nothing but surmise, based upon fragmentary evidence, which may be approximately correct, and may not be.

Whatever be done in the way of determining mill extraction, it is certain that the tailings ought always to be sampled carefully, inasmuch as the thing that, after all, primarily concerns the mill-man is what he is losing and how far it will pay him to go in cutting down the loss. If these data afford an opportunity to compute the percentage of extraction from the ore, well and good, but it is important to bear in mind that while a 90% extraction from $2 ore is a very good accomplishment, 90% of a $20 ore leaves a tailings that demands attention, and in these days gets it, of course.

BY THE WAY

We have just received an alluring prospectus, which appears to afford an opportunity to recoup war losses:

> Containing gold, silver and platinum, also a new metal yet unknown to science. These properties were originally located for their potash, borax, soda and salt that they contained, but it was found that these products could not be made to pay. They are situated in the region of Death Valley, Calif., and can be easily reached with a good auto. After many months of research work, we have discovered that these saline deposits contain gold, silver and platinum in a chloride form, and in a different form heretofore known in chemistry (not published). How to separate these values cheaply and commercially has been finally accomplished by us, after a lot of costly experimenting and a year's time. The average values that we found in gold, silver and platinum, from 75% of the assays taken, from over an area of four sections of 640 acres each (in all 2540 acres) was $100 per ton, 25% of gold. This means at the rate of $500,000 per acre, or $10,000,000 per single miner's claim of 20 acres, and that is only taking the deposit down to a depth of 4 or 5 ft. from the surface. An option on these properties can be obtained. We are looking for capital to help us finance the same. To parties who are willing to finance the entire proposition we are willing to coöperate on a fair equitable basis.

*

The general manager of one of the leading zinc-smelting companies of the United States received recently a letter from an applicant for a position, which embodied some curious remarks and prompted the general manager to indite a reply as follows:

> Yours of the 16th received and I must say your letter makes a very good impression. We decided for the present not to fill the position, waiting a few months until business conditions are a little better. At present we have one-third of our plant shut down. I cannot refrain, however, from referring to the last part of your letter, where you say:
>
>> Before accepting the position, however, I would have to know something about your status in the zinc industry. The past history of zinc in Oklahoma has been so characterized by inefficient mining, crude extraction and unorganized sales departments that it has looked discouraging to a technical man. I trust that the period has passed and that the industry is now on a more scientific basis.
>
> As you never worked in a zinc-smelting plant it is supposed you know nothing about it. Of course, we admit that all the fools are congregated in a zinc smeltery, and if you look over the bunch, it is probably not surprising that the zinc industry is in such a poor shape. We admit these technical men (and you know they are all technical men these days that are in charge of our works, graduates from the best universities of Europe and the United States) are possibly the poorest products ever turned out. We have found, however, that when the well known lead metallurgists have tried zinc smelting they have admitted there may be something to this easy zinc-smelting metallurgy. In other words, they turned fools after a few years. Now we are just waiting for a "genius" to drop into zinc smelting because we surely need one. As to our own references, you may inquire of Mr. Ingalls, editor of the "Engineering and Mining Journal." We hope that reference is sufficient.

The general manager sent us a copy of his letter with the following remark: "Previously I did not know that even the children were aware of our shortcomings." This shows how excellently the "professors" have taught that the zinc metallurgists live and work in the gloom of ignorance, although we have frequently mentioned that it is the "professors" who are ignorant.

The investigation of the miners' strike, which a committee of Congress conducted in the Copper Country this spring, was productive of a good deal of technical information, as well as other material of more lively interest. At one time Congressman Casey, whose sympathies were all with the strikers, asked about the voting for the members of the Calumet & Hecla trust-fund administration board, saying that he understood the mining captains stood around while the ballots were being cast and directed the men to vote for the company candidates. Mr. MacNaughton retorted that they must have done some standing, since the voting extended over a period of a week or 10 days. Congressman Casey again asked whether it was frequent for men in the mines to change their names in order to avoid being garnisheed. Mr. MacNaughton said he never heard of their doing it for that reason, but that they did frequently change their names. He remembered one occasion on which a man sued one of the Calumet & Hecla companies, about two years ago, for an injury. He brought suit under his own name, and then went to work for the same company under an assumed name, thus working for it and suing it at the same time. Congressman Casey said that could be easily understood. It can. Mr. Casey seemed to be the chief inquisitor on the committee. He brought up the system of presenting grievances by an employee, asking whether Mr. MacNaughton thought that an ordinary man with a family of eight or nine or ten or eleven children, who had a grievance, would like to come and present it before him, Mr. MacNaughton, the man who had the right to discharge him, and thus take the risk of shutting off his income and the support of his family.

Mr. MacNaughton replied that Mr. Casey was not much acquainted with the men of the district, or he would know that such a man would readily come to the office and he would take care to bring every one of his children with him. Further, if chance permitted, he might borrow a few. Congressman Casey asked whether this was general in that part of the country, and Mr. MacNaughton said it was; but we do not suppose he referred particularly to the borrowing of children. An attorney for the strikers, grilling Mr. MacNaughton on cross-examination, attempted to find out what his salary was. It has been reported that it was $100,000 per annum. Mr. MacNaughton wouldn't answer, and some dispute arose about the question among members of the committee. At last Mr. MacNaughton apparently got irritated and said, "My salary is not $100,000 a year; and, otherwise, it is none of your affair, and I won't tell you." The record states that this was productive of applause and demonstration.

The same attorney in an impassioned speech said, "Any community that stands for and is an exemplar of a salary of $30,000, or $50,000, or $75,000, or $100,000 a year, while behind that man stands a fellow that is working for 20c. a week, or less, as shown by the evidence, is an affront to organized labor, to the dignity of organized labor, and an insult to the genius of American institutions." This provoked Congressman Switzer, who apparently had a leaning toward the operators' side, to say: "What about $7500?" We understand this is the salary of a congressman, and Congressman Switzer apparently wanted to know where he got off at in the attorney's estimation.

PERSONALS

H. C. Enos, of Mexico City, is examining mines in California for Eastern capitalists.

Clarence T. Emrich is assayer and chemist for the Caribou Mines Co., Caribou, Colorado.

Hoyt S. Gale of the U. S. Geological Survey is visiting California and examining the magnesite deposits in the State.

Harry J. Wolf, now in San Francisco on professional business, will inspect mining property in Nevada and then return to Denver.

George E. Collins expected to sail from England on his return home about the end of July, his intention being to proceed directly to Denver.

Mark R. Lamb, mining engineer and representative of the Allis-Chalmers Co. in Chile, who has lately been visiting the United States, has returned to Chile.

Edward C. Weatherly, after spending the winter in London, Eng., has returned to his home at Ouray, Colo., where he will develop his Chrysophir group on Hayden Mountain.

Kirby Thomas is at Ouray, Colo., making an examination of the Old Laut mine. He will proceed to other examinations in Nevada, California and Arizona before returning to New York.

Frank H. Sistermans has left El Paso, Tex., for Batopilas, Western Chihuahua, where he will be engaged in examination work, returning to New York towards the middle of September.

Fred. C. Bennett, formerly of the rail mill of the Maryland Steel Co., Sparrows Point, Md., has just gone to India to become superintendent of the rail mill of the Tata Iron & Steel Company.

Prof. Wyndham Dunstan, director of the British Imperial Institute, has sailed for Newfoundland to investigate the oil and other mineral resources of the colony on behalf of the British government.

Thomas H. Edwards, formerly of the National Tube Co., McKeesport, Penn., has been appointed general superintendent of the bessemer steel department of the Wheeling Steel & Iron Co.

C. M. Eye has been appointed manager for the Benguet Consolidated at Baguio, Philippine Islands, and will sail from San Francisco Sept. 26. In the meantime he has gone to Colorado to test a shipment of Benguet ore and to purchase machinery for the mine.

Walter W. Bradley, field assistant of the California State Mining Bureau is at present in Madera County, from which region he will go into Fresno and King counties. Mr. Bradley was formerly librarian of the bureau, and in the past year has done a large amount of field work for the bureau in some of the northern counties of the State.

Erroll MacBoyle, field assistant of the California State Mining Bureau, has completed work in Plumas and Nevada and some other northern counties, and is now ready to go into Sierra County. He will work from there south through Mother Lode counties to San Francisco. Mr. MacBoyle is connected with Burch, Caetani & Hershey of San Francisco, and has made mine examinations for the firm in California and Philippine Islands.

OBITUARY

George Vreeland Tompkins died at Basking Ridge, N. J., July 30, aged 65 years. He was well known as a metal dealer in New York for many years.

News was received by cable July 29 of the death of Professor Martens of the Royal Testing Laboratory, at Berlin. He was widely known as an expert metallurgist who had devoted himself to research into metallurgical problems.

R. C. Wolfram, manager of the West Dome mine, Porcupine, was on July 30 found dead in his room at a hotel in North Bay with a bullet wound in his head. A large revolver was found near the body indicating that he had committed suicide.

Archibald Blue, chief officer of census and statistics for Canada, died at Ottawa July 27, after an illness of about two years, aged 74. He was born at Oxford, Ont., and after having been engaged in journalism for many years entered the service of the Ontario government. In 1882 he organized the Bureau of Industries and in 1884 became Deputy Minister of Agriculture. He subsequently acted as secretary of a commission of inquiry into the mineral resources of the Province and when the Bureau of Mines was formed in 1891 he was appointed director. Mr. Blue retained this position until 1900 when he went to Ottawa as chief census commissioner for Canada, becoming in 1905 chief officer of census and statistics. He was the author of several works dealing with the growth and industries of the country. He leaves a widow and three sons.

Arthur Otis Granger died in Philadelphia, July 30, aged 68 years. He was born in Providence, R. I., but passed nearly all his active life in Philadelphia, or at Cartersville, Ga., where he had mining interests. In 1886 he was president of the United Gas Improvement Co.; in 1888, president of the Welsbach Light Co., the Chautauqua Lake R. R. Co., and the Etowah Iron Co., and when he retired he was president of the American Gold Dredging Co., the Caribbean Co., the Auer Incandescent Light Co. Mr. Granger was a life member of the Franklin Institute and the American Institute of Mining Engineers, the American Association for the Advancement of Science, and the Society of Arts of London.

W. H. Tallman, who died at Wheeling, W. Va., July 22, aged 74, was one of the pioneer iron and steel manufacturers of the Ohio Valley. He and others organized the Ætna Iron & Nut Company in 1872 and he was president of the Ætna Iron & Steel Company as reorganized in 1886, continuing in that office until 1893. He was also one of the founders of the Standard Iron Company. Mr. Tallman retired from active business in 1893 when the Ætna and Standard Steel companies were combined in the Ætna-Standard Iron & Steel Company. He was connected with a number of interests, banking and industrial, in the Ohio Valley, and had much to do with the building up of the steel industry in that section.

SOCIETIES

Oregon-California Mining Congress.—This society has just closed its session in Ashland, Oregon, electing the following officers for the ensuing year: President, Hon. James Logan, Waldo, Oregon; first vice-president, G. W. Meredoff, Kennett, Calif.; second vice-president, J. O. Gillson, of Shasta County, Calif.; third vice-president, M. E. Bittmer, Reading, Calif.; fourth vice-president, G. A. Reichman, Fort Jones, Calif.; secretary, G. F. Hellmugh, Etna Mills, Calif.; treasurer, F. J. Newman, Medford, Oregon. Etna Mills, California, was selected as the place for holding the next session of the congress, the date to be set later and during the month of April or May 1915. The congress will send an exhibit to the Portland Land Show and also to the Panama Exposition at San Francisco in 1915.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

BRIQUETTING APPARATUS—Nils V. Hansell, Bloomfield, N. J., assignor to American Grondal Co., New York, N. Y. (U. S. No. 1,105,510; July 28, 1914.)

ORE CONCENTRATOR—Peter Stenger, Fort Wayne, Ind., assignor to Deister Concentrator Co., Fort Wayne, Ind. (U. S. No. 1,105,109; July 28, 1914.)

CONCENTRATORS—Pulp Distributor for Concentrators. Wilton E. Darrow, Sutter Creek, Calif. (U. S. No. 1,104,969; July 28, 1914.)

CYANIDING—Apparatus for Filtering Valuable Compounds. Newton A. Burgess, New York, N. Y., assignor to Butters Patent Vacuum Filter Co. (U. S. No. 1,103,345; July 14, 1914.)

FUEL—Apparatus for Distributing Pulverized Fuel. Henry H. Blake, Pittsburgh, Penn., assignor to Blake Crusher & Pulverizer Co., Pittsburgh, Penn. (U. S. No. 1,104,404; July 21, 1914.)

IRON—Briquetting Iron Ores. Walther Mathesius, Charlottensburg, Germany. (U. S. No. 1,104,124; July 21, 1914.)

LEACHING—Electrolytic Apparatus. John D. Fields, Butte, Mont. (U. S. No. 1,104,646; July 21, 1914.)

MAGNESITE—Process of Making Sintered Magnesite and Dolomite. Eduard Pohl, Rhöndorf-on-the-Rhine, Germany. (U. S. No. 1,103,375; July 14, 1914.)

MINING-CAR WHEEL—Hugh W. Sanford, Knoxville, Tenn. (U. S. No. 1,104,549; July 21, 1914.)

ORE TREATMENT—Process of Treating Ores. Frank P. Arnold, Carbondale, Penn., and George F. Wedeman, Washington, D. C. (U. S. No. 1,104,239 and 1,104,287; July 21, 1914.)

RADIO-ACTIVE BARIUM COMPOUNDS—Method of Treating. Herbert N. McCoy, Chicago, Ill. (U. S. No. 1,103,600; July 14, 1914.)

The Railroad Rate Decision

WASHINGTON CORRESPONDENCE

The long-expected decision of the Interstate Commerce Commission in the so called advance rate cases was delivered by the Commission on Saturday, Aug. 1, late in the afternoon. The report covers the whole question of advanced rates on railways as affected by the application of four years ago, which was then refused, and as affected by the application which has been under consideration and is now settled. It is an interesting fact that the rate decision in a number of cases refers to mining products and assigns them a treatment different from that accorded to other items of freight. In dealing with the application for higher rates, the report now delivered says, after reviewing the general character of the problem:

"Protests against a general increase in freight rates were presented by the railroad commissions. . . . Protests against proposed increases in rates so far as they affect specific articles, of which the tonnage in some cases is large, were presented by many shippers, and particularly by shippers of coal, coke, ore, brick, cement, lumber, ice, sand, gravel, paper pulp, corn products and petroleum."

The commission reviews the merits of the argument quite fully and reaches the conclusion that the roads in Eastern territory are not receiving a satisfactory revenue and that they ought to be permitted to obtain more through an increase in rates. The claim, however, is made that there is a good deal of difference between the New England territory, the Central Freight Association territory and other portions and that a different treatment in these is required. Dealing specifically with the question of an advance, the commission exempts mining products from the application of higher rates, saying:

"We have seen that the class rates in Central Freight Association territory are on a lower scale than can be found elsewhere in the country and that many of the commodity rates are too low and are probably unremunerative, considering the diversified nature of the traffic. The class rates and many of the commodity rates may, therefore, with propriety be increased. This approval, however, is subject to the following limitations:

"(a) With respect to certain heavy commodities, namely, brick, tile, clay, coal, coke, starch, cement, iron ore and plaster, protestants made such a showing as to constrain us to hold that the carriers have failed to sustain their burden under the statute.

"(2) Reference has heretofore been made to the fact that the proposed tariffs are based on a minimum increase of 5c. per ton on all commodities moving under rates stated in cents per ton when less than $1 per ton; with respect to certain hauls, this would result in increases much in excess of 5% and in certain cases the increases would be as high as 50%. The carriers have failed to establish the propriety of this minimum increase, and the evidence offered by the protestants makes it clear that it would work hardships and discriminations and cannot be approved, since under it a disproportionate burden is cast upon the heavy short-haul traffic. . ."

There is an interesting point in the portion of the report which deals with those railways which are largely engaged in the carriage of mining products. Attention is called to the fact that the coal-carrying roads are very prosperous and then attention is turned to methods that may be employed by the railways in general for the purpose of economizing their outlays. In this connection attention is called to investigations not heretofore announced, by the Bureau of Mines, and the Commission says:

"Fuel is, next to wages, the largest item in operating expense. The railroads of the United States report their aggregate fuel cost to be about $250,000,000 a year. But the actual cost is much greater; for the reported figures do not include, ordinarily, the cost of hauling the fuel on the lines of the carrier by which it is used. Furthermore, the cost of coal is increasing. Much has been done in recent years by means of mechanical devices and otherwise to reduce fuel costs. Thus the Baltimore & Ohio since 1910 reduced its coal consumption 9.50% per unit of freight traffic moved. But it has been demonstrated clearly that by knowledge and care on the part of employees and the management much greater savings can be made. With the assistance of the Bureau of Mines, questions were framed calling upon the carriers for details bearing upon this subject. Other investigations are being made by the Commission."

In closing, the Commission says: "The contention of the carriers is that upon investments in property amounting to approximately $640,000,000 since 1910, no commensurate return has been made, and that the net operating revenue between 1910 and 1913 shows an actual decline—additional investment cannot be expected on the showing made on the last increments of investment. . . . It is not necessary to say that on such a showing the investing public will hardly be eager to intrust its funds to transportation enterprises."

Geheimrat Martens

BY DR. HENRY M. HOWE

The death of Geheimrat Martens removes a stately and inspiring figure, a man who without self-assertion, indeed with apparent self-forgetfulness, has played a very important part in the development of the present wonderful industrial eminence of Germany. Our many conferences in the meetings in the Council of the International Association for Testing Materials, from 1901 till 1912, convinced me from the first of the exaltation of his character and the breadth of his views. Representing widely divergent social conditions, the autocratic and parental on one hand and the democratic and individualistic on the other, we approached most problems from opposite points of view, but we usually came to like conclusions. When he asserted his great powers, you felt that it was not because of the prominence which this gave him, but in spite of it. His ready self-abnegation was shown by his cheerful abandonment of the work of investigation, for which he had rare powers, and accepting instead the arduous and rather thankless task of administration. All reasonable people, even in differing with him, must have felt absolutely sure of the nobility, genuineness, and depth of his convictions. Those of us who knew him even moderately well must have felt the warmth and tenderness of his heart, unmaskable by the more prominent aspects of so dominating, indeed so overwhelming a personality.

Editorial Correspondence

SAN FRANCISCO—July 29

Kennedy System of Tailings Storage will be completed by an Eastwood multiple-arch dam in course of construction at the Kennedy mine. The tailings are from the 100-stamp mill. The tailings wheels, which were completed in the early part of the year, have been operating successfully, and a careful study has been given to the action of the tailings after being passed over the wheels and distributed on the low ground beyond the hill, over which the tailings are elevated. It was practically conceded in the beginning of the installation of the wheels that a solid dam would be necessary, in order to properly impound the tailings and prevent any possibility of escaping into the streams. The tailings are elevated approximately 105 ft. from the intake at the first wheel to the plane of delivery from the last wheel, and travel a distance of 1120 ft. This hill over which the tailings are elevated is part of a low range between the Kennedy and Argonaut mines and the town of Jackson. The tailings are distributed on what is known as Bright's field, which has a gradual slope toward the town, and through it a small stream of water flows. The narrowest part of this field has been selected as the dam site. The dam will be 440 ft. long and 30 ft. high. It was necessary to get down to bedrock for a foundation. The spans of the arches are 40 ft., making the buttresses 40 ft. apart. The dam will be 2600 ft. from the last wheel. The area thus provided will be sufficient to take care of the tailings from Kennedy mill for several years. It is expected to have the work completed by November.

An Important Improvement in Dredge Construction, the manufacture of stock-steel hulls, was marked by the completion and launching of the new steel hull of Yuba No. 4 dredge at Hammonton, Calif., July 26. The early designs of steel hulls for dredges of large bucket capacity were found in some respects to be faulty. In the completion of Yuba No. 14 dredge and subsequent operation, it has been demonstrated that the faults of earlier designs were not only correctable, but easily corrected. Taking No. 14 as an example of what may be safely called a perfect steel dredge, the Yuba Construction Co. has laid plans for the manufacture of steel hulls of a common size, which may be adapted to the reconstruction of all of the smaller wooden hull boats in the Yuba Basin field, operated by the Yuba Consolidated Gold Fields. Yuba No. 3 dredge is also being reconstructed with a new steel hull. There are now five other wooden-hull dredges operated by the company which may be adapted to the stock-steel hull, of which the new hull of Yuba No. 4 is the initial example. The operating company has installed 13 wooden-hull dredges, the last one, No. 13, is a 15-cu.ft. bucket dredge; No. 1 and No. 2 were of 6-cu.ft. bucket capacity; the others were all equipped with 7½-cu.ft. buckets. No. 10 dredge was destroyed by fire. No. 5 was sunk. No. 4, the hull of which has just been launched, was taken out of commission on account of serious damage to the wooden hull. No. 3, for which a new steel hull is now ready for construction, is still in commission, and when the new hull is launched the dredge will be run alongside and the machinery transferred from the old wooden hull to the new steel one. As in the case with No. 4, there may be some new parts necessary, but on the whole the machinery is in good repair, and with some special renewals will be equal to the life of the steel hull. It is understood that all the wooden-hull boats except No. 13 will be provided with steel hulls in order, and it is not improbable that the time will come when No. 13 also will be thus provided. It is the last of the wooden-hull boats built in this field and was exceptionally well built.

DENVER—July 30

A Cloudburst at Telluride, July 27, caused considerable damage. Two deaths resulted. Much of the town was submerged in mud and débris to a depth of 5 or 6 ft., while many buildings were destroyed. The telephone operator informed most of the residents of the sudden danger.

A. S. & R. Co.'s Smelting in Colorado, states an official of the American Smelting & Refining Co., is approximately 55,000 tons of ore per month, this being about the average for the last two years. The largest tonnage in a single plant is being treated at the Arkansas Valley plant, at Leadville, where five furnaces are in blast. Three furnaces are in use at the Globe plant in Denver and the same number at the Pueblo plant, each plant occasionally blowing in a fourth unit. The Durango plant is running but one furnace. The Cripple Creek district furnishes 3000 tons of smelting ore per month. While this ore is highly siliceous, it is desired in smelting, especially for use in pot roasting at the Arkansas Valley works.

Interest in the Moffatt Tunnel, a 6-mile bore through the main range of the Rocky Mountains, at James Peak, continues even, though the tunnel is but a project. Last spring Denver voted to issue bonds for the construction of this tunnel, but a subsequent court ruling declared the city could not constitutionally incur such indebtedness. This materially affected the plans of the Denver & Salt Lake R.R., successor to the Denver, Northwestern & Pacific R.R., and for a time the project languished. However, the city's tunnel commission could not be persuaded to resign. Denver has a commission government. The five official commissioners that constitute the City Council looked with disfavor on continuance of the expensive tunnel commission. Dissension assumed positive shape in a recent act of the Council repudiating bills incurred since the proposition was declared legally impossible, and in refusing further appropriations. A dispute has therefore arisen among politicians, with the probability that, notwithstanding the utter uselessness of the commission, its existence must be financially provided for until the city can vote to discontinue it. Mining interests of western Colorado and northeastern Utah desire the building of this tunnel and an extension of the railroad beyond its present terminus, Steamboat Springs. While the dispute has been on, a party of men prominent in the affairs of the railroad has been touring the line, and General Manager Morse is reported as having said that his company has raised one-third the required capital and that the balance will probably be raised by individual investments.

SALT LAKE CITY—July 30

Report of the Surveyor-General for Utah for the year ended June 30, 1914, shows that an aggregate of 2881 miles of surveys have been made, at a cost of $38,300. The report outlines all operations in the various divisions of the work, and recommendations are made for increased funds for field and office work during the present fiscal year, as the office has a large amount of work to do on unsurveyed lands, which need early attention. Field work on 54 townships was filed during the year, and 94 townships, comprising 1,466,520 acres, were surveyed. The survey of mining claims decreased as compared to the year preceding, it being shown that only $2944 was deposited for this work, as compared to $5553 the previous year.

HOUGHTON—Aug. 3

Franklin's Developments on the Allouez Conglomerate Lode continue to be satisfactory. Work has been carried on slowly, but all of the openings to date have been in ground which averages better than that which the Franklin formerly mined at a profit. The rock which is now being taken out is treated at the Calumet & Hecla customs mill at Point Mills, and the Franklin's own milling plant has not yet resumed operations, nor is there any intention to start operations until further developments on the Allouez conglomerate assure enough rock to keep the mill running.

Mass Consolidated now has its daily rock shipments up to a total of 1150 tons, and a further increase can be made of at least 100 tons per day if the company can secure cars. All of the mines are sending so much rock from the nines to the mills that it is difficult to furnish enough cars. The Mass was the last of the mines to get back to normal production, following the strike, and this has made it particularly difficult for the Mass to get all of the cars needed. Mass has an interesting development in its lower openings in the amount of mass copper that is coming in, and substantial shipments of this material go directly to the Quincy smelting plant at Ripley. In the early days this mine was noted for the masses of copper that were encountered; in fact, the name of the present operating company came from this fact. Up to within the last few months not so much of this copper has been found, but it is now coming in again in considerable quantities. The lower parts of the mine are being unwatered and sinking will be resumed and a larger force of men put to work to keep the advanced openings well ahead of shipping, so that the tonnage may be maintained well in the future. The rock that is now going to the mill yields 15 lb. of copper per ton, not counting the mass copper. The greater part of the rock comes from the Evergreen lode, although some of the openings are in the Butler and its north branch and some from the Ogima formation.

Winona continues to operate at the largest capacity the company has ever been able to produce, but it continues to lose much in the concentrating process, due to the peculiar character of the rock. Experiments to date have not determined how a higher saving can be made, but several other schemes are being tried by which it is hoped to evolve an economical process by which the saving of the smaller flakes of copper can be made. For several months the Lovett process has been undergoing a test. While this process secured the copper, the cost was practically prohibitive. However, there is hope that by a combination of the Lovett process with the Armstrong-Shields jig and classifiers the Winona problem may be solved. There are two leaching processes under consideration for Winona rock, and the best posted men are of the opinion that in this leaching process lies the real solution of the Winona difficulties. The application of a process similar to that which the Calumet & Hecla purposes to apply to its tailings may be made soon, and the Slater leaching process is going to be tested. Winona is one of the smaller mines that finds it just possible to keep going when it is working at full capacity, and even then it needs a good price for the output. At present the company is not losing money. It already has called assessments to the limit of its capital under the Michigan statute, and in case further capital is needed a reorganization of the company will be necessary. The St. Mary's Mineral Land Co. is the largest owner of Winona stock.

MARQUETTE—Aug. 1

Suspension of Production at the Baker Mine at Iron River, on the Menominee range, has been made by Corrigan, McKinney & Co. The Baker has considerable ore in stock, and this will be shipped. Market conditions then will dictate the program. The mine had been employing 200 men. Many of these have been laid off. The remainder have been transferred to the Tully property in the same field.

Shipments from the Lake Superior Iron Region the last few weeks have been much more brisk than heretofore this season. The outgo at present is, in fact, well up to that of a year ago at this time. There is no hope that the volume for the season will compare favorably with the record-breaking movement of 1913, since the accumulated deficiency amounts to millions of tons, but it is evident that the year will close with the deliveries at the lower lakes aggregating a materially larger total than was indicated some weeks ago. More trains are in service on the ore-hauling railroads than at any time so far this season. The product being shipped, as has been the case heretofore, is chiefly direct from the mine workings. There is, however, an increased movement from stockpiles, and it is this fact that is looked upon by the community in general with particular cheer. It has been feared that with the surplus stocks maintained practically intact the winter months would witness curtailments, depriving many men of employment. The hope now exists that mining operations in the underground districts will be continued on the present basis.

A New Record in Ore Hauling was made several weeks ago, when there was hauled from the Chicago & Northwestern Co.'s Menominee range assembling yards at Iron Mountain a train of 135 loaded cars. Never before had so much ore been forwarded to the docks at Escanaba or any other port in a single consignment. Each car contained 65 tons, on the average, so that the trainload comprised almost 9000 tons, the capacity of the ordinary lake freighter. The 135 cars were hauled by one of the Northwestern's new "Class Z" locomotives. The engine was assisted by a small locomotive while leaving the yards, and again while passing over an unusually heavy grade, but this was done, it is said, principally to relieve the strain on the couplings, railroad men insisting that the capacity of the big engine had by no means been taxed. It was not so many years ago that trains of 50 cars, each car holding 10 tons, were considered extraordinary, and when the capacity of the ore cars was doubled and 60 cars were hauled at once, the load aggregating 1200 tons, the trains were viewed with amazement. It appears likely that a few years hence, on the Northwestern at least, 10,000-ton trains may be common.

Operations in the Gwinn Field of the Marquette range are at low ebb. Of the several properties of the Cleveland-Cliffs Iron Co., only three are in commission. The only other operator is the Steel Corporation, with the Stegmuller mine. The Cleveland-Cliffs is producing ore at the Stephenson and, to a lesser extent, at the Gwinn, with the operations at the Gardner wholly confined to development. A characteristic of the ore of the district is the excessive moisture. At the Stephenson this runs from 15 to 18%. Experiments are being made with a Buttner drier, a German device, in an endeavor to rid the ore of most of its moisture as the product is mined. So far the tests have been satisfactory. The drier consists of a rotary cylinder, at one end of which is a furnace and at the other end a chamber into which the material treated is discharged. The ore and the drying gases and vapors are drawn through the drum together, and in the same direction, and the process is rapid, the claim being made that one machine can treat 2000 tons of material daily. The experimental plant has a capacity of 2½ tons per hour. The heat may be derived from any fuel. Coal is used at the Stephenson, and the test drum is rotated by electricity. In the experiments to date the moisture in the ore has been reduced from upwards of 18% to 4½%. This has been done at a cost for fuel of less than 5c. per ton of ore treated.

JOPLIN—Juy 25

Closing of the Continental Zinc Co.'s Mine was caused by the steady drop in the price of zinc ore until the maximum base price for zinc ore was below $40. The mine was one of the largest sheet-ground mines operating and it closed after weeks and months of operation under unsatisfactory prices. It is likely that further additions will be made to the list of properties that will be closed down till better prices prevail. On the other hand, the Miami camp is showing a greater activity. W. H. Frickleton and associates, of Joplin, have just opened a new mine on Tarr Creek that is proving to be a heavy producer. It is believed to be the best strike of zinc ever made in the Miami camp, a camp noted for its rich mines. A second strike by O. W. Sparks, of Galena, Kan., on a new lease in the Miami camp, is attracting almost as much attention, while still another of J. W. Barnes & Co. is said to be showing well.

Interest in Oil Flotation applied to zinc concentration in the Joplin field is unusual and is attracting the attention of mine operators and engineers. One such movement is noted in the combined efforts of the Missouri State Geological Survey and the U. S. Bureau of Mines. Each of these has placed men in the field to undertake experimental work along these lines. C. L. Wright represents the Bureau of Mines, and under his direct supervision the work of experimentation will be conducted. Otto Von Schlichten represents the Missouri Geological Survey. An experimental plant will be built and the various ores tested out and a final determination made as to the applicability of oil flotation to zinc concentration in this field. From the work already done by private interests, it seems certain that if the process is applicable from a commercial point of view, it will be confined in its use strictly to the sand and slime now being treated upon tables. The cheapness of Joplin milling, running from 15 to 50c. per ton of rock handled, with a recovery of 50 to 75%, depending upon the mill and upon the character of the ore, makes it difficult to find a substitute for present processes that will at all appeal to the practical operator. The mine operator is willing to listen to anyone who has anything to offer that will reduce his losses in the sands, the treatment to apply solely to the sands without disturbing the general milling process. In fact, he is keenly alive to the improvement of his practice along these lines, for it is now well established that the bulk of his concentration losses occur there, but he wants the remedies to be localized to that department of his mill. Before the court decision in the Minerals Separation case was rendered, a company of Butte men undertook some experiments on the Priscilla lease to determine if it were profitable to treat the accumulated tailings and slimes on this ground All the experiments were done under cover of extreme secrecy, and nothing was told the public of the results, but the character of the operations and actions of the men led to the public's deductions that the results were not such as to lead to much optimism.

TORONTO—Aug. 1

Toronto Mining Exchanges Have Been Closed as a result of the closing of the Toronto and Standard stock exchanges This has been done as it was apparent that the better mining stocks were being sacrificed to meet the necessities of the other exchanges.

The Mining News

ALABAMA

Jefferson County

TENNESEE COAL, IRON & R. R. CO. (Birmingham)—Company has received 200 cars of manganese ore from Cuba by way of Pensacola for use at Bessemer.

ALASKA

LAKINA COPPER CO.—Plans are being made for a mill for copper property on Lakina River.

JUMBO—A three-mile tram is being built at this copper mine to convey ore from mine to orebins.

MOTHER LODE (Kennecott)—An 80-hp. gasoline engine has been installed to operate an air compressor.

ALASKA MEXICAN (Douglas)—June production from 19,824 tons of ore, $40,969, or $2.09 per ton; profit $14,773.

ALASKA EXPLORATION CO. (Fairbanks)—Dredge on No. 8 Above, Fairbanks Creek, commenced work in June. Necessity of making some repairs delayed starting season's work.

ALASKA UNITED (Douglas)—June production from 20,244 tons of Ready Bullion ore, $45,269, or $2.26, profit $17,607; from 18,357 tons of 700 Claim ore, $30,447 or $1.67 per ton, loss $1830.

JUALIN-ALASKA (Jualin)—Contract for a number of service buildings including a large bunk house, boarding house, machine shop, assay office, and blacksmith shop, has been let, as well as contract for mill with a capacity of 200 tons of ore per day.

CRITES & FELDMAN (Fairbanks)—These operators have bought 5-stamp mill of Pioneer Mining Co. Mill was built in 1912 and has been used chiefly for custom work. It will be moved from Chatham Creek to Helen S. claim on Fairbanks Creek. A large body of ore is developed and it is hoped to keep mill running steadily for several years.

PIERSON & ANDERSON (Fairbanks)—These operators, who recently found good pay on Twentymile Creek, have been driven from their shaft by water. Although it places a serious handicap on operations, it is believed that a two-in. centrifugal pump will keep mine clear. Since there is an abundant supply of wood near at hand, cost of pumping will not be excessive.

RAINBOW (Fairbanks)—L. M. Drury, former manager for lessees of Newsboy mine, has been given a lease on Rainbow mine with option of purchase for $65,000 at any time during life of lease. Rainbow mine, which is situated in Skoogy Gulch, was formerly operated by Roth & Maddocks. Several hundred tons of ore have been shipped, but grade is too low to yield a profit except with a mill on the ground.

HANDS-ACROSS-THE-SEA ASSOCIATION (Fairbanks)—On this claim on upper Vault Creek rich ground is being worked. A recent cleanup, from one week's wheeling by four men, returned $5000. Paystreak is 10 ft. thick, pay runs $6 to $8 per sq.ft.; width is 60 ft. Owing to scarcity of water during June and July, it is possible to sluice only a part of the dirt hoisted. Rest is dumped and will be sluiced during fall rains

ARIZONA

Cochise County

COPPER QUEEN (Bisbee)—At Czar mine old stoping ground is being worked to a decided advantage, at the Lowell good-grade ore has been encountered on 1200 level close to Oliver line. Work on Uncle Sam is under way, and a headframe, hoist and engine room are to be erected. Test mill is expected to be in operation in two weeks.

Gila County

MIAMI COPPER CO. (Miami)—Orders have been given by directors to curtail production 50%; entire force will be retained to work half schedule time.

CALIFORNIA

Amador County

VALPARAISO—All work has been suspended on this mine near Middle Bar after two years of development and exploration for paying pockets.

BUNKER HILL (Amador City)—The 97th consecutive monthly dividend was paid July 15. Ore at present is low grade, but still is profitably treated.

KEYSTONE (Sutter Creek)—Twenty stamps of mill were started July 18, on ore from lower levels recently developed. It is stated that a large tonnage is blocked out. Ore is low-grade, but can be mined and milled at a profit. Keystone was first mine to pay dividends in early days of Amador quartz mining.

ARGONAUT (Jackson)—Dividend of $1.50 per share has been declared, making a total of $300,000. This is first dividend paid since commencement of apex suit brought by Kennedy Extension Gold Mining Co. At time action was brought company stopped paying dividends, pending outcome of suit, and accumulated a large surplus. Suit was begun in 1909 and a decision in favor of Argonaut rendered June 29, 1911

Butte County

PACIFIC GOLD DREDGING CO. (Oroville)—Arrangements have been completed for reconstruction of Pacific No. 3 dredge, which will be installed on Butte Creek, 10 miles east of Chico, where it will operate on a part of Drexler estate. Dredge was built in Oroville in April 1904, and was operated there for a number of years.

Eldorado County

INDIANA GOLD DREDGING CO. (Oroville)—A 4-cu.ft Bucyrus-type dredge built by this company at Michigan Bar near Latrobe on Cusumnes River, early this year, went into commission Apr. 1, and is reported to be digging in good gravel.

Mariposa County

NUMBER FIVE (Hornitos)—A new mill is practically completed and crushing of ore will begin shortly.

NUMBER ONE (Hornitos)—Preliminary work towards reopening is in progress. Mine will be pumped out and put in order for development.

SILVER LEAD (Hornitos)—Construction of a five-stamp mill has begun. This is an old property, idle for a number of years, and is being reopened.

Nevada County

INDEPENDENCE (Nevada City)—Hoist was burned July 26, fire supposed to be incendiary.

UNION HILL (Grass Valley)—This property adjoining Brunswick will probably be sold to G. C. Johnston of San Francisco, and others, and be developed on an extensive scale. Mine was bonded some time ago to L. B. Doe of San Francisco, but deal was not consummated, owing, it is said, to inability of proposed purchaser to properly develop property.

GLADSTONE (French Gulch)—Installation of new electric hoist is completed. It is designed to sink 2500 ft. and operate at a speed of 1000 ft. per minute with a load exceeding two tons. It is equipped with 275-hp. motor.

Shasta County

MAMMOTH COPPER MINING CO. (Kennett)—Rights-of-way and water rights to waters of Back Bone Creek have been obtained from Summit Copper Co. All mineral rights are reserved to granting company on eight claims, over which rights-of-way pass.

Tuolumne County

HART & JACOBS (Sonora)—Building of 10-stamp mill is contemplated to take place of a small crushing plant, formerly used for prospecting.

COLORADO

Gilpin County

ARAPAHOE MILL (Black Hawk)—Remodeling of Rocky Mountain concentrator is completed; plant treats 50 tons per day.

GILPIN ORION (Central City)—This mine, idle for years, has been reopened by lessees who have developed a good shoot in 340-ft. level east.

LILLIAN (Russel Gulch)—Eastern men have reopened this property that has been idle several years. It was formerly a producer of high-grade gold ore.

Mesa County

LLOYD well at De Beque developed a flow of oil spouting 175 ft high. It caught fire and drilling outfit was destroyed.

Park County

SNOWSTORM PLACER (Fairplay)—Platte River Dredging Co. is making usual summer run. Operations are always restricted to 80 or 90 days per season by shortage of water that stops hydraulicking in September. This being an unusually wet season, work may continue perhaps two or three weeks longer than usual.

San Miguel County

WELLER (Telluride)—Water line 650 ft. long, just completed, will carry water from Ballard Mountain to mill. Recent cyanide tests were unsatisfactory and treatment will be restricted to concentration.

GEORGIA

Lumpkin County

TOLEDO MINING CO. (Dahlonega)—Mill building is erected and machinery is being installed. Pipe line from power canal to run turbine is completed. Company has built a flume to handle ore by hydraulicking, but extremely dry weather has cut down water supply, so a tramway will be laid to Singleton Cut in rear of plant and operations will be started on this ore. A pipe line and flume have been laid for working Barlow Cut, but this and all other mining in district including operation of a dredge, has been hampered by lack of water, which has been insufficient to supply even local hydro-electric light station for nearly a month.

IDAHO

Coeur d'Alene District

CHICAGO-BOSTON MINING CO. (Wallace)—At regular annual meeting of stockholders recently an encouraging report was made by Manager Cyrus W. Gossert. Property has been operated steadily for last two years. Flume and water-power plant have been completed and 800 ft. of tunnel has been driven by machine drills. Owing to limited amount of water operations were confined to freshet seasons, and work was continually hampered by lack of adequate power. In June last year company suspended operations in tunnel entirely and has since then devoted its available income to acquiring and installing a new and much more powerful waterpower system. It was necessary, in order to carry work ahead on this new power plant, to buy and erect a small sawmill, which now is within one mile from mine and within national forest reserve, and to purchase from Government timber for lumber needed in construction of flume and buildings. Flume, now completed, is nearly a mile in length, grade for which in many places was made through rock. Head attained by this flume is approximately 470 ft. Company has purchased a compressor of ample size to run several drills together with a Pelton waterwheel with which to operate it. This machinery is installed on concrete foundations in a new building erected for the purpose. As soon as penstock is placed to connect waterwheel with flume plant will be ready to operate. In addition to this new equipment many minor permanent improvements have been made, such as erection of a bunk house, a commodious cabin, wagon shed and stable, laying out trails and roads, installation of an electric lighting system and a telephone line. Two new claims adjoining property have been located and added to holdings. Work in No. 6 tunnel up to time it was temporarily discontinued produced encouraging results. Work will be resumed in this tunnel very soon.

MINNESOTA

Mesabi Range

MUNICIPAL EXTRAVAGANCE ON MESABI RANGE—Consumers Ore Co., owning Frantz mine, within city limits of town of Buhl, has issued an injunction and restraining order on town officials. The 1910 census showed town's population as 1000. In 1913 tax levy was $125,000 or $125 for every man, woman and child. Only 1½% of tax is paid by residents, balance coming from mining companies. It is expected that 1914 tax levy will produce $250,000, and mine owners feel that it is time to call a halt. Among other improvements, town is expending $80,000 on streets this summer, which seems liberal for 1000 inhabitants. At Mountain Iron, Pitt Iron Mining Co. has just pursued same course of action. At this place a $25,000 concrete street is being laid, while mining company cites that there are but eight teams in town to use it. Mountain Iron has a population of 1343, and a $100,000 school building. A $20,000 library has been completed. The same condition exists throughout the Mesabi range, where the mining companies are called upon to pay large taxes and the small municipalities have huge sums to expend for improvements. $100,000 school buildings are comparatively common, the most modern fire fighting apparatus is provided, sewage-disposal plants and water systems compare favorably with those of large cities, and streets and parks are perfectly maintained.

GENOA (Gilbert)—This mine, which supplies village of Gilbert with water, was recently flooded by heavy rains, causing a temporary interruption in water service. It has now been pumped out.

MONTANA

Fergus County

KENDALL GOLD MINING CO. (Kendall)—After a lapse of two years company has resumed payment of dividends to amount of 6c. per share, totaling $30,000, on all stock of company. According to statement of secretary dividend will be paid out of surplus in company's treasury. During operation of mines at Kendall, $1,500,000 was paid out in dividends. Mines have been closed for many years, being considered worked out. Company still operates a hydro-electric power plant in Kendall district which furnishes power and light to Barnes King mines and to adjoining settlements.

Park County

WESTERN SMELTING & MINING CO. (Cook City)—Renewed activity is reported from Cook City in old camp near northeast corner of Yellowstone Park. G. L. Tanzer of Livingston, manager of company announces that a force of 100 men will be put to work to blow in custom smelter at Cook City. It will treat ore from various copper, gold and silver mines in district which, though rich cannot stand cost of 63 mile haul to nearest railroad. It is Tanzer's opinion that by demonstrating possibilities of district, he will be able to induce railroads having branches in that territory, to build a connection to camp.

Silver Bow County

ANACONDA (Butte)—It is reported that Anaconda has closed its Great Falls smelting plant and seven mines on account of European situation.

NORTH BUTTE (Butte)—New shaft on Granite Mountain claim is completed to 3000-ft. level. Connections have been made from levels in this shaft to all levels of Speculator mine with exception of 2600 level.

BERNARD REALTY CO. VS. J. P. NOLAN—Judge Bourquin in Federal court, on July 26 ordered decree to be entered in favor of Bernard company. Case involved title to placer ground and lodes in Butte district. Judge Bourquin held that as title had been in name of Bernard company for 41 years it was too late in the day to attack it.

BUTTE & ZENITH CITY (Butte)—Since installation of two Cameron No. 9 pumps, discharging 300 gal. of water per minute, shaft has been kept dry, permitting sinking without further interruption. Shaft is now down to 525 ft., which is 65 ft. below station. It is proposed to carry it down to 1000 level whence property is to be explored and developed.

BUTTE & SUPERIOR (Butte)—Development on 1500 level has proved ore on that level to be of much the same character as that taken from levels above. Most of present output amounting to 1100 tons per day comes from ground between 700 and 1400 levels. Black Rock shoot seems to lengthen with depth so that further development work on 1500 and 1600 levels is expected materially to swell ore reserves of company.

BUTTE-ALEX SCOTT (Butte)—Recent exploration work below 1900 level has strengthened belief that lower levels would show better results than those already in operation. About 100 tons of ore per day are taken at present from 2000 level. This output is to be maintained until higher prices of copper shall prevail when output will be increased. Some of the ore shipped recently ran as high as 25% copper. Present earnings pay for all operating expenses as well as for development and shaft sinking. Shaft is now down below 2100 level and when 2200 level is reached, stations will be cut on 2100 and 2200 levels and crosscutting will be started.

PILOT-BUTTE (Butte)—Regarding reported strike of zinc ore on 2400 level of this mine, Superintendent Gow has issued following statement: Development work on this level has all been in an easterly direction to intercept several known copper veins. Zinc ore has been encountered to east of shaft toward Black Rock (Butte-Superior) claim on ninth, thirteenth, eighteenth, 2000- and 2200-ft. levels and it is assumed that it would also be found on 2400 level east of shaft, but no work has been attempted on this level to verify this as mining of zinc ore on this or other levels of Pilot-Butte is unprofitable at present due to lack of a mill to treat such ores.

BUTTE-BALLAKLAVA COPPER CO. (Butte)—President Freimuth has made another appeal to stockholders for funds to carry on development work necessary to put property in position where it can be operated profitably. Long shut-down caused by litigation with Anaconda company depleted treasury so that at time of issuing annual report, May 1 cash balance in treasury was only $180. Funds appealed for are for sinking shaft to 1800 level and to liquidate outstanding obligations. Sinking has been recommended by Walter Harvey Weed, consulting engineer of company in order to exploit oreshoot on 1800 level which from a study of upper levels promises to furnish shipping ore for entire length of vein within ground awarded to Butte-Ballaklava under compromise agreement with Anaconda company; namely 425 ft. Weed also points out that to put mine on profitable basis more ground must be opened, permitting larger daily output, and increase in earnings for payment of dividends, investment in new properties and for erecting mill to treat large tonnage of low-grade ore which yields no profit if shipped to smelter under present contract.

NEVADA

Esmeralda County

KEWANAS MINING CO. (Goldfield)—Station is being cut on 700-ft. level. A 20-hp. hoist will be installed and winze will be sunk 150 feet.

WESTMINSTER GOLD & SILVER MINING CO. (Cuprite)—A two-compartment working shaft will be sunk to depth of 200 ft. This shaft is now 160 ft. deep, and 25-hp. hoist and 40-ft. headframe have been installed. Lateral development will also be done.

Humboldt County

ROCHESTER CONSOLIDATED MINING & MILLING CO. (Rochester)—Articles of incorporation have been filed; capitalization, $500,000; par value, $1. Main office will be at Lovelock. Company will build a mill at Rochester.

Lincoln County

DAY-BRISTOL MINING CO. (Pioche)—Aerial tramway from mine to Pioche Pacific R. R. has been completed at cost of $47,000 and has been accepted by receiver of company. This tramway will reduce cost of transportation to railroad and will probably make profitable several leases which have not been a financial success to date.

Lyon County

NEVADA-DOUGLAS (Ludwig)—High-grade copper ore has been struck on 200-ft. level of Casting Copper mine, copper minerals being chalcocite and tenorite. A large tonnage of milling grade ore is being developed in Ludwig mine. A new discovery of good-grade copper ore has been made northwest of Ludwig shaft. Construction of leaching plant will start at once. Crushing and leaching sections will be built first and precipitation on iron will be method used for present.

Mineral County

A NEW MILL AT CANDELARIA will be built, it is reported. Recently constructed experimental stamp mill and cyanide plant has successfully treated ores of district and plans for 200-ton mill are being drawn.

A NEW CYANIDE PLANT AT BELLEVILLE is being built to treat tailings from milling plant that operated on ores from Candelaria during early days of that camp. Water supply is piped from springs on western slope of Mono Mountain, a distance of seven miles.

Nye County

TONOPAH EXTENSION (Tonopah)—New equipment has been installed in incline winze from 950-ft. level and work will be resumed on 1020- and 1100-ft. levels.

Storey County

OPHIR (Virginia City)—Station at 1600-ft. level is being retimbered, 15-in. air pipe is being laid from 2200 winze, and good progress is being made in reopening Central tunnel.

MEXICAN & UNION CONSOLIDATED COMPANIES are making preparations to open 2650-ft. level. Pump will be installed in joint Union-Sierra Nevada winze and another in Mexican winze which is 146-ft. below 2500-ft. level.

White Pine County

DEVELOPMENT WORK IN ELY DISTRICT is being done by Giroux company where six Star churn-drills are in operation; Boston Ely, by diamond drilling; and McDonald Ely, in shaft sinking.

MACON CITY (Lane City)—Lease and bond has been taken and development work will start at once. A milling plant to treat mine and dump ore may be built.

NEW MEXICO

Grant County

ORION MINING CO. (Lordsburg)—Dundee mine has been taken over under lease and bond by U. S. Smelting, Refining & Mining Exploration Co. Main shaft now 375-ft. deep, is being sunk. Crosscuts are being driven to walls.

NORTH CAROLINA

Mecklenburg County

PARTRIDGE SMELTER (Charlotte)—Plant has been overhauled and some test runs have been made.

SURFACE HILL MINE (Charlotte)—This mine, 12 miles from Charlotte and near Allen's Station on Norfolk Southern, is again working. A concentrating plant will be installed.

Montgomery County

UWARRA (Candor)—Mill obtains its water supply from Reedy Fork Creek, which, owing to prolonged drought, has been nearly dry for a month. Mill is now closed and will stay closed until Sept. 1 when fall rains should supply ample water. In meantime work on development under ground will go ahead, principally on 400-ft. level.

CANDOR MINING CO. (Candor)—Cyanide mill is now running nights only, all mining being done by day. Old dumps accumulated during early days of mine are also being worked, better milling facilities now permitting profit from low grade ore. It has been predicted locally for a year that this mine has been on the point of ceasing operations ,but it is probable that work will continue for some time though on a less extensive scale than formerly.

Moore County

EL ORO MINING CO. (Hemp)—Company has been incorporated by the Gearhart brothers and others to work gold prospects.

OREGON

Clackamas County

OGLE MOUNTAIN—After several years constant development work, this mine near boundary line of Clackamas and Marion Counties, will soon be operated at full capacity. Cyanide plant with a capacity of 100 to 150 tons per day has been constructed; 25 men are now at work on the property, but with the opening of cyanide plant, force will be increased to at least 40, it is stated. Some 4700 ft. of tunneling has been done. Property is owned by Oregon City men.

Josephine County

GRANITE HILL (Granite Pass)—This mine, long idle, will soon be in operation again. Machinery has been well taken care of and is in good shape, and with small repairs will be in running order. Shafts are full of water and it will take two weeks to pump them out. Power for operation of 20-stamp mill will be furnished by electrical equipment.

SOUTH DAKOTA

Lawrence County

GOLDEN REWARD (Deadwood)—Company has purchased old Hidden Fortune 60-stamp cyanide mill and started removing it to millsite in Deadwood. Purchase was made from Homestake Mining Co., which came into possession of plant when it took over Hidden Fortune property. With the addition of this plant to its mill which is running steadily, Golden Reward will have a capacity of 400 tons daily.

HEIDELBERG MINING CO. (Two Bit)—Corporation of this name has been organized to take over property in Two Bit district which was developed successfully for 10 months by syndicate promoted by Deadwood Business Club. Capital is 500,000 shares of 25c. each. Half of capital was issued in payment for property; balance was placed in treasury and small lot will be sold at par to secure funds for further development. Latest shipments show higher grade of ore. Returns at Golden Reward mill were $22.20 per ton, as against $16 to $18 for previous lots.

HOMESTAKE (Lead)—At the B. & M. shaft one of the largest steam hoisting plants in the world is being assembled. It will have a capacity for raising 6 tons from a depth of 3200 ft. Using flat steel ropes, 5/8x7 in., on reels; hoisting will be done with skips. Engine was built by Nordberg Mfg. Co., Milwaukee, Wis., and weighs over 1,000,000 lbs., requiring 14 standard flat cars to transport it from Milwaukee to Lead. Arrived at Lead problem of removing it from railroad to shaft, a distance of 2000 ft. over rough ground and up a considerable elevation, was solved by engineering department of company. Track of heavy steel rails, 6-ft. gage, was laid, on which specially designed car was operated. Car was constructed of steel frame, with a bed composed of 12x12-in. timbers. Motive power was secured by two single-drum hoists, attached to front end of car, and operated by compressed air. In this mannear easy work was made of delivery of massive pieces, two largest of which weighed 25 tons. Engine has two hoisting reels; will handle material in two of the five compartments of shaft. Old hoisting engine will not be removed, but will be retained as an auxiliary to new machine. It is expected plant will be in full operation by end of present year. Engine cost $77,000; freight on it to Lead approximately $8000 and foundations, erection, building and headframe, $67,000. Headframe will be of steel. Concrete, reinforced with steel, is being used for foundations, which, in thickest part, are over 20 ft. Steam will be secured from boiler plant close to Chicago & Northwestern Ry. tracks, grading and foundations for which are well in hand, and which will be completed before the hoist is ready to operate. This plant will contain six 600-hp. boilers; it will also furnish steam for electric generating station.

UTAH

Juab County

MAY DAY (Eureka)—Lead ore was opened on 300 level near stope mined by lessees in early part of year.

OPOHONGO (Mammoth)—Winze from 700 level is down 25 ft., with good showing. Above here lessees are mining gold ore.

BULLION BECK (Eureka)—Two cars of concentrates were shipped from jigging plant by lessees, who are working the dump.

UTAH POWER & LIGHT (Eureka)—Substation is to be built on ground bought from Chief Consolidated. Equipment is to be moved over from substation near Colorado mine.

EAGLE & BLUE BELL (Eureka)—Ore has been followed to 1600 level, and preparations being made to sink shaft from 1550 to 1700-ft. level Shipments of 100 tons of silver-lead ore being made daily.

PLUTUS (Eureka)—This property of 14 claims has been leased for two years to Fairbairn Leasing Co., working adjoining Godiva. Plutus is consolidation of old Plutus and Tetro Companies. It was worked under lease several years ago by J. H. McCrystal and others. Development will be done at depth.

Salt Lake County

OHIO COPPER (Bingham)—During June a little over 2400 tons of ore per day were mined and milled; in all 74,600 tons Remodeling of different sections of mill is in progress; expected to give capacity of more than 3000 tons daily. Machinery for changes contemplated is practically all on hand; first remodeled section expected to be put in commission during August.

UTAH COPPER (Bingham)—According to data, not officially compiled, this property has 340,000,000 tons of porphyry ore developed and partially developed, estimated to carry 1.4% copper. Average net smelter recovery in last four years has been 63.4%, running as low as 61.%, or 17.08 lb. copper per ton at lowest recovery. Now that Bingham & Garfield R. R. bonds are largely out of the way, net earnings from railroad become available as credit against cost of operations. Cost of steam shovel mining, exclusive of stripping charge and exploration, is 21c. per ton, transportation, 15c., milling 37c., which, allowing 13c. credit for gold and silver, gives net mining, transportation, and milling cost of 60c. per ton or 3.53c. per lb. Cost of smelting, refining, and selling is 3c. per lb., making total 6.6c. per lb. Including exploration, depreciation, etc. cost is 7¼c. After first 100,000,000 tons of ore have been removed, stripping charge of 7½c. per ton mined is expected to terminate. By carrying all of ores ove Bingham & Garfield, instead of one-third over Denver & Rio Grande as at present, an additional saving will be made. Costs during second quarter of 1914 were 8c. per lb.

WASHINGTON

Okanogan County

DIVIDEND—A railroad spur is to be built from this mine to Oroville, which will greatly facilitate operations.

ELLEMEHAM DEVELOPING & OPERATING CO. (Oroville)—This company is operating the Prize mine where considerable improvements have been made. Regular shipments are being made.

CAABA (Oroville)—Mine is loading out its third car of concentrates for shipment to smelters. Mine has been in operation only a short time. About 85 men are employed and 70 tons of ore per day are being treated in concentrator. Mill, which is equipped with stamps and Wilfley tables, has proved of greater capacity than was at first expected and hauling arrangements are being made to deliver 120 tons of ore per day to plant. Caaba is a silver-lead-copper property.

CANADA

British Columbia

RICH GOLD FIND reported at Edmonton by old prospector in Liard River district about 1500 miles northwest of Edmonton. Prospector says he was two years in district without seeing white man. Says it is extremely difficult to reach district. We can well believe statement.

QUATSINO—This Vancouver Island mine is surveying for a railroad, and doing development work. The Quatsino company was organized by W. E. Cullen of Spokane and M. W. Bacon of Butte, general manager for the Stewart mine in the Coeur d'Alene district, Idaho.

SILVER HOARD (Ainsworth)—Surveys have been made for power plant and company plans to have first unit of a 100-ton daily capacity concentrator constructed and operating by Jan. 1, 1915. Power plant will be constructed in relays, that water may be used repeatedly. There will be two generating stations of 200-hp. each, the first to furnish power and light for mine and second to drive mill machinery. Hoisting and compressor equipment are being installed new at mine and facilities will be increased as development justifies.

ONTARIO

COBALT PRODUCTION FOR JUNE WAS:—Alladin Cobalt (Silver Queen), 53.92 tons; Beaver, 53.69; Chambers Ferland, 31.89; City of Cobalt, 42.62; Cobalt Lake, 125.50. Cobalt Townsite, 188.01; Coniagas, 155.17; Crown Reserve, 105.72; Hudson Bay, 73.35; Kerr Lake, 76.02; La Rose, 218.80; Mckinley Darragh, 279.29, Nipissing, 376.02; Peterson Lake, 80.66; Penn Canadian, 20.95; Right of Way, 32.44; Temiskaming, 37.91. Trethewey, 53.39; total, 1,987.35 tons.

CROWN RESERVE (Cobalt)—Company will renew its lease on Silver Leaf property adjoining, for an additional five years.

KIRKLAND LAKE PROPRIETARY (Kirkland Lake)—Company has purchased five Stitt claims in the Kirkland Lake district.

TECK-HUGHES (Swastika)—New syndicate has taken option on control. Sufficient money will be advanced to develop property thoroughly.

NIPISSING (Cobalt)—Company has taken an option on Teck Hughes property in Kirkland Lake. Development on Vein 98 of Meyer shaft in Cobalt has shown 500 ft. of ore, materially adding to reserves. High grade mill is treating most of the Kerr Lake and La Rose ore, all of which is shipped in form of bullion. Net earnings for first six months of 1914 were $900,000.

MEXICO

Sonora

GREENE-CANANEA (Cananea)—Latest reports state that conditions are improving. Fire in Veta Grande and Oversight mines is under control and both properties are being worked through extra shafts. One of the helmet crews of the Copper Queen mine at Bisbee, Ariz., was sent to help fight the flames Shaft No. 11 has been entirely destroyed

The Market Report

METAL MARKETS

NEW YORK, Aug. 5

The metal markets this week are in a condition entirely unprecedented. Owing to the closing of the foreign exchanges and the action of the leading copper producers, we are obliged, for the first time since these reports were begun, to omit the quotations of copper and silver in New York, and the quotations of all the metals in London. For copper there is for the moment no market, and the other metals are naturally slow and depressed. Recent conditions cannot last, of course; but the disturbance is so widespread that it is difficult to predict when a change will come.

Copper, Tin, Lead and Zinc

Copper—In spite of the turmoil of last Thursday and Friday some domestic consumers were courageous enough to contract for some round lots of electrolytic copper at 12½@12¾c. Since then there has been no business and consequently there are no quotations for copper, as announced on our editorial page. Also there have been no quotations from London since Thursday, the Exchange there having been closed.

The Copper Producers' Association will suspend the publication of its monthly statistics during the existing disruption of the world's affairs.

Curtailment of production has been ordered by the Anaconda, Phelps, Dodge & Co., the Jackling-Hayden-Stone companies, and the Miami so far as publicly announced. All of the important producers will doubtless curtail, which in general will probably be at the rate of about 50% of June production.

The Central Chile Copper Co. reports for the six months ended June 30 a production of 2,826,880 lb. copper.

Base price of copper sheets is now 18½c. per lb. for hot rolled and 19½c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14¼@14½c. per lb., carload lots at mill.

Exports of copper from New York for the week were 3514 long tons. Our special correspondent gives the exports from Baltimore at 2331 tons for the week.

Shipments of Katanga Copper six months ended June 30 are reported at 4520 metric tons blister copper, 96-97% pure, and 100 tons matte, carrying 65% copper.

Copper Imports in Germany six months ended June 30 were 116,904 tons, of which 102,188 tons were from the United States. Exports were 3377 tons; net imports, 113,527 tons.

Brass Prices as announced by the American Brass Co. on Aug. 1 are: Sheets, high brass, 14¾c. net per lb.; low brass, 16½c.; wire, high brass, 14½c.; low brass, 16½c. Rods, high brass, 14½c.; low brass, 17¼c. Tubes, brazed, 19¼c.; open seams, 19¼c. Angles and channels, 19¼c. Scrap allowances are 9¼c. net per lb. for high brass, 10½c. for low brass.

Tin—Since the beginning of the crisis and the closing of the London Exchange there has been no wholesale market. There have been some transactions in one-ton to five-ton lots at fancy prices, but the large interests in tin have refused to quote and pronounce that there is no market.

Exports from Baltimore for the past week included 150,005 lb. scrap tin to Rotterdam.

Tin production of Federated Malay States, as officially reported for six months ended June 30, was 24,902 long tons, an increase of 1018 tons, or 4.3%, over last year.

Visible Stocks of Tin on Aug. 1 are reported as follows: London, Straits and Australian, 3763; London, other kinds, 3316; London, afloat, 3221; total London, 10,300; Holland, 455; United States, excluding Pacific ports, 3412; total, 14,167 long tons, a decrease of 1860 tons during July. The figures include tin afloat.

Lead—The A. S. & R. Co. maintains its previous price, but from independent quarters there has been an emphatic pressure to sell and lower prices have been accepted.

Exports from Baltimore for the week included 56,008 lb. lead to Liverpool, 728,558 lb. to Rotterdam, making 784,566 lb. lead in all.

Spelter—At the beginning of the crisis producers sold round lots of spelter at reduced prices, and overtures were made to consumers to sell very large tonnages at a sharp cut, but when it appeared that they would be promptly taken up the tentative intimations were withdrawn and asking prices were raised. A considerable volume of business was done at the advance, and at the close sellers were quite firm. It is anticipated that the war conditions in Europe may lead to exports from here.

Base price of zinc sheets is $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

DAILY PRICES OF METALS

NEW YORK

July-Aug.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Dts. per Lb.
30	*	52¼	12.70 @12.75	31	3.85 @3.90	3.70 @3.72½	4.80 @4.90	4.65 @4.75
31	*	52¾	12.45 @12.55	33	3.85 @3.90	3.70 @3.72½	4.80 @4.90	4.65 @4.75
1	*	*	*	*	3.85 @3.90	3.70 @3.72½	4.90 @4.95	4.75 @4.80
3	*	*	*	*	3.80 @3.90	3.65 @3.70	4.90 @4.95	4.75 @4.80
4	*	*	*	*	3.80 @3.90	3.65 @3.70	4.90 @4.95	4.75 @4.80
5	*	*	*	*	3.80 @3.90	3.65 @3.70	4.90 @5.00	4.75 @4.85

*No market.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c.

LONDON

July-Aug.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
30	23¾	56	12.17	57¼	61¼	132	135	18¾	4.07	21¾	4.73
31	.....	.....	.....	..		..	.....	....	....	.	...
1	...	....	.				.	...	.....		...
3	.....	...	....	.			.....	....	. .	.	..
4	...	.....	..				.	...	.		.....
5	. ..	...			....		.	. . . .			.....

Note—London Exchange closed from July 31.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅓c.; £15 = 3.26⅓c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Other Metals

Aluminum—The market for this metal is practically closed by the war excitement. No prices can be quoted for imported metal, as supplies are cut off. Both Germany and France have prohibited exports as contraband of war, and England is expected to follow. The home producer, while filling contracts, declines to quote on new business for the present.

Antimony—The market is entirely upset by the war news and the total uncertainty about exports. Quotations are given today at 7½@8c. for ordinary brands and 9½@10c. for Cookson's.

Quicksilver—The market is active and excited and demand just now exceeds the supply. The New York price has advanced to $42.50 per flask of 75 lb., and a further increase is expected. It is not possible to quote any London prices.

Nickel—Quotations for ordinary forms—shot, blocks, or plaquettes—are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Minor Metals—Quotations for **Bismuth** are $1.80 per lb. for imported, $1.72 for metal from native ores—**Cadmium**, 750 marks per 100 kg.—81c. per lb.—at works in Germany—**Magnesium**, $1.50 per lb., New York—**Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, and $5 per lb. for small quantities.

Gold, Silver and Platinum

Gold—The gold situation is most deeply involved owing to the war excitement. There is, of course, no open market in London just now, and every nation is guarding its own stores. Exports from this country are temporarily stopped, except to Canada, the banks of that country having taken some $5,000,000 this week. There is a demand for gold almost everywhere, but no one seems to be in a position to get it.

A curious incident is that of the German steamer "Kronprinzessin Cecile," which sailed from New York last week with about $10,500,000 in gold bars on board, consigned to London and Paris. At that time no declarations of war had been made, but the vessel could be reached by wireless. It was reported first that she had reached a German port, then that she had been captured by a British cruiser, but these proved false, and on Tuesday, Aug. 4, she arrived at Bar Harbor, Me. Why that port, no one knows, for no coal nor supplies can be had there, and it is not a commercial port. The gold will probably go back to the U. S. Subtreasury for the present.

Russian Gold Production in 1913, according to the latest official statement, was 1,249,860 oz. fine, or $25,834,600. If the usual allowance for unreported gold is made, it brings the total up to $28,416,060 for the year.

Iridium—There has been nothing done in this metal, but dealers hold it at $76@79 per oz., New York.

Platinum—The market is disturbed, owing to the uncertainty as to future supplies. No new business has been done and quotations are nominally unchanged at $43@44 per oz. for refined platinum and $46@51 per oz. for hard metal. An advance is expected.

Shipments of silver from London to the East, Jan. 1 to July 23, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£4,196,500	£1,227,000	I. £30,500
China	432,000	40,000	D. 392,000
Total	£4,628,500	£1,267,000	D. £361,500

Indian shipments to date are a little ahead of last year, but China still holds back, with takings very small indeed.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Aug. 1

The base price paid this week for 60% zinc ore was $39.50@40 per ton. The base price paid for 80% lead ore was $46@47 per ton

SHIPMENTS WEEK ENDED AUG. 1

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,192,890	240,000	404,200
Year	89,361,230	3,316,500	22,656,570

Shipped during week to separating plants, 2,430,640 lb. zinc ore.

JOPLIN, MO.—Aug. 1

Blende sold as high as $42.50, the assay base being $39@41.50 and the metal base $37.50@39 per ton of 60% zinc. Calamine is $22 per ton of 40% zinc. The average selling price of all grades of zinc is $3[illegible]2 per ton. The highest price paid for lead was $47.50, the base continuing at $46 per ton of 80% metal content, and the average of all grades is $45.98 per ton.

Another of the large Webb City mines closed down tonight, ostensibly until Sept. 1. This is a total of eight in two months. One thousand tons decrease in the shipment is partly occasioned by lack of cars and partly by a decreasing production.

SHIPMENTS WEEK ENDED AUG. 1

	Blende	Calamine	Lead	Values
Totals this week	$9,014,110	$493,820	$1,417,120	$205,770
Totals 31 weeks..	317,633,920	22,696,850	54.161.360	7.756.940

Blende value, the week, $168,310; 31 weeks, $6,207,180.
Calamine value, the week, $4880; 31 weeks, $256,485.
Lead value, the week, $32,580; 31 weeks, $1,293,275.

IRON TRADE REVIEW

NEW YORK—Aug. 5

The iron and steel markets are practically at a stand, and everyone is waiting for further developments as to the European war. Most people are inclined to expect an increased demand here, but others doubt it. For the present the financial disturbance resulting from the general disarrangement abroad, puts the market in a condition where a conservative course seems to appeal to most manufacturers and buyers. It may be a month before the conditions are clear.

PITTSBURGH—Aug. 4

The effect of the European war has been to stiffen finished steel prices, not by reason of increased demand but by the sellers adopting a very conservative course. Their view is that the labor supply may be inconveniently diminished and that the total demand for steel from the United States may be very considerably increased. The circumstances dictate a very conservative policy even though, when so much is in doubt, there is far from assurance that demand will actually be increased.

The immediate effect has been to decrease export shipments, because there is danger in vessels moving, but the view is that should the war as a whole last a long time the question of naval supremacy will be determined in a relatively short time and vessel room will be available, when European sources of production are so largely shut off from neutral markets.

Steel prices are being named now only for immediate acceptance, but they are not quotably higher than a week ago. The sheet market is firming up rapidly, as several independent mills have advanced prices and the movement is expected to become general.

Pig Iron—The pig-iron market, which had been decidedly more active, as to foundry grades, in July than in June, has been very quiet the past few days, owing to the war. Unlike steel makers, blast furnacemen have not materially stiffened in their price views, though as a matter of fact they have not had time to consider exhaustively the possibilities created by war conditions. W. P. Snyder & Co. report their pig iron averages for July at $14, Valley, for bessemer and $13, Valley, for basic, the same as for three months preceding. Rarely have the averages been unchanged for so long a period. We quote: Bessemer, $14; basic, $13; malleable, $13@13.25; foundry, $13@13.50; forge, $12.50@12.75, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—On the first threat of a general war buyers began purchasing ferromanganese, and by last Thursday dealers had sold all the foreign producers would permit them to sell, at $38, Baltimore for English and $37, Baltimore for German. Then the market came to an absolute standstill, the foreign producers refusing to sell more at any price while dealers were unable to find any re-sale material. To bring out even small lots of re-sale material very high prices will doubtless have to be offered. The Carnegie Steel Co. will possibly become a seller in time. It prepared for a large production beyond its own consumption this year, and at the beginning of the year made sales for six months, but withdrew from the market when the foreign producers made sharp reductions. Imports of manganese ore have been very large for two years, considerably in excess of the requirements for producing the amount of ferromanganese that has been made to date. Fancy prices on ferromanganese would not seriously increase the cost of making steel, for it is computed that to quadruple the price, on the basis of the recent market of $37 or $38, would only add $1 to the cost of producing a net ton of finished steel.

Steel—The market for billets and sheet bars has been very quiet, tonnages required being adjusted on old contracts. The fact is that the practice of contracting for supplies, with a monthly or quarterly price adjustment, in the light of the existing market, became so general that hardly any steel is left to be sold in the open market and furnish the required basis for this adjustment. In general the market may be quoted at $19 for billets, and $19.50 for sheet bars, f.o.b. maker's mill, Youngstown, and at $19.50 for billets and $20 for sheet bars, f.o.b. maker's mill, Pittsburgh.

IRON ORE

Iron ore shipments from the Lake Superior region are still light, and the season promises to show a heavy reduction from last year.

In the East also business is slow. The Eastern furnaces are taking only moderate quantities of imported ore this season, and even Cuban imports have been light.

Imports of Iron Ore in Germany six months ended June 30 were 6,748,053 metric tons; exports, 989,127; net imports, 5,758,926 tons. Imports of manganese ore were 391,879 tons; exports, 2871; net imports, 389,009 tons.

FOREIGN IRON

Foreign trade of Great Britain in iron and steel and manufactures thereof is valued by the Board of Trade returns as below for the six months ended June 30:

	Exports	Imports		Excess
Iron and steel	£25,169,145	£7,602,460	Exp.	£17,566,685
Machinery, hardware, etc	29,405,727	8,619,489	Exp.	20,786,238
Totals	£54,574,872	£16,221,949	Exp.	£38,352,923
Totals, 1913	57,314,160	15,601,506	Exp.	41,712,654

The quantities of iron and steel exported were 2,504,994 long tons in 1913, and 2,376,264 tons in 1914. Quantities imported, 1,110,703 tons in 1913, and 1,170,989 tons this year.

Pig-Iron Production in Germany in June was 1,531,313 metric tons, being 75,880 tons less than in May. For the half year ended June 30, the total make was: Foundry iron, 1,595,862; forge iron, 224,860; steel pig—including spiegeleisen, ferromanganese and all similar alloys—1,218,580; bessemer pig, 156,953; Thomas (basic) pig, 6,091,941; total, 9,288,196 metric tons. This is a decrease of 288,007 tons, or 3%, from last year.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 268,290 short tons; shipments, 267,261 tons. Production of the Greensburg and Upper Connellsville districts, 38,487 tons.

Connellsville Coke—The market has continued stagnant. No demand for furnace coke developed at the month end and it is evident that the furnaces which did not make contracts for the half year covered for August at least in addition to July. There are occasional offerings of spot furnace coke at less than $1.75, but only in limited tonnages. We quote: Prompt furnace, $1.75; contract furnace, $1.75@2; prompt foundry, $2.25@2.35; contract foundry, $2.35@2.50, per ton at ovens.

Foreign Fuel Trade of Germany six months ended June 30, in metric tons:

	Exports	Imports		Excess
Coal	18,169,595	4,775,981	Exp.	13,393,614
Brown coal	31,325	3,184,095	Imp.	3,152,770
Coke	2,630,129	295,142	Exp.	2,334,987
Briquets	1,621,990	79,697	Exp.	1,542,293

Of the briquets exported this year 424,489 tons were made of town coal or liquite.

CHEMICALS

NEW YORK, Aug. 5

The general chemical market has been disturbed and uneasy, like all the markets, by the foreign news. Nevertheless there is some business forward and affairs are moving quietly.

Arsenic—The market is quiet, with only a moderate demand. The producers' agreement still holds and there is no change in prices, $3 per 100 lb. being named for both spot and futures.

Copper Sulphate—Business is on a fair scale with steady sales. Prices are unchanged. Quotations are $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—A steady but moderate business is being done. The curtailment of production, heretofore mentioned, seems to be in progress. The advices from Chile are that several large oficinas have closed down. If this continues there should be a stiffening of prices. Quotations here are fairly steady, at 2.02½@2.05c. per lb., according to position.

Pyrites—Imports at Baltimore for the week includes 4914 tons of pyrites from Huelva, Spain.

PETROLEUM

The monthly statement of the "Oil City Derrick" for July shows new wells completed as follows: Pennsylvania grade, 630; Lima-Indiana, 162; Central Ohio Gas, 91; Kentucky, 18; Illinois, 139; Kansas-Oklahoma, 869; Texas-Louisiana, 134. This shows a total of 2043 wells completed, a decrease from the June report of 299. New production was 131,949, or 57,682 bbl. less than in June. There were 342 dry holes, or 56 fewer than in the previous report, and 227 gas wells, an increase of 40. At the close of July, 543 rigs were up and 2201 wells drilling, the total amounting to 2744, a net decline of 167 from the work under way at the close of June.

COPPER SMELTERS' REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments	2,069,960	1,279,537	585,387	1,114,758	
Anaconda	23,800,000	22,900,000	23,500,000	23,800,000	
Arizona, Ltd	3,286,000	3,570,000	3,092,000	3,742,000	
Copper Queen	7,637,042	7,562,723	8,388,203	7,613,719	
Calumet & Ariz	5,875,000	5,450,000	5,495,000	4,630,000	
Chino	5,399,814	5,926,591	5,496,875	5,486,419	
Detroit	1,973,725	1,790,926	2,105,034	2,129,100	
East Butte	1,546,180	1,178,000	1,179,762	1,215,323	
Giroux	287,980	45,948	429,553		
Mason Valley	1,250,000	862,000	916,000		
Mammoth	1,800,000	1,850,000	1,750,000	1,725,000	1,950,000
Nevada Con	5,218,257	4,880,043	4,959,589	4,483,175	
Ohio	597,520	610,518	625,000		
Old Dominion	2,997,000	2,779,000	3,302,000	2,937,000	
Ray	6,036,908	6,089,362	6,300,847	6,039,710	
Shannon	1,082,000	1,012,000	1,056,000		
South Utah	406,381	247,641	55,394		
Tennessee	1,262,184	1,370,800	1,336,950		
United Verde*	3,100,000	3,000,000	3,100,000	2,900,000	
Utah Copper Co.	12,323,493	12,739,757	13,208,483	12,870,063	
Lake Superior*	11,000,000	13,000,000	12,500,000	16,000,000	
Non-rep. mines*	8,200,000	8,000,000	8,200,000	8,000,000	
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	
Total prod.	109,649,444	108,644,846	110,082,077		
Imp., bars, etc.	22,676,605	17,043,191	19,081,487		
Total blister	132,326,049	125,688,037	129,163,564		
Imp. ore & matte	7,029,646	10,400,122	10,586,506		
Total Amer.	139,355,695	136,088,159	139,750,070		
Miami†	3,361,100	3,130,772	3,347,000	3,124,750	3,257,300
Shattuck-Arizona	1,136,158	1,386,594	1,353,043	1,225,987	
Brit. Col. Cos:					
Granby	1,775,852	1,692,102	1,669,334	2,443,294	2,706,295
Mexican Cos.:					
Boleo†	2,535,680	2,204,720	2,213,120	2,204,720	
Cananea	4,260,000	2,632,000	2,222,000		
Moctezuma	2,882,884	2,654,926	2,834,616	3,370,800	
Other Foreign:					
Braden, Chile	1,810,000	2,720,000	2,480,000	741,440	
Cape Cop., S. Af.	660,800	468,160	582,400	732,480	
Kyshtim, Russia					
Spassky, Russia	896,000	904,960	907,200	902,720	
Exports from					
Chile	6,944,000	9,072,000	7,616,000	7,840,000	
Australia	8,176,000	7,168,000	8,400,000	5,712,000	
Arrivals-Europe†	17,572,800	17,299,520	13,558,720	19,040,000	

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

† Does not include the arrivals from the United States, Australia or Chile.

COPPER STATISTIC

	United States			Visible Stocks.		
Month	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452			
VIII'13	131,632,362	73,649,801	73,263,169	53,594,945	66,420,480	120,015,385
IX	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr., '13	1,622,450,829	767,261,760	869,062,784			
I, 1914	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,355,667
II	122,561,007	47,586,657	83,899,183	87,296,685	50,108,800	137,405,485
III	145,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV	151,500,531	63,427,633	82,345,216	64,609,319	46,435,200	111,044,519
V	142,308,287	55,592,170	72,710,477	70,337,001	52,371,200	122,708,201
VI	141,345,571	46,227,353	73,350,196	84,342,641	61,062,400	145,405,041
VII				106,110,663	64,220,800	170,331,463
VIII						

Note—Visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev	Aug. 10	Aug. 31	$0 03
Aurora-Sampson, Ida	July 18	Aug. 18	0 002
Buffalo, Mont	Aug. 2	Sept. 2	0 004
C & R, Ida.	July 14	Aug. 18	0 001
Challenge Cons., Nev	July 21	Aug. 11	0 05
Emerald, Utah	July 15	Aug. 18	0 0033
Enterprise, Ida.	July 31	Aug. 17	0 002
Evergreen, Utah.	July 23	Aug. 22	0 01
Exchequer, Nev	Aug 13	Sept. 3	0 02
Federal-Ely, Nev.	July 20	Aug. 21	0 005
Four Timbers, Wash	July 29	Aug. 29	0.0015
Great Western, Nev	Aug. 10	Aug. 31	0.01
Holy Terror, Ida	July 15	Aug. 15	0 0005
Jack Waite, Ida.	July 21	Aug. 18	0 01
Macnamara, Nev	July 27	Aug. 17	0 03
Maryland, Ida	Aug. 5	Sept. 5	0 003
Moonlight, Ida	July 13	Aug 20	0.005
Nabob, Ida	July 20	Aug 17	0.005
New Hope, Ida	July 13	Aug. 13	0.002
North Bunker Hill, Ida	July 18	Aug. 22	0 002
O K., Utah	Aug 17	Sept. 2	0 005
Old Evergreen, Utah	July 23	Aug. 22	0.01
Oreano, Ida.	July 24	Aug. 24	0 002
Paymaster, Ida.	July 15	Aug. 12	0 002
Reeds Peak, Utah	July 6	Aug. 10	0 005
Smuggler, Utah	July 11	Aug. 11	0 005
Spider, Utah	July 21	Aug 18	0 0025
Sunrise, Ida	July 14	Aug. 24	0 002
Wasatch, Utah	July 27	Aug. 31	0 05
Wasatch-Utah, Utah	July 13	Aug. 17	0 01
West Century, Utah	Aug. 2	Aug. 24	0 005

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56 260	62 938	57.572	25 887	28 983	26.553
February	59 043	61 642	57 506	27 190	28 357	26 573
March	58 375	57 870	58 067	26.875	26 669	26 788
April	59 207	59.490	58 519	28 284	27 416	26.958
May	60 880	60 361	58 175	28 038	27 825	26.704
June	61 290	58 990	56 471	28 215	27 199	25 948
July	60 654	58 721	54 678	27 919	27 074	25.219
August	61 606	59 293	.	28 375	27 335	.....
September	63 078	60 640	. .	29 088	27 986	.....
October	63 471	60 793	....	29.299	28 083	......
November	62 792	58.995	. ..	29 012	27 263	......
December	63 365	57.760	. ..	29 320	26 720	......
Year	60 835	59 791	.. .	28 042	27 576	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16 488	14 223	71 741	64 304	77 750	69.488
February	14 971	14 491	65 519	65 259	71 575	70 188
March	14 713	14 131	65 329	64 276	70 658	69 170
April	15 291	14 211	68.111	64 747	74 273	69 313
May	15 436	13 996	68 807	63 182	74 774	67.786
June	14 672	13 603	67 140	61 336	70 821	66 274
July	14 190	13.223	64 166	60.540	69 446	64 955
August	15 400		69 200		74 313	...
September	16 328	.	73 125		78 614	....
October	16 337	.	73 383		79 250	...
November	15 182	.	68 275		73 825	...
December	14 224	.	65.223		69 583	...
Year	15 269		68 335	..	73 740	..

New York, cents per pound, London, pounds sterling per long ton.

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50 298	37 779	238 27[illegible]	171 905
February	48 766	39 830	220 140	181 550
March	46 832	38 038	213 61[illegible]	173 619
April	49 115	36 151	224 159	163 963
May	49 038	33 360	224 143	150 702
June	44 820	30 577	207 208	138 321
July	40 260	31 707	183 511	142 517
August	41 682		188 731	. .
September	42 410	.	193 074	..
October	40 462		184 837	
November	39 810		180 869	
December	37 635		171 786	. . .
Av. year	44 [illegible]		206 279	

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4 111	4 171	4 011	17.114	19 665
February	4 325	4 048	4 175	3 937	16.550	19 606
March	4 327	3 970	4 177	3 850	15 977	19 651
April	4 381	3 810	4 242	3 688	17 597	18 225
May	4 342	3.900	4 226	3 808	18 923	18 503
June	4 325	3.900	4 190	3 810	20 226	19.411
July	4 353	3 891	4 223	3 738	20 038	19 051
August	4 624		4 550	. . .	20 406	. ...
September	4 698	. . . .	4 579	. .	20 648	......
October	4 402	. ..	4 253	...	20 302	......
November	4 293	.. ...	4.146		19 334	......
December	4 047	.. ...	3.929		17 798	......
Year	4 370	.	4 238		18 743	

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6 931	5 262	6 854	5.112	26 114	21 533
February	6 239	5 377	6 089	5 228	25 338	21 413
March	6 078	5 250	5 926	5 100	24 605	21.460
April	5 641	5 113	5 491	4.963	25 313	21 569
May	5 406	5 074	5 256	4.924	24 583	21.393
June	5 124	5 000	4 974	4 850	22 143	21.345
July	5 278	4.920	5 128	4 770	20.592	21 568
August	5 658		5 508	.	20 706	. . .
September	5.694	.	5.444	.. .	21.148	.....
October	5.340		5.188	......	20 614	......
November	5 229	. .	5 083	.....	20 581	......
December	5 156	.. ..	5 004	...	21 214	......
Year	5.648	. ...	5.504	......	22.746	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18 15	$14 94	$17.35	$13.23	$18 59	$13 90
February	18.15	15 06	17 22	14.12	18 13	14 09
March	18 15	15 07	16.96	13 94	17.53	14 18
April	17.90	14.90	16 71	13 90	16 40	14 10
May	17.68	14 90	15 80	13 90	15 40	14 23
June	17.14	14 90	15 40	13 90	15 10	13 97
July	16.31	14 90	15.13	13.90	14 74	13.96
August	16.63	.. ..	15 00	.....	14 88	......
September	16.65	..	15 04	.....	14 93	......
October	16.60	.	14 61	..	14 80	.....
November	16.03	......	13.91		14 40	......
December	15.71	......	13.71	. .	14.28	......
Year	$17.09	......	$15.57	. ..	$15.77	......

STOCK QUOTATIONS

COLO. SPRINGS July 29	
Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con.	.006
C. K. & N.	.05
Doctor Jack Pot.	.06
Elkton Con.	47
El Paso.	1 40
Findlay	.006
Gold Dollar	.02½
Gold Sovereign	.01
Golden Cycle	1.00
Isabella	10¼
Jack Pot	05
Jennie Sample	03
Jerry Johnson	03¼
Lexington	004
Old Gold.	01
Mary McKinney	50
Pharmacist	‡ 009
Portland	1 10
Vindicator	1 00

SALT LAKE July 30	
Name of Comp.	Bid.
Beck Tunnel	.03
Black Jack	.04
Cedar Talisman.	.00½
Colorado Mining.	11½
Crown Point.	01½
Daly-Judge.	5 00
Gold Chain.	10
Grand Central.	70
Iron Blossom.	1 37½
Little Bell.	12
Lower Mammoth.	‡.00¾
Mason Valley	2 12½
May Day	.05¾
Opohongo	01¾
Prince Con	18
Silver King Coal'n.	2.80
Silver King Cons.	1.80
Sioux Con.	.01½
Uncle Sam	‡.03½
Yankee.	.01½

TORONTO July 30			
Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	‡ 00½	Foley O'Brien	26
Coniagas	‡7 00	Hollinger.	18 00
Peterson Lake	‡ 31½	Imperial	‡ 01¾
Right of Way	‡ 02	Jupiter	‡ 06¾
T. & Hudson Bay	‡35 00	Pearl Lake	‡ 02½
Timiskaming	10	Porcu. Gold.	.05
Wettlaufer-Lor.	05	Preston E. D.	.01
Big Dome.	‡8 10	Rea.	‡.10
Crown Chartered	‡ 00¾	Swastika	‡.01
Dome Exten.	.07	West Dome.	‡.05

SAN FRANCISCO July 30			
Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks		Misc. Nev. & Cal.	
Alta.	.06	Belmont	5 40
Belcher.	.44	Jim Butler	81
Best & Belcher	‡.04	MacNamara.	‡.01
Caledonia	.50	Midway	.14
Challenge Con.	‡.08	Mont.-Tonopah.	.56
Chollar	‡ 02	North Star.	.19
Confidence.	‡ 21	West End Con.	.64
Con Virginia.	07	Atlanta	12
Crown Point (Nev.)	36	Booth.	.03
Gould & Curry.	‡ 01	C.O.D. Con	.02
Hale & Norcross.	‡ 04	Comb. Frac.	.04
Mexican	40	Jumbo Extension	.17
Occidental	75	Pitts.-Silver Peak	.27
Ophir	.06	Round Mountain	.34
Overman	24	Sandstorm Kendall.	.05
Potosi	.01	Silver Pick.	.05
Savage.	‡ 05	Argonaut	2.50
Sierra Nevada.	.03	Brunswick Con.	1 50
Union Con.	.08	Central Eureka.	20
Yellow Jacket	.35	So. Eureka.	1.40

N. Y. EXCH. July 30	
Name of Comp.	Clg.
Amalgamated	49½
Am.Sm.&Ref.,com	52½
Am. Sm. & Ref., pf.	97½
Am. Sm. Sec., pf. B.	78
Anaconda.	25
Batopilas Min.	.75
Bethlehem Steel, pf.	81½
Chino.	32
Colo. Fuel & Iron.	21½
Federal M. & S., pf.	29½
Great Nor., ore., ctf.	23
Guggen. Exp.	40½
Homestake	110
Inspiration Con.	15
Mex. Petroleum	53
Miami Copper	17½
Nat'l Lead, com.	41½
National Lead, pf.	102
Nev. Consol.	10½
Ontario Min	2½
Phelps Dodge	175
Quicksilver, pf.	1½
Ray Con.	16½
Republic I&S, com.	18½
Republic I&S, pf.	78
SlossSheffi'd, com.	19½
Sloss Sheffield, pf.	82
Tennessee Copper.	24¾
Utah Copper	46
U. S. Steel, com	51½
U. S. Steel, pf.	106½

N. Y CURB July 30	
Name of Comp.	Clg.
Beaver Con.	.21
Big Four	.05
Boston Montana	‡9½
Braden Copper.	6
B. C. Copper	1½
Buffalo Mines.	1
Can. Cop. Corpn.	‡2
Can. G. & S.	.08
Caribou.	.08
Chambers Ferland	‡.12
Con. Ariz. Sm.	$\frac{7}{16}$
Cons. Nev.-Utah.	‡½
Coppermines Cons.	1½
Davis-Daly	‡ 64
Diam'field-Daisy	.05
Ely Con.	.05
Florence	.27
Gold Hill Con	‡$\frac{7}{16}$
Goldfield Con.	1$\frac{7}{16}$
Greene Cananea	28
Kerr Lake.	5½
La Rose.	75
McKinley-Dar-Sa	.49
Mines of Am.	2½
Mutual Min, pf	2½
Nevada Hills	.26
New Utah Bingham	‡½
Nipissing Mines	5½
Ohio Copper	.10½
Oro	.07
Puebla S. & R	2½
Stand'd Oil of N.J.	357
Stand'd Silver Lead	1$\frac{11}{16}$
Stewart	1$\frac{3}{16}$
Tonopah.	5¾
Tonopah Ex.	2½
Tonopah Merger.	31
Tularosa.	.25
West End Ex	.03
Yukon Gold	2½

LONDON July 23	
Name of Comp.	Clg.
Camp Bird	£0 8s 3d
El Oro	0 14 0
Esperanza.	0 13 9
Mexico Mines.	5 0 0
Oroville	0 10 6
Santa Gert'dis.	0 11 3
Stratton's	0 0 6
Tomboy	1 1 3

BOSTON EXCH July 30	
Name of Comp.	Clg.
Adventure	1
Ahmeek	260
Alaska Gold M.	19½
Algomah	‡.90
Allouez	38½
Am. Zinc	12½
Ariz. Com., ctfs.	3½
Bonanza.	.51
Butte-Balaklava	‡2
Butte & Superior	25
Calumet & Ariz.	56
Calumet & Hecla.	394
Centennial.	15½
Cliff.	‡1
Copper Range.	30
Daly West	‡2
East Butte	9
Franklin	3½
Granby	67½
Hancock	11½
Helvetia	‡.30
Indiana	3
Island Cr'k, com.	46
Island Cr'k, pfd.	87
Isle Royale	17½
Keweenaw	3½
Lake	5
La Salle	‡3½
Mass.	‡4
Mayflower	4½
Michigan	‡.60
Mohawk	39
New Arcadian	3½
New Idria Quick.	‡3½
North Butte.	20½
North Lake	‡1½
Ojibway	‡ 90
Old Colony	3½
Old Dominion	45½
Osceola	70
Quincy	53
Santa Fe	‡1½
Shannon.	4$\frac{11}{16}$
Shattuck-Ariz.	‡21
Superior	23
Superior & Bost.	1½
Tamarack	29
Trinity.	3
Tuolumne.	‡.35
U. S. Smelting	31½
U. S. Smelt'g, pf.	43
Utah Apex	‡1½
Utah Con.	10
Victoria	1
Winona	2
Wolverine	37
Wyandot	.50

BOSTON CURB July 30	
Name of Comp.	Bid.
Bingham Mines.	04½
Boston & Corbin.	.25
Boston Ely.	.25
Butte & Lon'n Dev.	.27
Calaveras	1½
Calumet-Corbin.	.05
Chief Cons	80
Corbin.	.90
Cortez	.30
Crown Reserve	1$\frac{7}{16}$
Eagle & Blue Bell.	88
First Nat. Cop.	1$\frac{7}{16}$
Houghton Copper.	1½
Iron Cap Cop., pf.	4½
Majestic	.16
Mexican Metals	.16
Nevada-Douglas.	1
New Baltic	.99
Oneco	.60
Raven Copper	.12
Smokey Dev.	.15
So. Lake	3½
Tonopah Victor	.18
Trethewey	‡.09½
United Verde Ext.	.70

‡Last Quotations.

The Engineering and Mining Journal

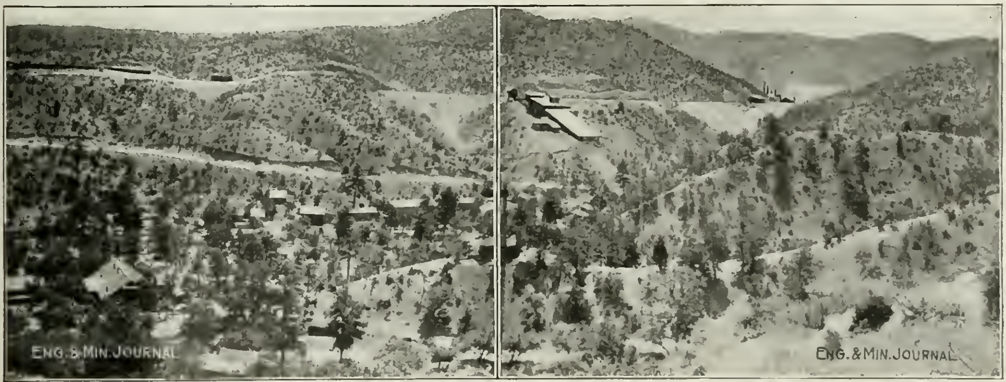
VOLUME 98 AUGUST 15, 1914 NUMBER 7

Burro Mountain Copper District

By W. Rogers Wade*

SYNOPSIS—Description of this New Mexico district, noting history, present operations and conditions, geology, mineralization, development and probable costs. The ores are disseminations in monzonite and granite, typical "porphyry copper." Secondary enrichment has produced workable bodies carrying chalcocite. The Phelps-Dodge company is the only operator of importance at present.

The Burro Mountain copper mining district is situated in Grant County, 12 miles southwest of Silver City, N. M. The town of Tyrone is the center of the camp and is reached by the Burro Mountain R.R. from Whitewater on the Atchinson, Topeka & Santa Fe. Three trains a week now run over this line, which has been but recently completed. The service is to be increased to daily trains later. The mines of the Chino Copper Co. are at Santa Rita, 17 miles the other side of Silver City, and 27 miles from the Burro Mountain district.



Town of Tyrone, Railroad Grade, Experimental Mill, Nos. 2 and 3 Chemung Shaft at Right

History of the Camp

Copper ores were discovered in the Burro Mountains in 1871 by the Metcalf brothers, the discoverers of the Clifton-Morenci district. In 1881, the Valverde Copper Co. built a smelting plant in Deadman Cañon. The town around the works was called Paschal for the organizer of the company, Paschal R. Smith. The company owned the St. Louis, Burro Chief, Boston, Marshall, Copper Mountain and several other claims. The nearest railroad point was Deming, N. M., over 50 miles distant and the wagon haul cost $15 per ton. The ore was secured mostly from the St. Louis mine and smelted in a reverberatory furnace. The supply of high-grade material was small and the operating costs so high that the company soon failed. The large masses of low-grade ore in the company's ground were, of course, worthless in those days.

Two years later, another company under the management of Col. Paschal R. Smith built another smelting plant at Oak Grove, but this ran only a short time.

Soon after Judge Deming organized the Alessandro Copper Co. to work a group of claims about three miles east of the St. Louis mine. The treatment plant installed here involved a leaching process using sulphuric acid. The acid was made on the ground from pyrites. Where these sulphur ores came from I do not know. The low grade of the ore, the lack of a railroad, and the attempt to leach 30 years ago, resulted in failure to make a profit, and the mine closed.

In 1904, Theodore W. Carter got the Leopold brothers of Chicago interested in the district and they organized the Burro Mountain Copper Co. This company took over the St. Louis, Sampson, Boston and other claims belonging to the Southwestern Copper Co., which itself was a reorganization of the Valverde Copper Co. The Leopolds erected a 250-ton concentrator and treated ore from the Sampson and St. Louis claims running between 3% and 4% copper. Soon afterward, they sold a one-third interest to the Phelps-Dodge company, and gave it an option on the other two-thirds at the same time.

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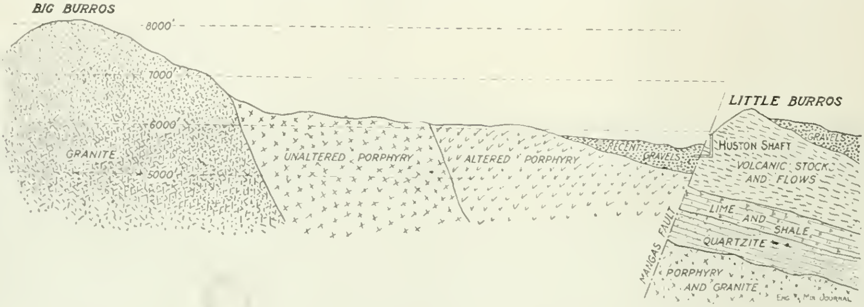
*Mining engineer, Tyrone, N. M.

About 1905 the Comanche Mining & Smelting Co. and the Copper Gulf Development Co. started developing property in the camp. In May, 1906, the Briggs-Oliver Development Co. took under option the Burro Chief group belonging to Thomas S. Parker and started Nos. 1, 2, and 3 shafts at Tyrone. This company later became the Tyrone Development Co. and then the Chemung Copper Co.

The Comanche and Copper Gulf companies merged into the Savanna Copper Co. The Phelps-Dodge company bought out the Leopolds' interest in the Burro Mountain Copper Co., and in 1913 it purchased the Chemung Copper Company.

Present Operations

At the present time the Burro Mountain Copper Co. is driving a transportation tunnel from the end of the railroad grade at Tyrone to Leopold. This tunnel is practically completed and connects below the bottom of the Sampson mine, 7000 ft. from its portal, with the extensive underground workings at Leopold. The company is testing out the flotation process at Tyrone in a 75-ton experimental mill, is erecting a central power plant, is building a five-mile railroad spur to the mill site, and will soon begin the erection of a 1000-ton concentrator.



Cross-Section through the Burro-Mountain Region across the Mangas Valley

Topography, Climate and Labor

The three central peaks of the Burros are rounded domes rising to 8050 ft. above sea level. The mining area is situated in the rolling foothills to the northeast of these peaks at an average elevation of about 6000 ft. The gulches in this area seldom exceed 300 ft. in depth and tunnel mining with one or two exceptions is not usually practicable.

The climate is never exceedingly hot in summer, being on an average cooler than in the Eastern states, and in the winter snow lasts but a day or so at a time, while the temperature is seldom below freezing in the day time.

Mexican labor is employed and is efficient when properly handled, as on the bonus or contract system. The wages are $1.75 per day for muckers and trammers, and $2.50 per day for machinemen, who are also Mexicans. The equable climate and the cheap labor make possible low costs per ton, an all-important factor in handling low-grade ores by underground methods.

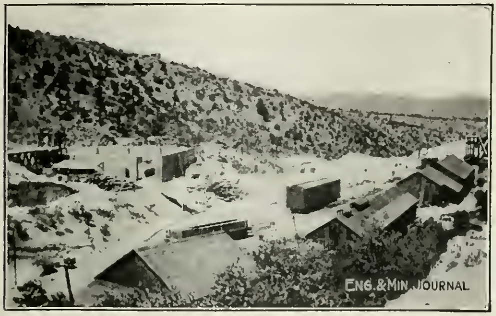
General Geology

The Burro Mountains proper consist of coarse-grained pre-Cambrian granite. This granite mass is many miles in diameter and was a deep-seated intrusion as evidenced by its coarse structure. The three central domes already mentioned seem to have been at about the center of the mass.

This granite contains crystals of feldspar up to 1½ in. long. A noticeable quantity of biotite is present throughout the rock, where fresh and unaltered. Northeasterly from the three central domes of the Burros, along the marginal edge of this basal intrusion lies a large area of quartz-monzonite porphyry. Near the main peaks this porphyry is hard, fresh and unaltered. As the mineralized area of the porphyry is approached, however, it becomes crushed, iron stained and impregnated with secondary silica, while the feldspars are mostly kaolinized. In the fresh porphyry, biotite is conspicuous, but in the mineralized zone, it is wholly absent. Just beyond Tyrone the outcrops of porphyry are covered by the Mangas Valley gravels. These gravels are deposits of recent geological origin and cover the mineral-bearing rocks in the neighborhood of Tyrone. Across the Mangas appears a well marked and extensive fault. This fault extends for miles in a northwest direction along the northern side of the valley and dips nearly vertically. The fault wall is marked in places by escarpments several hundred feet high. On the northern side of this fault occurs a series of rhyolite, andesite and basalt flows and dikes, cutting through and covering Cretaceous sediments. The basal granite undoubtedly underlies this series, the fault being later than the granite intrusion and the deposition of the sediments. The rhyolite in the Little Burros is extremely porphyritic, much shattered and appears to be copper bearing. Whether or not this upper rock will contain workable orebodies remains for development work to prove. The vertical movement along this fault has been extensive, the granite and porphyry area being elevated in relation to the sediments and volcanic flows. The relations of the various rocks are shown on the accompanying cross-section.

The copper-bearing area is the northeastern marginal zone surrounding the basal granite intrusion. This zone consists of an area of monzonite porphyry intrusions in the granite. The largest of these intrusions extends from a point near the base of the Big Burros to the Mangas Valley and has a width of three to four miles. This area is not entirely unbroken porphyry however. Floating in it and cutting into it are large areas of the granite. At Leopold the porphyry has only a relatively small proportion of granite blocks intermingled with it, while in the Chemung mine at Tyrone, the granite areas are extensive. Both the granite and the porphyry are much altered and it is often difficult to tell them apart. The porphyry has practically the same chemical composition as the granite and undoubtedly was derived from the same magma, representing a cooling phase in the crystallization of the granite mass. Orebodies occur in both rocks and seem to depend more on the fractured condition of the rock than on its crystallization or chemical composition.

This mineralized area has been extensively faulted and crushed by a series of fracture systems. The main fracturing took place first in a series of northwest and southeast fractures, dipping sharply to the southwest. The movement along this system was relatively small. Next followed a series of northeast and southwest fracturing dipping at 50° to 75° to the northwest. After this, there occurred deep and extensive faulting running northeast and southwest with the same strike as the series just mentioned, but with an opposite dip of from 35° to 65° to the southeast, the average being about 40°. This is the predominating system and forms the fissures in which the greatest mineralization took place. Finally, a minor series of north and south faulting occurred but with a small displacement. This last series is of recent origin, since it cuts an existing orebody.



AT PORTAL OF HAULAGE TUNNEL

Showing power-house foundation, railroad grade and No. 2 Chemung shaft headframe at right.

ORIGIN AND CHARACTER OF THE OREBODIES

The granite contained cupriferous iron pyrites disseminated through its mass. Mineralizing solutions succeeding the cooling and fracturing of the intrusion, naturally circulated away from the denser center, and following the lines of least resistance flowed into the extensively fractured marginal area. Here the solutions deposited primary cupriferous pyrite, chalcopyrite and silica in the faults and crushed zones, attacking the rock, dissolving out the biotite and other ferro-magnesian minerals and altering the feldspar to kaolin. Subsequent descending surface waters dissolved the pyrite and chalcopyrite, forming sulphates of iron and copper. The copper sulphate was redeposited at water level as chalcocite, by the reaction between copper sulphate and iron pyrites. This process of secondary enrichment has resulted in concentrating the copper into orebodies of workable grade from a primary ore that probably contained not over 0.1% to 0.2% of copper, possibly much less.

At the two developed mines in the district, namely, the Burro Mountain at Leopold and the Chemung at Tyrone, bodies of commercial ore have been found varying in size from 100x400 ft. in horizontal dimensions to 500x800 ft. One orebody is 820 by 1500 ft., but I doubt if this is of commercial grade. The vertical extent of these orebodies is not yet fully proved, but several of them have a thickness of at least 250 feet.

It appear from the nature of these secondarily enriched orebodies, that the deeper the leaching has extended, the greater the amount of copper there is deposited below. The deepest leaching has occurred along the strongest fissures. This is shown in the Chemung mine, where at 700 ft., leached ground is encountered, especially in the strong northeast and southwest fracture zones.

Several varying water levels have occurred in the district in the past as is shown by the occurrence of orebodies and leached areas both above and below the present water level.

The movement of the descending waters carrying copper sulphate in solution has been both downward and to the northeast. As a result the concentration of copper has been greatest in the northeast end of the mineralized zone. This is proved underground in the developed mines, higher grade ore being found in the Chemung than in the Burro Mountain at Leopold. The process of leaching and enrichment is still going on in the district, as is shown by the water coming from the mines, which is charged with copper sulphate.

VALUE OF DEVELOPED OREBODIES AND FUTURE COSTS

The ore in the camp runs from 2% to 3.25% in copper. All material below 2% has been considered of too low a grade to be classed as ore in the past. However this is an economic problem and I am of the opinion that future operations on a large scale will show a lower grade than this to be profitable.

I am not in a position to give an exact statement of the total ore reserves developed in the district but should estimate that twelve million tons of developed and partially developed ore is already in sight. The unprospected area is enormous and the ultimate tonnage mined from the district will be many times greater.

The probable cost per pound of copper from the Burro Mountain mine will be between 8 and 9c. All of this ore will be hauled through the 7000-ft. tunnel by electric locomotives and taken by steam from the portal of the tunnel to the mill, five miles distant. The ground is well suited to mining by the caving system. The Chemung ores will have to be hoisted and because of this and the other factors of increased costs attending deep mining the ore will cost more to mine. The probable cost will be about 9 to 10c. per lb. for copper mined from this part of the district. By the middle of 1915, the Burro Mountains should be producing at the rate of 12,000,000 lb. of copper annually.

Utilization of the Waste Heat of Slag

Much has been done in the last few decades to utilize the heat in iron blast-furnace slags, the annual production of which amounts to close on 200,000,000 tons. If their temperature is taken at 1500° C., the quantity of heat they contain must be enormous, all of which is wasted.—*Times* (London), May 21, 1914.

Efforts were made some years ago by the late Sir Lowthian Bell to save this heat, but the state of engineering achievement in his time did not permit a satisfactory solution of the problem. Further experiments have been in progress at the Clarence works of Messrs. Bell Bros., Middlesbrough, for some four years, the patents being in the hands of the Slag Power Co. The first plan was to drop the molten slag as it comes from the blast furnaces into water, and use the steam thus produced in a low-pressure turbine. But the considerable quantities of hydrogen and sulphuretted hydrogen produced along with the steam gave rise to difficulties in connection with obtaining the high vacuum necessary to the efficient working of the turbine. These difficulties were overcome, but a quantity of fine sulphur was also produced, and this it was found impossible to eliminate from the steam. Yet if it had not been removed it would have damaged the blades of the turbine with which it came into contact, and would also have blocked the steam passages. Another difficulty was caused by the fact that the hot blast-furnace slag when thrown into water froths up into a foam-like substance, which floats, and means had to be devised for submerging and removing it.

Instead of attempting to use directly in the turbine the dirty steam generated by the contact of the slag with the water, the plan finally adopted was to employ it indirectly for generating clean steam by means of a heat exchanger, the particular form adopted being a Kestner single-effect climbing film evaporator. The hot slag is run direct from the blast furnace into the primary generator, in which an upright shaft with four blades revolves, keeping the water in constant rotation. When the slag drops through the orifice the velocity of its fall carries it well below the lip, and before it rises to the surface it is swept by the moving water past the orifice and inside the seal. An elevator then lifts it from the generator and drops it through a second seal; by this time it is waterlogged and sinks, and it is then collected by a second elevator, which drops it into railway trucks for removal. The dirty steam passes from the generator to the evaporator, where it is used to produce clean steam, which is empolyed in the turbine. In the case of copper slag, the second elevator is not required, since the slag does not float in water, but immediately sinks.

Over 710 kg. of water have been evaporated per 1000 kg. of blast-furnace slag containing 550,000 cal.; deducting 18,000 cal. removed with the slag at 100° C. and 42,000 removed with the water taken up by the slag (on the assumption that it absorbs 50% of water), the available heat is 490,000 cal., or, if an allowance of 25% is made for loss, 367,500 cal., which divided by 622 give 590 kg. of steam. As the result of many experiments, the average efficiency of the evaporator is found to be 91%, but taking it at only 80% the amount of clean steam available for the turbine is 472 kg., and this with a consumption of 13 kg. of steam per horsepower, which is an excess of that guaranteed by the makers of the turbine with a vacuum of 28.5 in. and a vacuum of 7 in. over the water in the evaporator, means a yield of over 36 hp. per 1000 kg. of slag. Copper slag contains less heat than blast-furnace slag, the amount being found by experiment to be from 318 to 350 cal. per kg., and therefore by a similar calculation 1000 kg. will produce 281 kg. of clean steam, equivalent to a yield of, say 21 hp. in the turbine.

It is estimated that with a 1000-kw. plant with 75% load, the cost of generating 1 kw. would be 0.32d., whereas with a high-pressure steam plant using coal at 14s. 6d. a ton it would be 0.48d., the economy realized by the aid of the heat from the slag being thus 0.16d. per kw., which under the conditions stated would amount to £4300 a year. It is stated that the upkeep of the generator and evaporator is small. As the slag goes directly into the water, only steam at 100° C. comes in contact with the plant, which is thus not subjected to any great differences of temperature, while experience indicates that there is no action from the gases on the plates or tubes of the evaporator, provided they are kept clean.

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Sydvaranger Iron Mines, Norway

The increased layout for the so called "third construction period" is now completed, and the company is now in a position to export about 650,000 tons of ore annually. The amount of crude ore mined last year was about 1,000,000 tons, from which 425,000 tons of slig (concentrate) were produced. Of this about 180,000 tons were briquetted at Kirkenaes. The total export was about 450,000 tons of slig and briquettes, of which 70% went to Germany and 30% to England. As the increasing demand abroad for the company's briquettes had exceeded the capacity of their plant, an auxiliary briquetting works capable of turning out 100,000 tons annually was commenced last autumn.

The system to be adopted is that of the improved Gröndal-Raménske. It is estimated that the production and export in 1914 will be about 650,000 tons. A gross and net profit (the first hitherto obtained) of $277,775 and $48,045, respectively, appeared in the balance sheet for 1913. The value of the proposition is entered at $8,230,000. The number of men and officials employed during the first half of 1913 was 1100, and during the second half, 1300.

The Sydvaranger ore zone is about 1,000,000 sq.m. in extent; the ore is magnetite, of 36 to 37% Fe., which, by magentic separation, is brought up to 65 to 70% Fe. The Björnevand deposit has an estimated reserve of 50 millions of tons, and ore has been to a depth of 250m. The work is open cast, all borings being carried out with Ingersoll drills. Once a month, at Björnevand, giant blasts are carried out, and on a recent one (the record for Europe), 18,000 kilos of dynamite was used, at a cost of $12,500. Steam shovels of a capacity of 500 tons in 8 hr. are employed, and the crushers are of the manganese-steel Gets type, handling 3000 tons in 18 hr. The Sydvaranger company was formed in 1906, with a capital of $1,390,000, since increased to $4,450,000, and is not subject to expropreation, nor to any royalties, beyond the payment to the state, as ground owner, of under 1c. per ton on "all ore mined."

The Faultless Faultfinder

By Walter Scott Weeks* and Edward V. Huntington†

SYNOPSIS—Description of two charts for use in the rapid solution of fault problems. Having obtained the position of the fault and of the unfaulted portion of the vein and the amount and direction of the faulting movement, two simple operations with these charts give the horizontal offset of the faulted portion of the vein and the direction in which it lies. Practical examples illustrate the application of the devices. Other miscellaneous applications to geological problems are exemplified.

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When a vein or an orebody of plane form is displaced by a fault, the geologist or the mining engineer desires to know the relative position of the two portions of the vein which have been separated by the faulting movement. All fault problems can, of course, be solved by tedious graphical or algebraic methods, provided the necessary data have been obtained or can be assumed. To obviate the necessity for such methods, and to effect a simple, rapid and accurate solution of many fault problems for which the data are at hand, the two charts here described were devised.

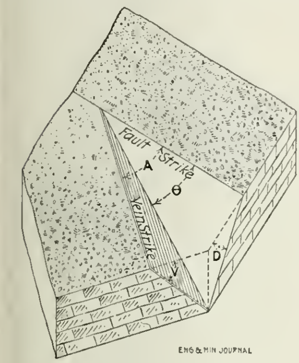

Fig. 1. Relations of the Planes and Angles

When a fault plane intersects the plane of a vein, the line of intersection, which occupies in general an inclined position in the earth, makes a certain angle with the strike line of the fault plane. In solving a fault problem, it is essential to determine the position of this line in the fault plane, that is, the angle it makes with the fault strike. Its position depends on three angles: (1) That between the strike of the vein and the strike of the fault; (2) the dip of the fault; (3) the dip of the vein. Knowing these three angles, the value of the angle desired can be determined. For this purpose Chart I is used. The relation between these planes and angles is shown in Fig. 1. When this angle is known, and the position of the line of intersection of the two planes is thus determined, the relative position of the two parts of the vein can be found, provided the direction and amount of movement of the hanging-wall block with relation to the foot-wall block is known.

Determination of the Strike Angle

The strike lines of the fault and the vein form four angles; considering the two angles on the hanging-wall side of the fault, they are supplementary, one acute and one obtuse, unless they happen to be right angles. Of these two angles, that toward the interior of which the fault plane and the vein plane both dip, is to be called the "strike angle" and denoted by *A*. If one of the planes is vertical, in order to determine which of the two angles is the strike angle *A*, it is assumed that the plane dips either one way or the other, but the actual dip of 90° is used in performing the computation.

The nature and position of *A* are determined as follows: Draw the strike of the fault with the dip toward the bottom of the page; draw the strike of the vein on the hanging-wall side, that is, the lower side of the fault strike line; indicate by arrow the dip of the two planes. The strike angle *A* is the angle between the portions of the lines whence the arrows point approximately toward each other. The manner of making this diagram is illustrated in Fig. 2, which shows the four possible cases. It should be stated, to avoid all possible confusion, that the left-to-right position of the fault strike line on the paper does not indicate an east-west fault.

Designations Used

It will be noticed that a part of each fault strike line in Fig. 2, lying on one side of the point of intersection, has been drawn heavy. The part is that adjacent to the strike angle A, and is to be called the "principal end of the strike."

The dip of the fault plane is to be designated as *D*, the dip of the vein plane as *V*. The inclined angle whose value it is desired to find, i.e., that made by the strike line of the fault with the intersection of the two planes, is to be called *θ*. It must be understood that this angle is measured in the plane of the fault downward from the principal end of the strike to the line of intersection. This angle may be measured clockwise as in I and III, Fig. 2, or it may be measured counter-clockwise, as in II and IV. This question of the direction in which it is measured is of importance in the use of Chart II.

Determination of θ by Use of Chart I

The method of using Chart I, to find the angle *θ*, is as follows: Suppose that the strike angle *A* has been found as shown in Fig. 2, from the data obtained in the field; that *D*, the dip of the fault, has been ascertained from field work, as well as *V*, the dip of the vein. On Chart I, Fig. 3, find the number on the circumference corresponding to the value of *A*; this will be at an end of a hyperbolic arc. Similarly, on the upper part of the vertical axis at the left of the diagram, find the number corresponding to the value of *D*; this will lie at an end of an elliptical arc. Trace along these two arcs to their point of intersection, which we may designate as

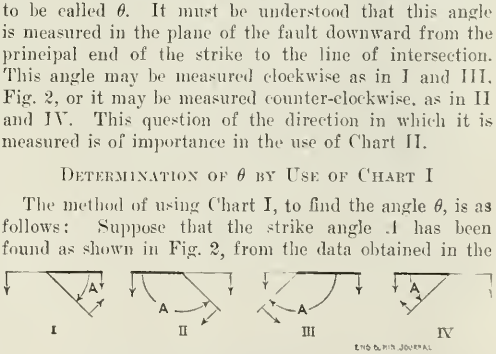

Fig. 2. Diagram to Determine *A* and Principal End of Strike

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†Assistant professor of mathematics, Harvard University.

Note—The manner of printing the "Journal" renders Charts 1 and 2 and the protractor unsuitable for the most accurate work. For such engineers and geologists as desire to make practical use of these charts, we can furnish a pamphlet reprint of the article in which the reproductions will be mathematically correct, for 50c. per copy.

X. On the lower half of the vertical axis, find the number corresponding to the value of *V*. With a straightedge connect this point with the point *X*. Along this straightedge, lay a semicircular protractor, preferably one numbered counter-clockwise from zero on the right. The angle which the protractor thus measures between the straightedge and the vertical axis of the diagram, will be the angle θ. The use of a protractor is not absolutely necessary. The outermost elliptical arc is approximately a semicircle. Therefore, if a second straightedge parallel to the first be laid through the point marked 90°, the middle point of the vertical axis, the angle desired will be measured on the outermost arc, which becomes itself a protractor. The error due to the fact that it is not exactly a circle will be insignificant.

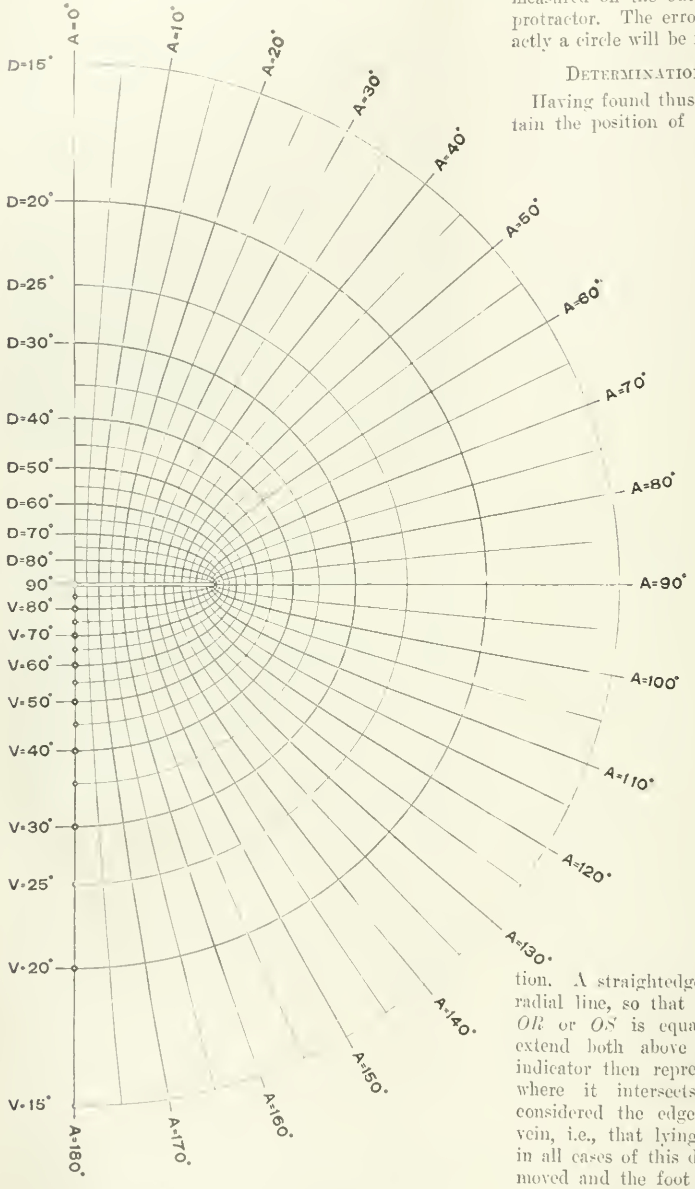

Fig. 3. Chart I, for Determining θ

Determination of Offset with Chart II

Having found thus the value of θ, it remains to ascertain the position of the faulted portion of the vein by means of Chart II, Fig. 4. This chart is a view of the fault plane from the hanging-wall side, the paper itself being in the plane of the fault; that is, we may imagine the drawing to be actually made in the plane of the fault and that we are looking down at it from a point in the hanging wall. The line *ROS* is the strike of the fault. In use, this had best be kept horizontal, although it is not so shown here. It should be stated again that this line in the horizontal position must not be taken to represent an east-west fault; the diagram is not in any sense a map.

The value of the angle θ is turned off downward from *OS* or *OR*, taking *O* as a center; *OS* is used if the principal end of the strike lies to the right of the point of intersection and *OR* if it lies to the left, this having been determined as illustrated in Fig. 2. It is not necessary to use a protractor for laying off θ, as the bottom of the diagram shows two rows of figures at the ends of radial lines from *O*, becoming thus a protractor. The upper row of these figures is used if θ is measured from *OR*, the lower if it is measured from *OS*. The figures around the circumference of the circle have nothing whatever to do with this first operation. A straightedge indicator is laid along the proper radial line, so that the angle included between it and *OR* or *OS* is equal to θ. This straightedge should extend both above and below *O*. The edge of the indicator then represents the actual edge of the vein, where it intersects the fault plane and may be considered the edge of the unfaulted portion of the vein, i.e., that lying in the foot wall. It is assumed in all cases of this discussion that the hanging wall has moved and the foot wall remains stationary, this being the usual assumption in the study of faults, and also that the two lines made by the intersection of the two portions of the vein plane with the fault plane are parallel, although this may not always be true.

The direction of motion of the fault will have been ascertained in the field. It may conveniently be expressed as making an angle with the dip line, up or down, to left or to right. Assuming the vertical line through O of Chart II, marked 0° on the circumference of the circle, to be the dip line of the fault, the direction of movement is traced from O out along that radius of the circle which makes the proper angle with the dip line and lies in the proper quadrant. If the fault is normal, i.e., if the hanging wall has moved directly or obliquely down the fault plane, the direction of movement is, of course, traced on a radius below ROS, as indicated on the diagram; if the fault is reverse, that is, if the hanging wall has moved up the fault plane, the movement is traced above ROS. The movement is traced along the radius selected, as far as Y, a point on the circumference. From Y, the distance along a horizontal line, i.e., a line parallel to ROS, to a point Z on the inclined straight-edge through O, representing the fault intersection, is measured in units of the scale at the top of the diagram. This distance represents the distance that the vein has been displaced horizontally in the fault plane for every 10 ft. of actual sliding along the fault plane, the length of the radius of the circle being 10 ft. as measured in units of the diagram scale. This horizontal displacement we shall call the "offset" of the vein. The actual offset is found by proportion. Thus, if it is ascertained that the offset measured is 3 units, or 3 ft. for each 10 ft. of faulting movement, and the actual faulting movement is 80 ft., then the actual offset will be to 80 ft. as 3 is to 10, or $\frac{80}{10} \times 3$, or 24 ft.

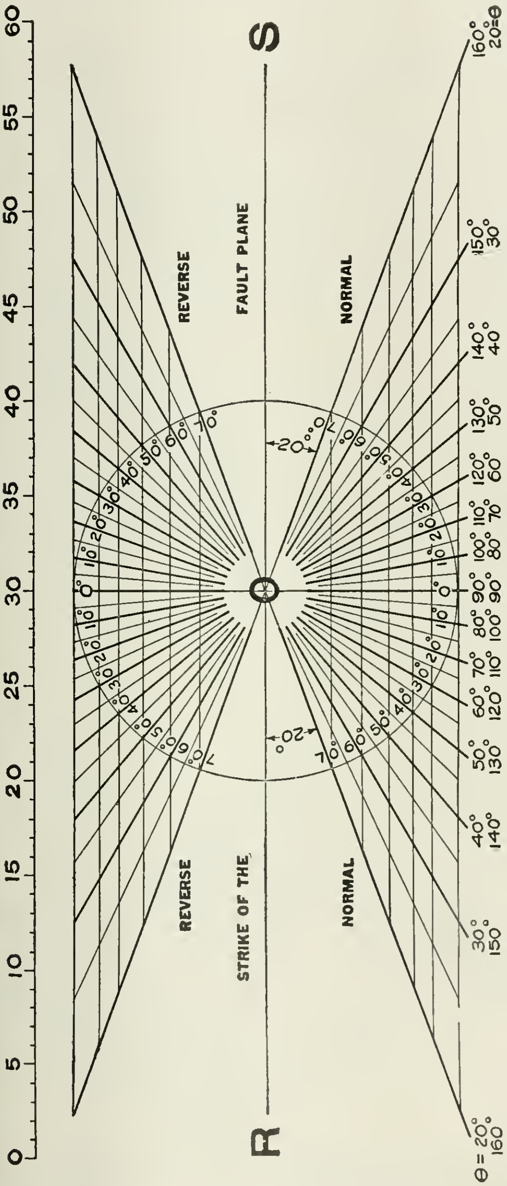

Fig. 4. Chart II, for Determining Offsets

If desired, the actual position of the intersection of the faulted portion of the vein with the fault plane can be represented by a second indicator through the point Y just found on the circumference, parallel to the indicator through O.

This general description of the method of using the chart can be made much clearer by a solution of some concrete problems. In all these problems the angle θ is determined to the nearest 5°.

Problem 1

Assume a fault striking east and west and dipping 40° to the south, cutting a vein striking N 60° E and dipping 50° to the northwest. Let the fault be of the reverse type, with a movement of 300 ft. and let the direction of movement be 30° to the northeast, that is, up the fault plane and to the right of the dip line, making an angle of 30° with the dip line (K, Fig. 5). Draw out the diagram L, Fig. 5, following the scheme of Fig. 2. It is found that the principal end of the strike lies to the left and that the strike angle A is 30°. We have given:

$$A = 30°; D = 40°; V = 50°.$$

It is first required to find θ. Using Chart I, trace curve $A = 30°$ and curve $D = 40°$ to their intersection at X (M, Fig. 5). Find the point $V = 50°$ on the lower half of the vertical axis. Lay an indicator or straight-edge between this point and X and measure the angle θ made by the indicator with the vertical axis. It is found to be 20°.

Turning to Chart II, turn 20° downward from OR and lay the indicator along this line from O, as in N, Fig. 5. This follows from the fact that OR is the principal end of the strike. Trace out the direction of fault movement from O, 30° to the right of the vertical and above OS, to the point Y on the circumference. Measure from Y parallel to OS, to the inclined straight-edge through O at the point Z. The distance measured in units of the diagram scale is 19. The offset was, therefore, 19 ft. per

10 ft. of movement. Since the actual movement was 300 ft., the actual offset is $1\frac{9}{10} \times 300 = 570$ ft. If a second indicator be placed through Y parallel to that through O, thus representing the intersection of the faulted hanging-wall portion of the vein with the fault plane, this will be seen to lie to the left of the unfaulted foot-wall portion and since the fault is, in this case, east and west, the hanging-wall portion will have been offset to the west. A drift from the foot-wall portion along the fault to the west should pick up the vein at 570 ft.

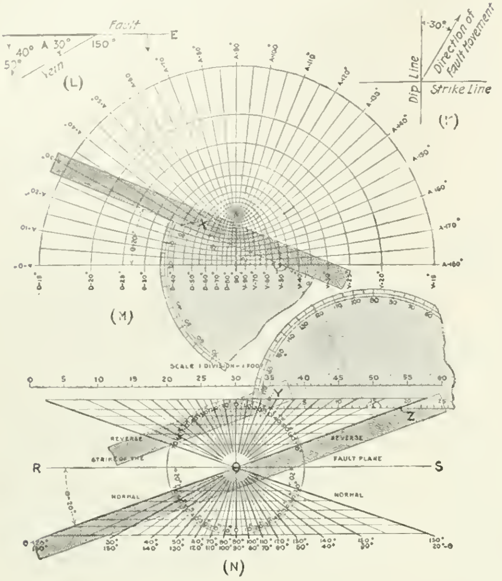

Fig. 5. Solution of Problem 1

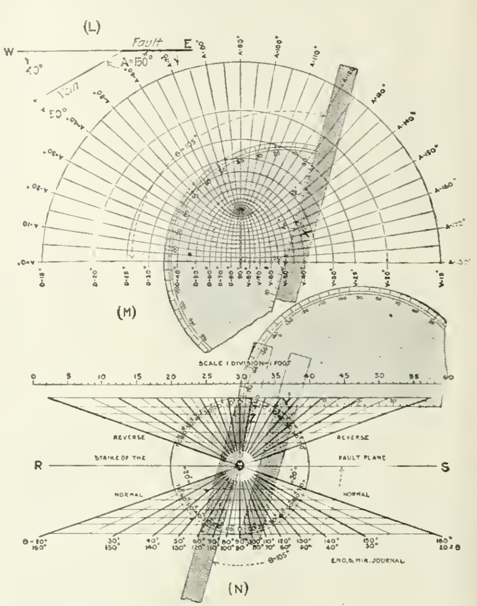

Fig. 6. Solution of Problem 2

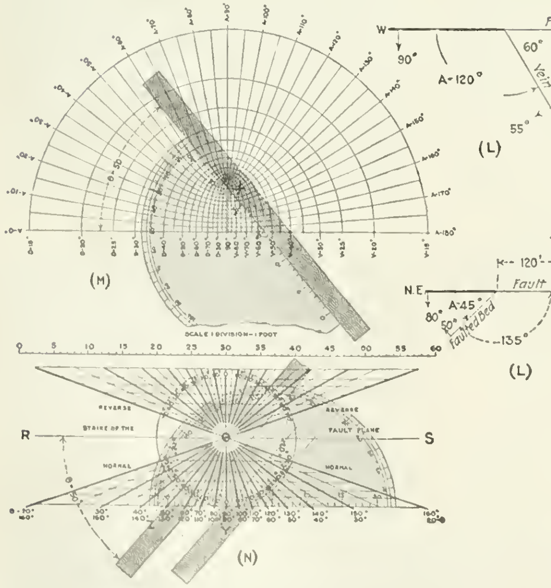

Fig. 7. Solution of Problem 3

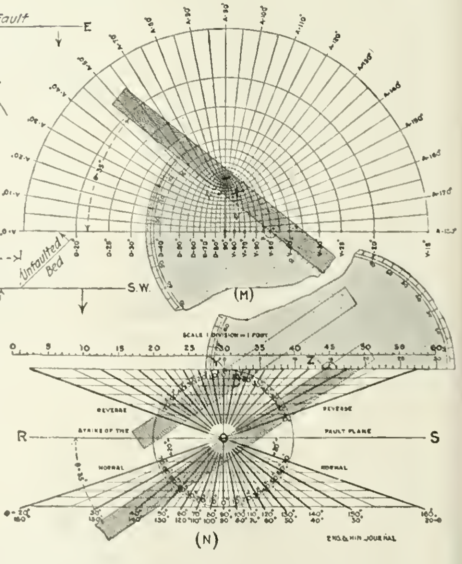

Fig. 8. Solution of Problem 4

Problem 2

Assume a set of conditions identical with those of Problem 1, but with the vein dipping to the southeast instead of to the northwest. By drawing the diagram *L*, Fig. 6, it will be seen that the principal end of the strike lies to the right and that A is 150°. The given data are then:

$$A = 150°;\ D = 40°;\ V = 50°.$$

As in *M*, Fig. 6, obtain the intersection X of curves $D = 40°$, and $A = 150°$. Through this point X and the point $V = 50°$, lay the straight-edge and measure the angle θ as before. It is found to be 105°.

On Chart II, *N*, Fig. 6, measure 105° down from *OS*, the principal end of the strike being to the right; lay the indicator as represented. Trace out the fault movement, just as in Problem 1, to point Y. Measure over to the indicator at point Z. This distance is found to be 2.7. The offset is, therefore, 2.7 ft. for every 10 ft. of movement, or 81 ft. for the 300 ft. of movement. By laying the second indicator through Y parallel to that through O, the faulted portion is found to lie to the east of the unfaulted.

Problem 3

Assume that a fault striking east and west and lying vertical, cuts a vein which strikes N 30° W and dips 55° to the southwest. The fault movement was vertical and amounted to 40 ft. The data are plotted as in *L*, Fig. 7, the block on the south side of the fault being assumed as the hanging-wall block. This block moves down so that the fault, plotted thus, is normal. The principal end of the fault lies to the left and A is found to be 120°. The data are:

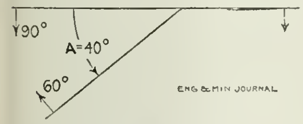

Fig. 9. Determination of A for Case 1

$$A = 120°;\ D = 90°;\ V = 55°.$$

On Chart I, *M*, Fig. 7, find the intersection of curves $A = 120°$, and $D = 90°$ at X. A straight-edge through X and the point $V = 55°$ makes with the vertical axis an angle of 50°, which is θ.

On Chart II, *N*, Fig. 7, turn off 50° from *OR*, the principal end of the strike, trace down the radius 0° from O to point Y. Measure from Y to the inclined straight-edge at Z. The result is 8.5. An offset of 8.5 ft. per 10 ft. of movement gives 34 ft. offset for the actual vertical movement of 40 ft. This offset, it will be seen, has taken place to the east.

Problem 4

Assume a set of sedimentary beds cut by a normal fault across their strike. The fault strikes northeast and southwest, and dips northwest at an angle of 80°. The beds themselves strike north and south and dip 50° to the east. A bed of conglomerate is found to be offset 120 ft. to the northeast when measured along a horizontal plane. The faulting movement took place perpendicularly to the strike of the fault, that is, directly up or down the dip. It is required to find the amount of displacement along the line of movement in the plane of the fault and whether the fault is normal or reverse. It should be noted that this problem is, to a certain degree, the reverse of those just solved, the offset being known, while the direction and amount of displacement are required. The data can be plotted as shown in *L*, Fig. 8. It is evident that the principal end of the strike lies to the left and A is found to be 45°. The given data are:

$$A = 45°;\ D = 80°;\ V = 50°.$$

Finding the intersection of curves $A = 45°$ and $D = 80°$; and connecting this point X with $V = 50°$, the angle θ is measured as 35° (*M*, Fig. 8). The angle 35° is then measured down from *OR* on Chart II, *N*, Fig. 8. It is known that the bed is offset to the northeast (*L*, Fig. 8). The fault has been plotted so that the northeast direction lies at the left. Since we know that the hanging wall is offset to the northeast, it must lie to the left of the unfaulted portion both in diagram *L* and on Chart II. The movement is along the dip line, therefore, to be traced either up or down the line running from O to 0° on the circumference of the circle. To bring the faulted intersection to the left of the unfaulted, this tracing must be performed upward from O, and this indicates that the fault was reverse. Tracing along the 0° radius to Y, and measuring horizontally to Z on the inclined indicator through O, we find the offset to be 14.5 ft. for each 10 ft. of displacement. Since the total offset is known to be 120 ft., the actual displacement along the dip is $\frac{120}{14.5} \times 10 = 83$ ft.

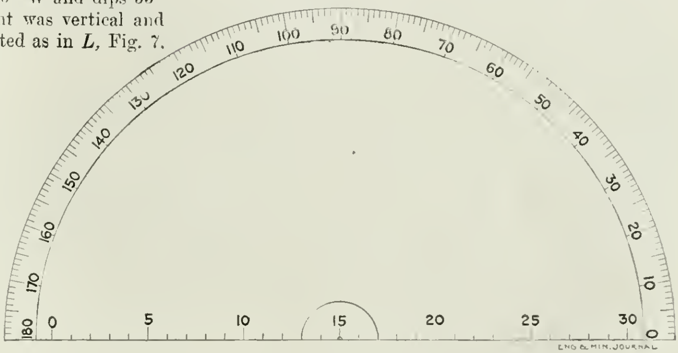

Fig. 10. Protractor and Scale for Use with Charts

Uses in Projection, Such as Geologic Sections

The geologist is often called upon to project angles upon planes, as in plotting, say, a vertical section across a series of dipping beds, not at an angle of 90° with the strike of the beds. After the use of Chart I as a means of solving fault problems has been mastered, it will be found of great service as an angle projector, by thinking of the angles and planes now to be dealt with in the terms of the angles and planes used in the fault problems.

Case I

Suppose a vein dipping at 60° is to be plotted on a vertical section made at an angle of 40° with the strike of the vein. By what angle will the dip of the vein be sented? The plane of the section can be considered a fault plane, and by plotting, as in Fig. 9, the angle A is seen to be 40°. We have then the data:

$$A = 40^\circ;\ D = 90^\circ;\ V = 60^\circ.$$

The value of the angle θ is then 47°, obtained from Chart I in the usual manner. This angle, it must be remembered, is the angle made by the intersection line of the two planes with the strike of the vertical or fault plane; obviously, this is the angle which it is required to plot on the section. The dip of the vein, modified by the fact that the section is not taken at right angles to the strike, is therefore plotted at 47° instead of 60°.

Case II

The line of intersection of a vein and a fault plane is found to make an angle of 50° in the fault plane with the strike of the fault. The dip of the fault is 60°. It is required to represent this angle in plan, that is, project the line of intersection on a horizontal plane. We can imagine a vertical plane passed through the line of intersection and its projection on the horizontal, to be a vertical vein. The desired angle, that made by the projection line and the fault strike, will be the angle A. The case will be that of a vertical vein cut by an inclined fault. We have given:

$$D = 60^\circ;\ V = 90^\circ;\ \theta = 50^\circ.$$

Using Chart I, place the center of the protractor at the center of the vertical axis, marked 90°; turn off $\theta = 50^\circ$; place the straight-edge along the bottom of the protractor; trace along the curve $D = 60^\circ$ until it meets the straight-edge; trace out along the hyperbolic curve from this point X, and it will be found to correspond to $A = 32^\circ$. Therefore, the angle between the fault strike and the projection of the intersection line is to be plotted at 32° on the desired plan.

Case III

The strike of a plane makes an angle of 30° with another horizontal line; the plane dips 60°. It is desired to find the angle between the strike of the plane and the vertical projection of the horizontal line on the plane. This, it will be noted, is the opposite of Case II. The given plane can be assumed as a fault plane, and the plane passed through the horizontal line in a vertical projection on the fault line can be considered a vertical vein. The angle which it is desired to find is, therefore, θ. There are given the data:

$$A = 30^\circ;\ D = 60^\circ;\ V = 90^\circ.$$

By the use of Chart I, θ is determined to be 49°.

Conclusion

In Fig. 10 is shown a protractor of suitable design for use with the charts, reading only counter-clockwise from 0° on the right to 180° on the left. On the bottom of this protractor is made a scale corresponding to the units of Chart II. It can thus be used for measuring offsets on Chart II. There is also printed in small type a set of rules for angle projection in using Chart I. These can be cut out and mounted on the front or back of the protractor. This, with the two charts also cut out, and all three properly mounted, will be a complete set of apparatus for solving the problems here described. For the straight-edge indicators, which are necessary, scales, cards, pencils, etc., can be used.

There has been no attempt to describe the mathematical theory on which Chart I is constructed. It may be assumed as correct. Readers who are further interested can consult an article by E. V. Huntington, entitled "A Graphical Solution of a Problem in Geology," to be published in the *American Mathematical Monthly*. The equation on which the chart is based is:

$$\text{Cotan}\ \theta = \text{cotan}\ A\ \cos D + \text{cosec}\ A\ \sin D\ \text{cotan}\ V$$

RULES FOR ANGLE PROJECTION

Case I: To find projection of dip angle on vertical plane. A = acute angle between strike of vein and strike of plane. D = 90°. V = dip of vein. θ = required projection of dip angle on vertical plane.

Case II: To find projection on horizontal plane of an angle in a dipping plane. D = dip of plane. V = 90°. θ = angle on dipping plane. A = plan of angle θ.

Case III: To find the vertical projection of a horizontal angle on a dipping plane. D = dip of plane. V = 90°. A = angle in horizontal plane. θ = vertical projection of A on dipping plane.

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Large Automatic Hoist

The Nordberg hoisting installation for the two shafts of the Inspiration Consolidated at Miami, Ariz., is going to be almost unique. The installation is in reality two separate hoists, one for each shaft, but as it will be possible to handle both from a single operating platform and as when running automatically, they will act as a single machine, it is customary to consider the set as in single hoist.

An idea of the size of the hoist can best be gained from a few figures regarding the work it is expected to perform. All hoisting will be done in balance, and since there are two shafts, this means that four skips will be in continuous operation. The skips will weigh 1500 lb. each and will have a capacity of 2400 lb., the net load to be hoisted. To allow ample time for repairs and emergencies, the hoisting period has been limited to 14 hr. per day and the capacity for the set for the period is 10,000 tons from a depth of 600 ft., corresponding to one skip of ore to the surface per minute. The hoist is so designed as to be entirely automatic in its operation, requiring no attendant whatever, neither on the surface nor underground at the loading pocket. It can, however, be disconnected at will so as to eliminate the automatic feature, making it hand operated. So far as known this is the first large hoist to be entirely automatic in its operation. Although the initial cost is much higher than it would otherwise have been, the amount saved in wages of engineers and attendants will soon offset the extra outlay.

*

Oregon Metal Production in 1913

The metal production of Oregon in 1913 was valued by Charles G. Yale, of the U. S. Geological Survey, at $1,746,402, an increase of over 100%. The most valuable product was gold, the output being valued at $1,627,710, of which $1,177,082 was derived from lode mining and $450,628 from placers. The silver production was 179,036 oz., and there were 87,207 lb. of lead produced. The copper output declined in 1913, the production amounting to only 43,330 lb. There were fewer mines in operation in 1913, but the tonnage from deep mines was materially increased. One new dredging operation was started during the year.

A Comparison of Roasting Furnaces

SYNOPSIS—An account of the experience at the Murray plant of the American Smelting & Refining Co. with both of these processes. Preroasting or diluting high-sulphur charges is necessary, as 15 to 18% sulphur was found to be the limit for satisfactory sintering. The Dwight-Lloyd plant has greater flexibility and the first cost is lower; the operating cost was in favor of the H. & H. plant, at Murray, and the product slightly superior, but both processes have given good results without any overwhelming advantage for either.

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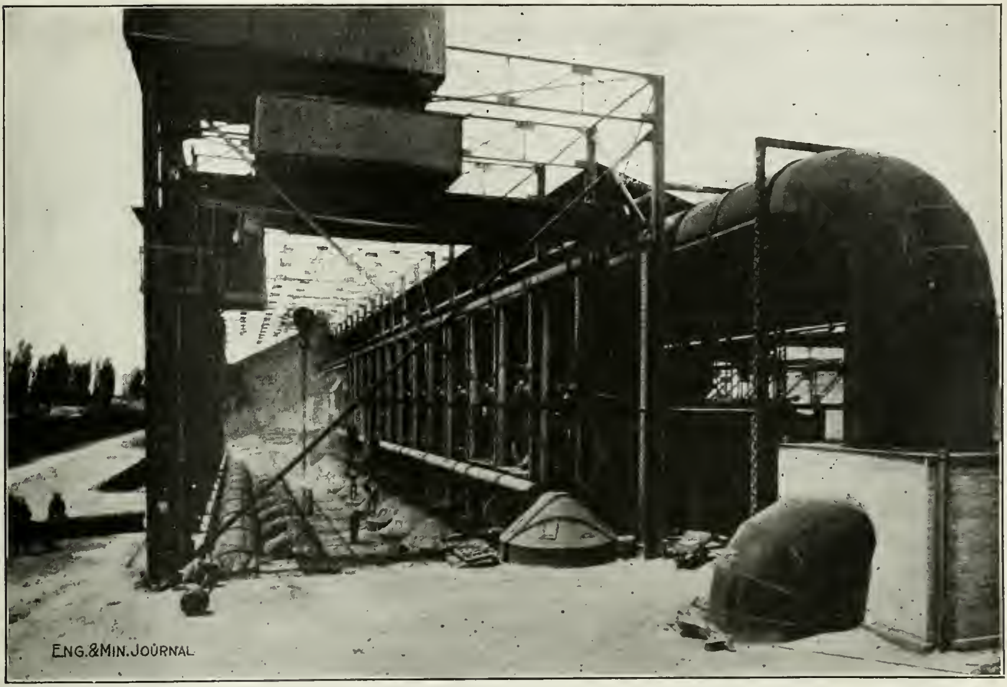

Huntington-Heberlein Roasting Pots at Murray, Utah

The gradually increasing proportion of sulphide ores which lead smelters of today are called upon to handle, has caused the roasting problem to become one of ever greater importance. We may look back a score of years or so and recall the old hand roasters, some of which turned out a finely divided roasted product, and others fashioned with a "fuse-box," wherein the roasted ore was slagged. Then came mechanical furnaces of several types, the Brückner cylinder, the Brown-O'Hara, the Ropp, and others, all designed to cut out the cumbersome hand labor of the old reverberatories. Roasting costs were thereupon reduced and tonnages stimulated to a gratifying extent. However, it seems to have been early recognized that this very feature of a greater amount of roasted sulphide ore as compared with oxide ore brought with it a train of difficulties at the blast furnaces. The mechanically roasted ore was fine physically, the blast furnaces were choked and the troubles of the smelter were not at an end. Then Huntington-Heberlein pot system of roasting appeared upon the scene, and later on the Dwight-Lloyd machines were invented, and inasmuch as both of these processes were designed not only to roast the ore but to agglomerate it as well, it was apparent that distinct steps in advance had been achieved.

Sulphur Limits of Roasting Equipments

At the Murray plant, modern roasting practice is fully exemplified and there are now in successful operation roasting furnaces or devices of several sorts; namely, Godfrey revolving-hearth furnaces, Wedge multiple-hearth mechanical roasters, Dwight-Lloyd sintering machines, and Huntington-Heberlein pots. Godfrey and Wedge furnaces will properly handle material high in sulphur, say ores with 25, 30 and 35% of that element; D. & L. machines and H. & H. pots will positively not treat efficiently ores or mixtures containing anywhere near the sulphur content mentioned, but are confined to charges containing from 15 to 18%. In passing, it may also be explained that, so far as the knowledge of the writer goes, Godfrey and Wedge furnaces do not economically eliminate sulphur to an extent sufficiently low for lead-smelting practice. With these simple facts in mind, it will be perfectly clear to all that the metal-

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Note—Excerpts from a paper to be read by W. W. Norton at the Salt Lake meeting of the American Institute of Mining Engineers, August, 1914.

lurgist in charge may elect to treat sulphide ores either in one of two ways: He may preroast in Godfrey and Wedge furnaces and subject the partly roasted product to a final treatment on D. & L. machines and H. & H. pots, or he may dilute the average sulphur in the raw ore to 15 or 18% by means of an admixture of the requisite quantity of nonsulphur fines and send the mixture thus obtained to D. & L. and H. & H. machines. The Murray plant does both. A certain flexibility is thus afforded for a segregation of the various classes of sulphide ores; moreover, in the matter of oxide fines, one can limit screening operations to a point deemed best metallurgically.

Godfrey and Wedge furnaces are essentially preroasters; D. & L. machines and H. & H. pots are final roasters. At Murray all final roast is either D. & L. or H. & H. We turn now to the primary object of this paper, namely, a brief discussion of the comparative merits of these two widely distinct methods of final roasting.

Cost of Installation

The Murray plant is equipped with two D. & L. machines, the total daily capacity of which may be stated at 220 tons, and 23 H. & H. pots, with capacity of 400 tons. It would, of course, be manifestly unfair to compare directly the total costs of these two installations, but it seems quite safe to say that for almost any given tonnage capacity a D. & L. plant can be built for considerably less than an H. & H. plant, it being understood that H. & H. is meant the converting-pot portion of an installation only, with no reference to Godfrey furnaces. In the case of the H. & H. one must have heavy cast-iron pots for handling ore in comparatively large units, expensive overhead handling crane, substantial cooling floor, and, finally, a crusher which the D. & L. does not require at all. The cost of the installation item must be put down in favor of the D. & L. plant.

Cost of Roasting

Any discussion of roasting costs should, of course, be based on units of sulphur eliminated. In a general way, our experience has shown that the D. & L. will reduce an initial sulphur of about 15 or 16% to about 4% in the roasted product, while the H. & H. is capable of handling a slightly higher initial sulphur, say 17 or 18%, with resultant 5% in product. During a recent period [illegible] units of sulphur eliminated per ton of charge at the D. & L. practically equaled units of sulphur eliminated per ton of H. & H., and it is probable that an exhaustive examination of Murray plant roasting records would show about the same amount of sulphur per ton of charge driven off as between the two sorts of roasters now under review. It follows that figures representing costs of roasting are truly comparable.

The limitations of this paper will not permit of a detailed review of roasting costs, but it may be stated that during the entire year 1913 the H. & H. made the better showing to the extent of about 5c. per ton roasted, and for the first three months of 1914 the H. & H. also had an advantage of about 3c. per ton. Murray experience, everything considered, indicates slightly lower costs for H. & H., as compared with D. & L., but the fact that all calculations are based on operations at an H. & H. plant having twice the capacity of a D. & L. plant must not be overlooked.

Wide Range of Charge

Any intelligent discussion of analysis of raw charge to roasters should have the fundamental thought in mind that the metallurgist must treat what comes to the plant. He cannot always be favored with the proportions of silica, iron and lead which would give the best results, consequently the adaptability of any given roasting device to a variety of materials will be accepted as an item of far-reaching importance.

Two or three years ago, in connection with a visit to three or four custom lead smelting works newly equipped with D. & L. machines, the writer was somewhat impressed with the limitations placed on the charge the machines were capable of handling. Inquiry brought forth the information that certain sorts of materials could be attempted only by resort to a special layer of fine limestone or other infusible material carried next to the grates; any percentage of raw matte at all seemed out of the question; zinc was naturally "side-stepped" as highly deleterious; much stress was placed upon the proportion of silica to the iron, and nearly all the enthusiasts demanded a goodly percentage of lead provided a choice quality of sinter was to be in evidence. Of late, however, the staff at Murray have found that a wide range of mixtures may be efficiently handled over the D. & L., and have no doubt that equally good progress has been accomplished at other works. Preroasted ore, any kind of raw sulphide ore or concentrates, flue dust, preroasted matte, or even raw matte may be combined in certain proportions and successfully sintered over these machines. A sufficient quantity of nonsulphur diluent to bring the average of the mixture down to 16% sulphur must always be added and, of course, the details of operation must be cared for. However, equally satisfactory results have been attained with H. & H. pots.

Turning now to physical character of the raw ore, it is, of course, recognized that the air currents are required to permeate a thin layer of charge in case of D. & L. treatment, whereas the pot roasters are committed to a much thicker layer; but a physically fine charge will restrict tonnage on D. & L. just as surely as it will in H. & H. pots, although the D. & L. process is able to treat slimes or rather fine material which it [illegible] wholly useless to attempt to treat in the H. & H. By way of summing up, it may be stated that the D. & L. process possesses a slight advantage over the H. & H. in the matter of flexibility or range of charge, because the D. & L. permits more delicate application of operating details which are essential to success; also extremely fine materials find no proper place in the H. & H. charge.

Lead Losses

We have certain data at hand showing a moderate lead loss on D. & L. machines, these data being based on standard operating conditions during which the resultant gases and fumes were sampled and analyzed. No data are available covering losses with H. & H. pots. The expense and difficulties in connection with accurately sampling an H. & H. output of 100 tons per day need not be pointed out and gas measurements and samples taken from the combined gases of 23 pots on two different main flues might eventuate in metal-recovery [illegible] ependable. . . . It is regarded as doubtful if the . & L. process is productive of any lower metal losses an is the H. & H. process.

Physical Condition of Product

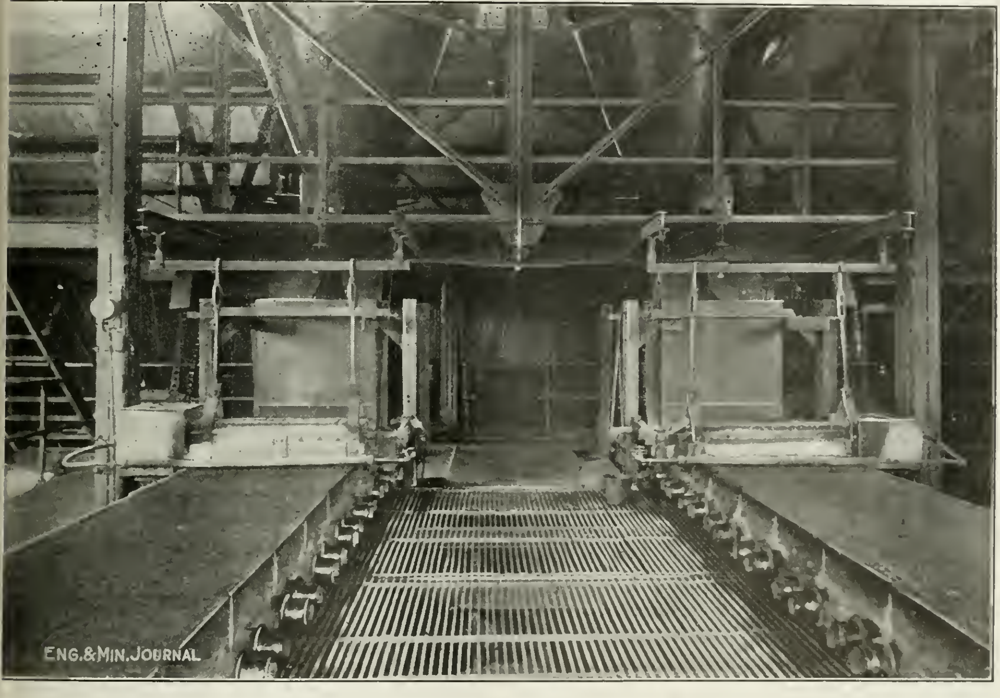
Final-roasting treatment results in a sintered or ag- omerated product, and material of a desirable physical iaracter is passed along to the blast furnaces. The . & L. sinter is usually of a porous or cellular structure; ie H. & H. tends to greater density or firmness. Pub- shed and unpublished opinions of metallurgists have ught to show that the peculiarly open or coke-like struc- ire of the D. & L. sinter carried with it certain extraor- narily favorable properties when subjected to the smelt- ig process in the blast furnace, and have even claimed ppreciable saving in the coke percentage used for smelt- ng. Rather exaggerated ideas concerning the efficiency f an exposure of porous surfaces to contact with reduc- ng gases have been advanced and intimate mixtures (pos- sibly intimately combined silica and lead) have been roclaimed as "predigested," and therefore more easily reduced. The writer believes that a partly fused or "pre- ligested" combination may tend to poor results rather than to good results when smelted, for the reason that such substances fuse at too low a temperature in the furnace. Certain writers have gone so far as to examine the cell structures of the D. & L. product microscopically and have declared that glazed or unglazed surfaces have a bearing upon the readiness with which the products were later reduced in furnaces.

With all due respect to the theories above set forth, it was considered that more dependable conclusions could be drawn by means of actual operating tests and accordingly the Murray furnaces during five days of August, 1912, were run on two charges, the one containing no D. & L. roast at all, the other containing a rather large amount of this material. It was believed that any peculiar virtue existing in D. & L. product would have abundant opportunity to make itself manifest. The exact charges used are given above, together with the average lead in resultant slag and matte.

TEST CHARGES WITH AND WITHOUT D. & L. SINTER

	Furnaces 1, 3, 7 and 8 (No D. & L.)	Furnace 5 (D. & L.)
Coke, 920 (11½%)	....	....
Bed 36, bin 7	2970	320
H. & H. roast	2000	....
D. & L. roast	....	4800
Hand-roasted matte	600	400
Iron ore	690	540
Limestone	1640	1840
Scrap iron	100	100
Total	8000	8000
	Per Cent.	Per Cent.
Average lead in slag for the run	0.63	0.91
Average lead in matte for the run	10.7	14.96

Great pains were used to make the experimental run one of value. The D. & L. roasted product was of a typically honeycombed character. No. 5 furnace was in excellent condition, its operations were closely watched by the metallurgist in charge of the furnaces and by the writer, yet absolutely no strengthening of reduction appeared. On the contrary, No. 5 did worse than the other furnaces.



The Dwight-Lloyd Sintering Machines at the Murray Plant

General blast-furnace experience covering a wide range of charges and a considerable period of time indicates that no particular effect, either good or bad, can be claimed for D. & L. sinter as relating to strength of reduction during the smelting process, and exactly the same remark will apply to H. & H. agglomerated material. (Of course, the D. & L. sintered cakes must be broken to the proper size and the H. & H. material must be crushed suitably small, or distinctly bad reduction will ensue.) That both of these products of modern roasting development help the speed of furnaces enormously is certainly a fact. The final roasters of modern smelters, in supplanting the old hand roasters and fine-ore producing mechanical furnaces, have very naturally served to increase blast-furnace tonnages to a remarkable extent.

As to which product is the better physically, that is to say, which will produce the heavier tonnage at blast furnaces, a first-class D. & L. sinter does not excel a first-class H. & H. agglomerated product. Moreover, given an inferior quality of both, it would seem that the admittedly cellular or at times fragile D. & L. can hardly equal the more firm and stable H. & H. Here, again, however, real experience at blast furnaces may outweigh mere conjecture or theorizing, so the following data are submitted with the idea of showing that in this instance at least the physical character of the D. & L. produced no better tonnage at blast furnaces than did the physical character of the H. & H. On Aug. 12 and 13, 1912, the following two charges were smelted side by side with the same coke percentage, the same blast pressure and as near like conditions in other respects as it was possible to obtain:

	Furnaces 1, 3 and 5 (H. & H.)	Furnaces 7 and 8 (D. & L.)
Coke, 920 (11½%)	....	....
Bed 37, bin 4	1400	2060
H. & H. roast	3000	....
D. & L. roast	....	3000
Hand-roasted matte	400	400
Iron ore	1140	580
Limestone	1960	1860
Scrap iron	100	100
Total	8000	8000
Average tons per furnace per day	294	287
	Per Cent.	Per Cent.
Average lead in slag	0.81	1.03
Average lead in matte	13.47	13.0

CONCLUSIONS

It is believed that a fair summary of the actual experience set forth in this paper would be as follows:

	Advantage in Favor of
Cost of installation	D. & L.
Cost of roasting	H. & H.
Adaptability of charge	D. & L.
Metal losses	Doubtful
Physical condition of product	H. & H.

This article is unable to point out any overwhelming advantage of the D. & L. over the H. & H. system, although continued progress may upset the balance at any time. If history repeats itself some new roasting system will take rank over both within a few years.

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Mineral Production of Hungary in 1912

The mineral production of Hungary in 1912, as officially reported, was as follows (*Oest. Zeit. f. B. u. H.*, June 13, 1914), the items being arranged in order of descending values: Lignite, 8,131,307 metric tons; pig iron, 552,838; salt, 309,758; coal, 1,079,096 metric tons; gold, 2851 kg.; iron ore for export, 591,585 metric tons coke, 149,912; briquettes, 118,505; pyrites, 103,80 metric tons; silver, 10,781 kg.; lead, 1605 metric tons bitumen, 4459; copper, cement and ore, 2433; antimon crude and refined, 857; copper, 241; quicksilver, 8 ammonium sulphate, 1009; petroleum, 2793; coal ta 2736; manganese ore, 8235; zinc ore and residue, 77 sulphuric acid, 1310; sulphur, 83; antimony ore, 6 silver ore, 10; alum stone, 600; quicksilver ore, 10 m tric tons.

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U. S. Geological Survey Organization

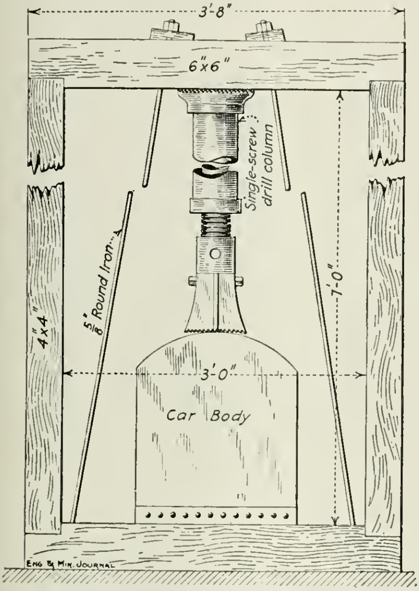
The following is the organization of the U. S. Geolo ical Survey, as of July 27, 1914.

Director, George Otis Smith.
Administrative geologist, George H. Ashley.
Chief clerk, Henry C. Rizer.
Geologic branch: Chief geologist, David White.
  Geology division, David White.
    Eastern areal geology, Arthur Keith.
    Western areal geology, F. L. Ransome.
    Metalliferous deposits, F. L. Ransome.
    Nonmetalliferous deposits, H. S. Gale.
    Coastal plain investigations, T. W. Vaughan.
    Western mineral fuels, M. R. Campbell.
    Eastern mineral fuels, David White.
    Glacial geology, W. C. Alden.
    Paleontology and stratigraphy, T. W. Stanton.
  Mineral resources division, E. W. Parker.
    Metallic resources, H. D. McCaskey.
    Nonmetallic resources, E. W. Parker.
  Alaskan mineral resources division, A. H. Brooks.
  Chemical and physical research division, G. F. Beck
    Chemistry, F. W. Clarke.
    Physics, C. E. Van Orstrand.
Topographic branch: Chief geographer, R. B. Ma shall.
    Atlantic division, Frank Sutton.
    Central division, W. H. Herron.
    Rocky Mountain division, Sledge Tatum.
    Pacific division, George R. Davis.
    Northwestern division, T. G. Gerdine.
  Water resources branch: Chief hydraulic engine N. C. Grover.
    Surface water division, J. C. Hoyt.
    Water utilization division, N. C. Grover.
    Ground water division, O. E. Meinzer.
  Land classification board: Chief, W. C. Mendenhal
    Coal, C. E. Lesher.
    Phosphate, A. R. Schultz.
    Metalliferous, A. R. Schultz.
    Oil, M. W. Ball.
    Power, Herman Stabler.
    Irrigation, W. B. Heroy.
  Administrative branch:
    Disbursing office, J. D. McChesney.
    Accounts division, Ben S. Favorite.
    Executive division, Guy E. Mitchell
    Library, Miss J. L. V. McCord.
Publication Branch:
    Editor, G. M. Wood.
    Distribution of documents, James P. Benfer.
    Chief engraver, S. J. Kubel.

Details of Practical Mining

Car-Bottom Straightener

In loading cars from stope chutes, especially where toping is done by the shrinkage system, the falling of rge pieces of ore batters the bottoms of the car boxes ut of shape. These car bottoms must be straightened rom time to time, and in the accompanying illustraion is shown a device which works much better than he time-honored sledging method. A frame, 3x7 ft. n the clear, is constructed of a 6x6-in sill, two 4x4-in. osts and a 6x6-in. cap, the whole held securely together y two ⅝-inch tie-rods, and firmly braced. The car box, he bottom of which needs straightening, is removed from ts truck and placed under the frame, bottom side up. single-screw drill column is then set up as shown, and ressure brought to bear on the box. By applying this ressure in two or three places, if necessary, the bottom s pressed back into shape without the denting and local trains which sledging would cause.



Single-Screw Column in Frame for Straightening Rounded Car Bottom

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Feed Pressures in Stopers

The Paynter rock-drill tester was described in the Journal, Nov. 1, 1913. The machine is proving of the greatest value in several ways and is disclosing many interesting points bearing on the design and operation of rock drills. One of these is described by the North Star mine management in a recent A. I. M. E. paper. It has regard to the effect of feed-barrel pressure. It is found that if the feed-barrel packing is slightly defective, the drill does not hold against the ground hard enough, causing as much as 30% decrease in drilling speed. And in the 16-V Waugh stopers, used at the North Star, wear in the barrel bushing after about 250 drill-shifts causes cushioning due to leakage of air, with reduction in the strength of blow, amounting to as much as 20%. In the 17-V type, at pressures below 85 lb. per sq.in., the strength of blow drops rapidly. Plugging some of the exhaust ports causes the strength of blow to decrease less rapidly. This makes the drill more effective at low pressures.

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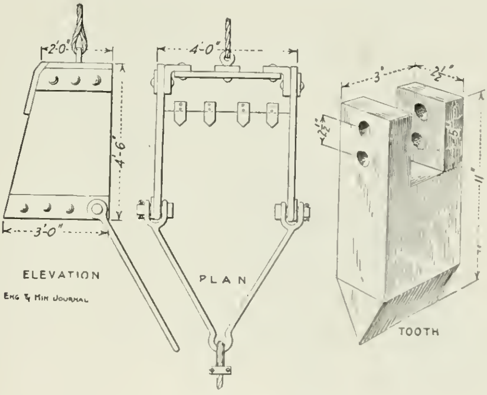
Drag Scraper for Handling Dump

By Frederick W. Foote*

The Portland mill, at Victor, Colo., was erected tc treat the low-grade dump material from the mine. The dump contained about 2,500,000 tons with an average value of about $3 per ton. It was found advisable to take the supply from the top of the dump. A cheap and efficient means was devised and put into operation whereby the material was elevated to the top of the dump.



Construction of Scraper and Detail of Tooth

It consists of a drag scraper connected to a 1⅛-in. endless cable, which runs through a pulley fastened at the bottom of the dump and around the hoist drum at the top. An electric hoist of 112 hp. is used and the cost is about 1c. per ton of material raised.

The scraper requires about two days for its construction. The body is of ½-in. boiler plate and the teeth are of cast iron. The life of the scraper depends on the character of the material handled and the speed of handling. The one described handles loose rock, is operated almost continuously and lasts from two to three weeks.

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*Britannia Beach, B. C

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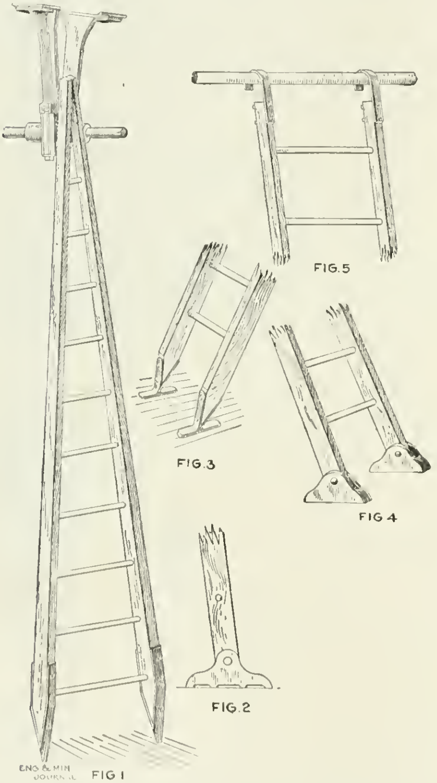
Some Safety Devices for Ladders*

The accompanying drawing shows some safety devices for application to portable ladders such as are used around the mine shop or mill. Fig. 1 represents a ladder with a tapered top, particularly adapted for use around shafting, where it can be supported against a narrow hanger. Steel points on the bottom are intended to prevent slipping. Fig. 2 shows a shoe for the ladder uprights; it is pivoted so that it always rests flat on the floor, and it has a corrugated bottom. Fig. 3 shows another nonslipping shoe, the bottom having steel points. Fig. 4 shows a pivoted shoe with sides of metal and a center of wood. The bottom may be of some such adhesive material as basswood, carborundum, lead or corrugated metal. Fig. 5 represents a method of supporting a ladder securely on shafting by hooks at the top.



Safety Hook and Safety Feet for Mill and Shop Ladders

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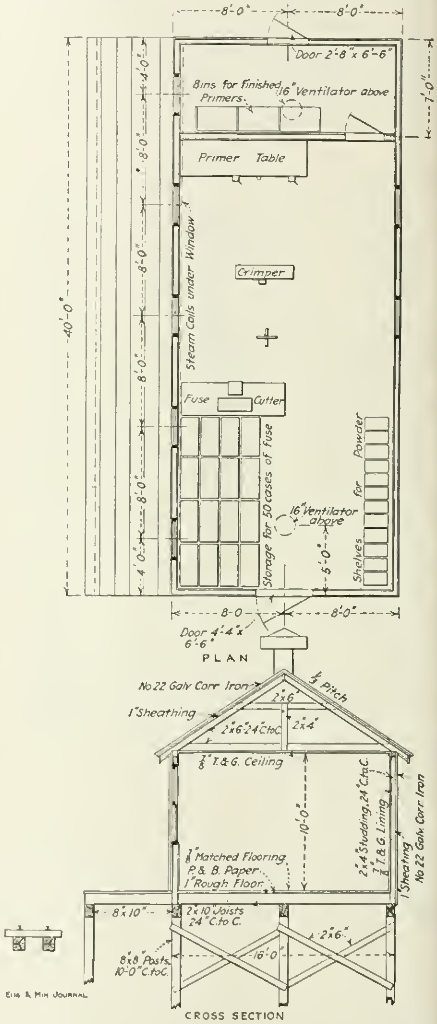
*From Inland Steel Co. Safety Bulletin No. 15.

Heating a Powder House by Electricity

By E. P. Kennedy*

At the Treadwell mines on Douglas Island, southeastern Alaska, it has always been the custom to make u the primers in houses on the surface. There were thre such primer houses, all heated by steam. Last summe a central primer house was built in which the primers o all the mines are made. This primer house is situate 1600 ft. from the nearest boilers and about one mil from the Treadwell mine.



Plan and Elevation of Alaska Treadwell Powde House

Four sectional steam radiators were installed, but in stead of connecting with steam, a 3000-watt Westinghouse bayonet heater was screwed into the bottom of each radiator. A short pipe was tapped into the top of the radiator and connected with a small covered tank, which was kept full of water, a small amount being added when necessary to take care of the evaporation.

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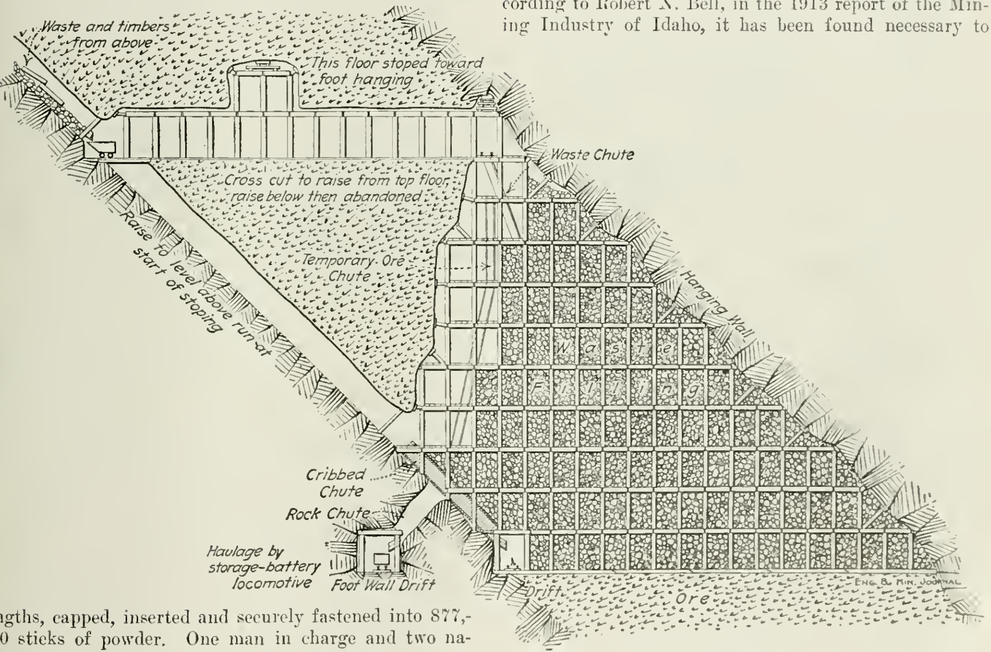
*Assistant superintendent, Alaska Treadwell Gold Minin Co., Treadwell, Alaska.

All leads entering the building and connecting with the bayonet heaters are in conduit and all switches are situated outside the building. The four radiators proved ample for our coldest weather and the amount of radiation can be regulated by opening the switch for one or more of the radiators. The installation has proved most satisfactory. From the point of safety it appears to be above criticism and as there is no loss of energy it would probably prove more economical for an isolated place than a long steam line from which there is continual waste of energy.

Each primer consists of a 4-in. stick 1¼ in. in diameter of 70% nitroglycerin powder, into which is inserted the end of a fuse on which is crimped a 6X cap and securely tied to the stick of powder. In the course of one year there are 875 miles of fuse cut up into 2-, 6- and 9-ft. lengths, capped, inserted and securely fastened into 877,000 sticks of powder. One man in charge and two natives can keep all the mines supplied with primers.


Waste and timbers from above
This floor stoped toward foot hanging
Waste Chute
Cross cut to raise from top floor, raise below then abandoned
Raise to level above run at start of stoping
Temporary Ore Chute
Hanging Wall
Waste Filling
Cribbed Chute
Rock Chute
Haulage by storage-battery locomotive
Foot Wall Drift
Drift
Ore
Eng. & Min. Journal

Section of a Stope Showing Means of Communication, Timbering and Filling

※

Six-Inch Pipe for Air-Lift Sump

By M. J. McGill*

While sinking at the Silver King Consolidated, we were troubled by a small flow of water, about 15 gal. per min., from the 1100-ft. station and about one set below. Instead of installing a pump, I decided to rig an air lift. The water had to be pumped to a winze about 1800 ft. in from the shaft, the winze collar being about 20.5 ft. above the station level.

We hung 34 ft. of 6-in. pipe in the shaft from a point one set below the station and blanked the lower end except for a 1-in. drain with a gate valve. Within 4 in. of the end of some 2-in. pipe, we drilled several ¾-in. holes, and just above this tapped in a ¼-in. nipple with an ell on each end. In the outside nipple we screwed a ¼-in. pipe. The ¼-in. and the 2-in. pipes bound together, we lowered into the 6-in. pipe. The ¼-in. was connected to the compressed-air line, compressor pressure being 100 lb.; the 2-in. pipe was connected to an old 2-in. air line, which led to the winze. At about 100 ft. in we put in a tee on the 2-in. line and a valve to relieve the air pockets. The flow of water was directed into the 6-in. pipe. With the air-inlet valve open about one-sixth of a turn, the water kept about 14 in. below the top of the 6-in. pipe, except when the miners turned on the air to blow smoke from the shaft bottom.

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Vertical-Face Stoping

In mining the Bunker Hill & Sullivan orebodies, according to Robert N. Bell, in the 1913 report of the Mining Industry of Idaho, it has been found necessary to maintain a nearly vertical stoping face, working from hanging to foot, instead of carrying the usual horizontal step-down stopes.

By this method the weight of the more or less shattered mass of ore is carried on the foot wall, while the square sets and waste filling afford a more direct brace to the heavy hanging. The accompanying cross-section of one of the stopes excellently illustrates the method employed in extracting the ore and handling the timber and filling material.

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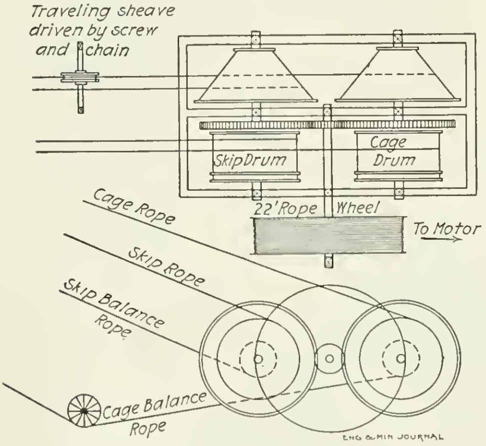
*Shop foreman, U. S. Smelting Co., Midvale, Utah.

Counterbalance and Rope Drive for Electric Hoist

When the Penn Iron Mining Co. installed electric power at its mines, the first hoist built especially for motor drive was that at the Brier Hill shaft (*Bull.* A. I. M. E., February, 1914).

The arrangement of this hoist is shown in the illustration. It consists of two cylindrical hoisting drums set tandem, and two conical drums for the counterweights. One hoisting drum is used for the cage and one for the skip; they are 12 ft. in diameter with 5-ft. 9-in. face, built of steel plate, set in tandem and on the shaft of each is a cast-iron conical drum with a small diameter of 4 ft. 6 in. and a large diameter of 17 ft. Each cylindrical drum, with its conical drum, is keyed to the shaft and is driven by clutching to a spur gear which is driven by a pinion, the gear ratio being 3.13 to 1. The pinion is set between the two drum shafts and carries a 21-ft. 6-in. rope wheel on the other end of its shaft. This pulley has 24 grooves for 1¼-in. rope, the pulley on the motor shaft being 48 in. in diameter. The motor is rated at 450 hp., makes 300 r.p.m., handles a 12,000-lb. skip load over a maximum length of travel of 989 ft., at a speed of 600 ft. per minute.



ARRANGEMENT OF BRIER HILL BALANCE DRUMS

The counterbalance rope leads from the smaller end of the conical drum. The strains are much less than in a hoisting drum and the drums can be made lighter. The sides of the cone are straight, which is not theoretically correct, but the difference in counterbalancing effect at different points in the shaft can usually be kept within 200 pounds.

A perfect counterbalancing of the skip dead load is not possible. The empty skip must be capable of descending the shaft by its own weight and of raising the counterbalance, while requiring little application of the brakes; the necessary excess weight is about 800 lb. For a 2000-ft. shaft, where the ore load weighs 12,000 lb., the skip 7400 lb., the rope 4900 lb., neglecting the friction losses, the loss without counterbalancing would be about 50.6%; by counterbalancing to 800 lb., the loss is only 6.6%.

The design of the conical drums is such that the total travel of the counterweight is less than that of the shaft conveyance and it never comes to the surface, thus freezing of the counterweight to its guides in severe winter weather is avoided.

In operation, the motor and transmission mechanism are brought up to speed before the hoisting drum is clutched in. The design is based on the requirement that the stored energy be sufficient to accelerate the load without reducing the speed below the slip speed of the motor. This method of reducing speed requires no resistance, as does the Ilgner system. The flywheel effect is not intended to permit hoisting when power is shut off. Hoisting is intermittent and the motor is not constant running, but is started on receiving the hoisting signal; about 20 sec. is required to get up to speed. Under such conditions, the saving over the Ilgner system in not having to spin the flywheel between trips, is considerable. There is also an appreciable saving in the mechanical control with brake and clutch, over the Ilgner control, by the omission of the direct-current generator and motor. The loss in the mechanical appliances for braking and clutching do not equal the rheostat losses of the other system. No power can be returned to the system from lowering men or supplies as in the Ilgner or Anaconda compressed-air systems, but the weight of material lowered is only 5% to 6% of that hoisted, and only a small fraction of this is saved in the other systems. About 250 tons is lowered per week, a distance of 750 ft. and the power thus wasted costs only $0.47 to generate.

The hoist in three years and seven months handled 500,000 tons of ore and still uses the original set of clutch frictions. It appears that it consumes 2.256 kw.-hr. to hoist one ton 1500 ft., and costs 0.764 cent.

RESULTS OF TEST ON BRIER HILL ELECTRIC HOIST

Date Nov., 1911	Kw.-Hr.	—No. of Tons Hoisted from— 5th Level	6th Level	8th Level	9th Level	Live Ton-Ft.	Kw.-Hr. per Live Ton-Ft.
6	563	6	24	195	228	371,424	0.001515
7	578	3	33	183	249	384,579	0 001505
8	558	3	30	180	240	372,480	0.001497
9	597	9	36	168	270	396,162	0.001507
10	615	6	30	183	279	410,853	0.001498
11	287	0	12	75	141	190,671	0.001510
Total	3198					2,126,169	0.001504

From 5th level to dump, 480 ft.; 6th level, 592 ft.; 8th level, 780 ft.; 9th level, 887 ft. Load, 12,000 lb. of ore. Hoisting speed, 600 ft. per min.

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Positive Ventilation at the Copper Queen*

Until recently, natural ventilation, aided by exhaust from drill machines, by small 5-hp. blowers and by compressed air, was the only means of ventilating the extensive Copper Queen mine workings. While the temperature in stopes was not high, the relative humidity in most places exceeded 90%, which made the air most oppressive. A mechanical ventilation system was completed in the Gardner during August, 1913. The results thus far attained in improved working conditions and increasing the efficiency of the men have justified the installation of similar systems in the Lowell and Sacramento divisions. The system in the Gardner involves two Sirocco blowers, situated near the 900 station, which deliver a total of 70,000 cu.ft. of air per min. This entire volume of air is so coursed as to ventilate the workings from the 1000 to the 600 levels, whence it exhausts through the Calumet & Arizona shafts.

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*From A. I. M. E. "Bulletin," August, 1914.

Details of Milling and Smelting

Relation of Speed to Efficiency in a Trommel

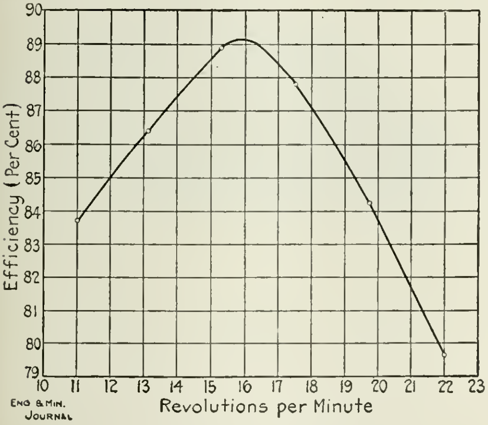
By H. A. Roesler*

The efficiency of screening has an appreciable effect upon the efficiency of coarse concentration, because, with poor screening the quantity of material which goes to the recrushing rolls is increased, thus producing more slime.

A series of tests was made to determine the relation of speed to efficiency of screening on the trommel described.

DESCRIPTION OF TROMMEL USED FOR TEST

Diameter	36 in.
Length	12 ft.
Slope	1¼ in. per ft.
Perforations	½ in. round holes punched on lines intersecting at 60°.
Percentage of opening	40.3%
Rate of feed	22 to 24 tons per hour.
Speed	11 to 22 r.p.m.



Relation of Trommel Efficiency and Speed

Samples of the feed and oversize were taken at ten-minute intervals for two hours with each speed, and cut down to 25 lb. by the method of discarding alternate shovelfuls. These samples were sized over a hand screen having ½-in. round holes. The results are shown in the accompanying table and curve.

Speed, r.p.m.	22.0	19.8	17.6	15.4	13.2	11.0
Size of drive pulley	10 in.	9 in.	8 in.	7 in.	6 in.	5 in.
OVERSIZE						
Per cent. on ½ in.	64.3	67.8	74.5	75.3	73.4	66.9
Per cent. through ½ in.	35.7	32.2	25 5	24.7	26.6	33.1
FEED						
Per cent. on ½ in.	26.9	25.1	26.2	25.3	27.4	24.9
Per cent. through ½ in.	73.1	74.9	73.8	74.7	72.6	75.1
Efficiency, per cent.	79.6	84.2	87.8	88.9	86.4	83.7

It is noteworthy that the best efficiency is obtained with a speed of 16 r.p.m. The variation in the percentage over ½ in. in the trommel feed probably has a small effect on the figures for efficiency, but this is not sufficient to affect the value of the results.

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*Mill superintendent, Vinegar Hill Zinc Co., Platteville, Wis.

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Herreshoff Converting Patent

James B. Herreshoff, Jr., has secured a patent (U. S. Pat. 1,103,925) for:

(1) The improvement in the art of bessemerizing matte which consists in introducing siliceous material into a converter upon the molten charge therein, which material thus becomes heated but chemically remains unchanged, removing the charge from said material and utilizing said heated material as a fluxing medium for a subsequent charge of matte.

(2) The improvement in the art of bessemerizing copper matte which consists in introducing siliceous material into a converter upon the molten charge therein, in sufficient amount to form a fixed viscous mass upon said charge, removing the charge from the converter, while allowing said mass to remain therein, and introducing matte into the converter upon said mass.

(3) The improvement in the art of bessemerizing copper matte which consists in reacting upon matte in the converter with a slag composed essentially of copper silicate.

Mr. Herreshoff cites examples—presumably from the converter practice at the Laurel Hill works of the Nichols Copper Co.—in which he introduces the siliceous material into the converter upon the bath or charge therein at a time when it is inert, such as at the finish of the blow so as to utilize the heat of the bath while the copper is being poured. Sufficient siliceous material may be introduced to finish a charge instead of adding it in fractional amounts. The converter slag is skimmed before all iron sulphide is blown to oxide, so that this clean slag may be discarded. No slag is poured from white metal or copper. The viscous slag at the end of a blow is permitted to remain in the converter, and with additional siliceous material, is worked up into clean slag with the subsequent charges of matte. The copper-silicate slag from reverberatory refining furnaces is worked up in a similar manner. Mr. Herreshoff in his patent discusses the subjects of temperature, lining and slag composition, as follows:

"I have found that when I use a converter the lining of which abuts tightly against the inner walls of the metallic converter shell, the temperature of the lining does not rise excessively owing to the excellent path for the conductivity of heat to the shell and the transmission of heat therefrom to the atmosphere. If, on the other hand, the basic or neutral lining is made very thick, and especially if it is also insulated from the steel shell of the converter, the lining will attain the temperature of the charge; the lining must therefore be maintained at a yellow heat to insure a reasonably long life. I have also found that the temperature of the bath can be controlled by forcing varied quantities of steam under pressure, preferably superheated steam, with the air blast into the converter. The temperature can be also controlled by adding siliceous material which contains copper, such as reverberatory slag, to the matte because the reaction between the copper oxide of said material and the matte produces a lowering of the temperature.

"I have found that it is advantageous to operate the converters at a temperature corresponding to a cream-white color. If operated at a lower temperature, which corresponds to that of the slag when it presents a yellow appearance, it would be difficult to keep the tuyeres free from accretions without resorting to excessive use of the tuyere rod, resulting in the rapid wearing away of the lining at the zone of the tuyeres and the increase of the blast pressure. If the bath is at a yellow heat, it may be quickly increased to a cream-white heat by the addition of carbonaceous matter, such as coal, preferably in an amount less than 1% of the weight of the charge. This obviously results in a saving of power and in increased life of the lining, especially at the zone of the tuyeres.

"I have found that the temperature of the converter will be higher when the slag is low in silica than when it is high in silica. If the lining is thick and insulated from the steel shell, the bath must be kept at a yellow heat. If now no other means than charging siliceous material into the converter is availed of for controlling the temperature, it will be found necessary to make a converter slag containing about 27% of silica. On the other hand, if the converter is lined with a thin lining of basic or neutral bricks of, for example, 6 to 12 in. in thickness, which are backed up tightly against the steel shell, the charge can be operated at a temperature higher than that of the lining, thus producing a slag low in silica and manifestly resulting in greater economies of operation. In this case the slag may contain 18% of silica or less, such a slag being greatly preferred over one containing 27% of silica because there is a smaller amount to handle and because it is more valuable as an iron flux for the blast furnace or reverberatory smelting furnace. Moreover, in order to bessemerize mattes higher than 60% in copper, the converter slag must not contain more than 20% of silica; otherwise the charge will be too cold to finish properly. It is ordinarily difficult to bessemerize such high-grade mattes which are poured into the converter at a low temperature, without the use of extraneous fuel. My process of preheating the siliceous material, as described above, is therefore of especial importance when high-grade mattes, low in fuel value, are being treated."

⁂

Good Uses for Old Belting

By L. D. Anderson*

The "bone yard" or scrap heap of every mill usually includes a large amount of worn-out belting. This material can be used to good purpose in several ways.

It makes an excellent cover for wooden stair treads. These treads wear out fast when used constantly by men in hob-nailed shoes. Metal treads last longer, but soon become worn smooth, when they constitute an actual menace. But wooden treads with pieces of old belting nailed to them have their life prolonged to a surprising degree and at the same time afford a secure footing. Canvas belting is better than rubber, as it does not become slippery when wet.

Again, there are many places in wet concentrating mills where the laying of canvas belting on the floor would do much to prevent accidents. Wet slimy material, despite the most careful work frequently slops over and runs on the floor. It is easy for a man in a hurry to slip up in a puddle of slime and perhaps fall into a moving machine. The rough surface of old canvas belt would do much to prevent this.

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*Superintendent, United States Smelting Co., Midvale, Utah.

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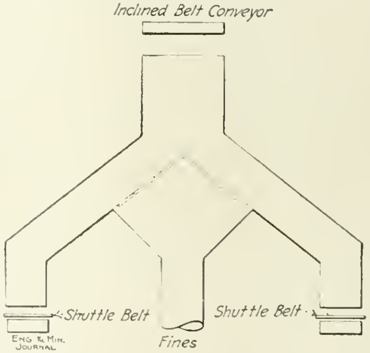
Rock Breaking at the Dome Mill

The former gyratory-breaker plant at the Dome mill, South Porcupine, Ontario, has been removed and superseded by Blake-type breakers. The gyratory breakers are said to have given a good deal of trouble, particularly in wearing out of bearings.

The ore comes from underground on an incline, trains of cars being hauled up by cable. Hoisting is in balance. As the cars pass over the chute, they are dumped without stopping. The cars are of the side-discharge type. Two men dump every other car as it passes the chute, the others being dumped as they pass on the back-trip.

This chute leads directly into one 21x36-in. Farrell breaker. Passing through this machine, the ore is elevated to a trommel with 2-in. holes. The undersize goes directly to the inclined conveyor belt leading into the mill bins. Oversize is passed through two 10x36-in. Farrell breakers, and thence to the belt conveyor. All material going to the mill bins is of a size to pass a 2-in. aperture.



Distributing System for Bypassing Fine

Leading to the mill bins, the belt conveyor is the same as originally installed, except that it has been lengthened, the mill bins having been raised 6 ft. all around. This conveyor formerly dumped into a movable tripper, but this has been displaced, and it now dumps into a fixed chute, in which a ¼-in. screen separates the fines, bypassing them directly to the tube mills, the oversize going through channels onto two shuttle belts, which distribute the ore in the battery bins.

⁂

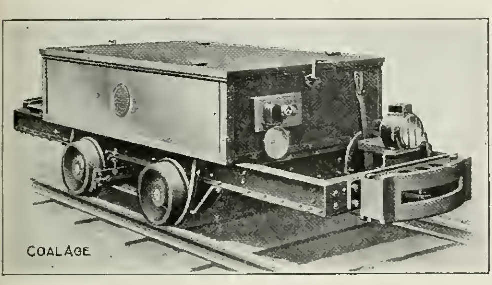
Roasting Lead Matte in a Single Operation has been abandoned at most of the large silver-lead smelting works in this country. Now the matte is given a preliminary roast in mechanical furnaces of the McDougal type and is then sintered with suitable diluents on Dwight-Lloyd straight-line machines or in the Huntington-Heberlein pots. This gives a much improved product for the blast furnaces, increasing the tonnage and the length of the campaigns.

Mining & Metallurgical Machinery

A New Storage-Battery Locomotive

Although the storage-battery mining locomotive has been in use for some time, many people are unfamiliar with its characteristics and possibilities. One small machine of this type may readily be made to do the work for which several mules and as many drivers would ordinarily be required.

With the storage-battery type of mine tractor, rail bonds, third rails, trolley wires or other forms of current conductors along the track or of which the track forms a part are obviously unnecessary. At night the machine is merely run to a place where connection with a current supply from outside the mine may be secured. Proper connections with the source of energy are here made and the machine allowed to charge over night. By morning the battery has become fully charged and is capable of delivering the maximum current required by the motor throughout the entire day.



Gathering Locomotive of Storage-Battery Type

The Atlas Car & Manufacturing Co., of Cleveland, Ohio, has recently placed upon the market a new line of storage-battery locomotives. These combine the simplicity and reliability of the automobile motor with the durability and ruggedness of the armor plate, trolley type of mine tractor so well and favorably known throughout the country.

These locomotives are built in sizes varying from 2 to 5 tons. Standard track gages range from 36 in. to 48 in., but may be varied to suit conditions. All of the machines are low, the maximum height above the rail being 3 ft. 6 in.

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G-O Riffles

A Monel metal riffle for concentrating tables is being placed on the market by the General Ore Concentrating Co., Inc., of 40 Cedar St., New York. The G-O riffles are die-drawn to the thousandths of an inch; after drawing, the Monel metal strips are punched and broached in automatic presses, producing nail holes that are tapered throughout the entire thickness of the riffle; the attaching nails or rivets are then upset to produce a flush surface. The rivet heads will wear smooth and as long as the riffle itself, and thus have a great advantage over the ordinary riffle with projecting nail heads that serve to produce eddies in the concentrating medium. The G-O riffle is furnished in thicknesses as fine as 0.008 in., and increases in thickness by 0.005 in. up to 0.048 in., so that the metallurgist is able to secure close riffling when desired for minerals having nearly the same specific gravity. The most usual width is $\frac{3}{16}$ in., but the company also supplies normally a $\frac{1}{2}$-in. riffle having a thickness of 0.048 in., and other sizes may be secured on special order. The price for the standard sizes is 5c. per lin.ft., f.o.b. New York. Supplying the riffles with the nails already inserted greatly facilitates application, and as the riffles are made of Monel metal, they have practically the qualities of steel, besides being noncorrosive.

⁂

Rotary Vacuum Pump for Filtration

By D. W. Minier*

The adoption in cyanide mills, of the practice of reducing all the ore to slime for treatment was made possible by the development of suitable filters for the separation of the metal-bearing solution from the treated pulp by vacuum operating through a filtering medium. The efficiency of such filtration depends upon many factors, not the least of which is securing a constant and uniform vacuum.

The machines used to produce vacuum are usually of the reciprocating type, the choice being confined principally to the matter of valves. There is, however, another type, long used in paper making and other industries, that has not received from metallurgists the attention it deserves. The rotary vacuum pump is worth consideration in view of its possible use in metallurgical filtration. The line of motion being rotary, instead of reciprocating, permits using shorter drives and lighter belting, or still better, a direct-connected motor drive; the lesser vibration permits using lighter foundations. The vacuum is constant and is not dependent on the adjustment or condition of valves or packing glands there being but two of the latter sealing the housing, both of which have far greater life than those in reciprocating machines.

The reciprocating machine with its ground cylinder and piston head is, of course, positive in action which cannot be said of the rotary machine with housing and impeller, yet the reciprocating machine must come to rest and reverse twice in a full cycle of operation, while the movement of the rotary is continuous. This offsets the claimed advantage of positive action. On actual test in operating a battery of filters, a reciprocating-type vacuum pump gave 23 in. vacuum, when the valves and machine were in perfect shape, but it required a portion of the time of a first-class machinist to keep it in this condition. A slight neglect of adjustment caused a drop in the vacuum. Oil feeders must be kept in good condition to insure good work, and lack of attention for some hours may be disastrous. A rotary vacuum pump on the same battery of filters gave but 20 in. vacuum, but it held that reading. The only attention required was the filling of the lubricating-oil reservoirs. It may be that better than 20 in. vacuum could be obtained by a change of speed or adjustment of the pump itself, although frankly there seems nothing about the machine that needs adjusting.

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*Mining engineer, 330 Central Bldg., Los Angeles, Calif.

The condition of machines in a mill is at the mercy of the millman and the millman is best intrusted with a machine that requires little attention. If the metallurgical ideal in milling is uniformity of operation in each step of the process, the mechanical ideal is a constantly operating machine that needs little attention and is "foolproof."

One of the proofs of a good machine is to be able to forget its existence and consider only its work. The points of advantage to be considered in the use of the rotary-type machine for metallurgical filtration are: Constant uniform service with minimum attention; absence of valves to adjust or replace; simplicity of adjustment, there being only that of replacing the housing packing-glands at long intervals; a lubricating system needing attention only at long intervals; lack of vibration and consequent lighter foundations; small floor space required, a rotary requires 109x14 in., while a reciprocating requires 111x96 in.; machine direct-connected with motor; shorter drive and lighter belt, rotary 14-ft. drive, reciprocating 22½-ft. drive, former belt half the weight of latter; a "fool-proof" machine, impossible to abuse and running long intervals without attention.

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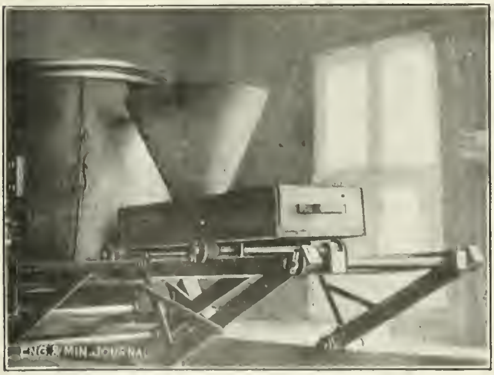
Mold Platform for Tilting Furnace

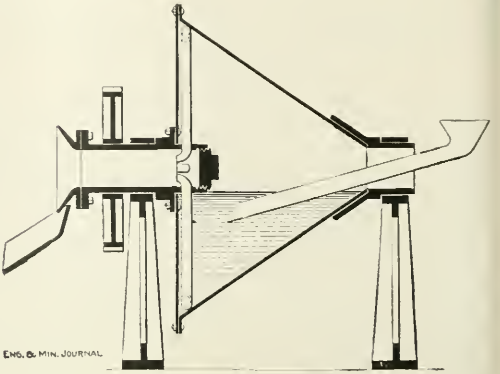
In the Journal of May 16, 1914, p. 1005, is a description of a mold platform which keeps the mold constantly in place before the lip of a tilting furnace. The illustration shows a platform built by the Monarch Engineering & Manufacturing Co., and installed at the Tom Reed mines in Arizona. As can be seen, this device keeps the mold immediately below the crucible lip.



Monarch Pouring Device

The Hardinge Classifier

To provide a new classifying machine for handling wet pulps, H. W. Hardinge, of New York, has invented a device, U. S. pat. No. 1,098,497, which in external appearance is essentially like his conical grinding mills. It consists of a cone-shaped barrel, although construction is not limited to the identical specifications, at the vertex of which is an entrance chute passing through an overflow exit. The unclassified pulp enters through this chute, the light slimes overflowing through the trunnion opening, while the sands settle in the angle between the cone sides and the head. There they are elevated by pipes and discharged into the other trunnion, the pipes acting like the spiral in a Frenier pump. The illustration accompanying shows the arrangement of the machine.



The Hardinge Classifier

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Metallic Tape Threader

The Lufkin Rule Co. has put out a measuring-tape attachment known as a "threader," to be furnished with their metallic woven tapes without extra charge.

The threader is a loop and stud arrangement, by means of which the tape, though securely fastened to the winding drum of the case when in use, can yet be readily detached from it and a new tape as readily attached, without manipulation of the case, case screw or drum.

Woven tapes are sometimes torn by accident or through long use often become soiled and worn in such a way that they must be replaced while the case is yet in fair condition. The case not receiving the same hard use as the tape line usually outwears it, and representing approximately half the value of the outfit it is of considerable importance that it be a simple matter for anyone to insert a new tape in the old case as often as necessary and thus get the fullest measure of use out of the case as well as the tape. Metallic tapes without cases are quite generally stocked by hardware houses, etc., and can always be easily obtained. The attaching is perfectly and easily accomplished by means of the threader.

⁂

A New White Metal, containing a large amount of iron, and perhaps therefore unique, is noted by "Metaux et Alliages" as the invention of J. F. Duke, of Manchester. It consists of Fe, 50.3%; Ni, 19.16%; Cu, 29.14%; Al, 1.40%. One to 2% tin decreases its hardness. It is said to resist corrosion by acids and the atmosphere.

The Chiksan Mines, Chosen--III

By Clarence L. Larson*

SYNOPSIS—Milling consists of crushing in breakers and stamps, amalgamating both inside and on apron plates. The pulp is then separated and the sand is cyanided by leaching. Concentration is also followed. Total combined extraction is about 96%. Costs in detail are given.

⁂

Hand tramming is used entirely, iron cars made at the mine of 1 ton capacity, being used on 12-lb. rails set to an 18-in. gage and on a grade of 10 in. per 100 ft. Where trams are especially long, several cars are run together, one man to each car. Loaded cars are dumped directly over the rail grizzlies covering the station pockets. Thus the breaking up of boulders larger than 8 in. in diameter is enforced. Ordinary wooden slide-board chutes are employed. A bill of material and of labor costs for a 1-ton iron car, manufactured at the mine is shown in the table.

COST OF A 1-TON MINE CAR

Carpenter, 4 shifts @...	$0 80	$3 20
Blacksmith, 6 shifts @.	0 90	5 40
Blacksmith helper, 6 shifts @..	0 30	1 80
2 pieces 8x8-in., 6 ft.......	0 55	1 10
26 nuts @...............	0 015	0 39
206 lb. ⅜x2-in., strap iron @..	0 03¼	6 69
36 lb. ¾x3½-in. strap iron @.	0 03¼	1 17
8 lb. ⅜x1½-in. strap iron @....	0 03¼	0 26
26 lb. ⅞-in. round iron @....	0 03¼	0 84
5 lb. ⅝-in. round iron @....	0 03¼	0 17
5 lb. ¾-in. round iron @	0 03¼	0 17
18 lb. ⅞-in. round iron.	0 03¼	0 59
8 ft. 1-in. angle iron @...	0 06¼	0 50
1 lb. ⅜x1¼-in. rivets @.	0 07½	0 53
770 lb. ⅛-in. sheet iron @...	0 03¼	5 53
128 lb. 3-16-in. sheet iron @.	0 03¼	4 16
1 piece ½x8-in. 10 ft. @..	0 15	0 15
1 set of car wheels		12 75
Total cost of car		$45 40

A 1-ton skip is used for hoisting in Sajunkohl, and a ¾-ton skip in Tonkohl. Twenty-five-pound rails are used on the footwall for track. Tonkohl shaft being quite steep, about 82°, uses guides of roughly hewn 4x4-in. native timber. But one skiptender is necessary on each of the day and night shifts in each shaft, as he moves from level to level. Rack-and-pinion gates, lifted by hand wheels, are used on all skip pockets. Signaling to the engine room is accomplished by the use of a ⅜-in. wire cable extending up the shaft, which is attached to a triangle gong in the engine room.

Ore Handling and Transportation

Sajunkohl ore is hand trammed from the surface-hoisting bin about 200 ft. to an ore-sorting slide, from which the sorted ore is dropped into the shipping-ore bins below. These shipping bins have a capacity of about 250 tons.

Yangdei Mining Camp

Tonkohl ore is hand trammed from the headframe bin in 1⅓-ton cars a distance of 300 ft. to the foot of a 750-ft. single-track incline running up at about 21°. The cars are hoisted singly, and trammed to the Sajunkohl shipping bins, down a distance of 1500 ft. on an 8% grade. The cars are dumped on rail grizzlies just over the shipping bins, thus enabling sorting. The track on the incline is of 25-lb. rail, while all the other track is of 12-lb. rail. The cost of hoisting up the incline and tramming to the shipping bins averages 11½c. per ton.

From the shipping bins, the ore is drawn into 1¼-ton cars and in them trammed by hand, in trains of 8 to 12 cars, one man per car, a distance of about one mile, down an 8% grade, to the Yangdei mill. Here it is dumped on tipples into two mill-holes through which the ore descends about 160 ft. to a tunnel below, out of which the ore is hand trammed to the mill bins, a distance of about 200 ft. The cost of tramming from the Sajunkohl bins to the tipple, labor, maintenance and repairs, is 7c. per ton (distance, about one mile).

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*Box 24, Moscow, Idaho.

Power Plants

Sajunkohl and Tonkohl mines are each equipped with two 75-hp. boilers. Tonkohl, with low-pumping and hoisting duties, requires but one boiler to be fired; when hoisting ore and shipping to Saojunkohl, both boilers are required. Sajunkohl with heavy pumping and hoisting duties requires both boilers all of the time. Mine water is used for steaming.

The smaller mines have an assortment of boilers, some vertical, and others small locomotive boilers purchased from a railway construction contractor. The wide scattering of shafts is a serious handicap to prospecting, as water is always encountered and pumps soon become necessary; electric power is not available and separate steam plants are required for each shaft.

Sajunkohl and Tonkohl mines were recently equipped with compressed-air systems, both alike. The compressors are 12x12x14 in., simple steam, single-stage machines, each providing air about sufficient to operate two Waugh drills and two 2½-in. Siskol piston machines. Receivers, 3-ft. diameter and 8 ft. high, are provided with two water traps to each installation, these being 2 ft. diameter by 6 ft. long. The total cost of the two compressors, receivers and traps, spare parts for the compressors, and freight through to the mine, was $3094. A total piping length of 5740 ft. was provided, sizes from 1 to 3 in. The total cost of pipe, fittings and valves, and freight, was $1726.

Eight Siskol 2½-in. piston drills, together with accessories and a complete list of spares, cost complete with freight $1915. Six No. 12-A Waugh stopers, with a supply of spares, and two tons of Crescent steel, together with freight, amounted to $1288. Thus the total cost was $4011 per installation.

Ventilation and Pumping

The various mine headings are driven to connect with each other in such a way as to provide natural ventilation. Topography is favorable and raises to surface provide over 100 ft. of elevation above shaft collars, making good circulation below.

In a few extreme cases, such as the sinking of long winzes, it has been necessary to use hand bellows at times. The recent installation of compressed air now allows its use in the cases mentioned above, and also allows driving blind headings greater distances to connections. Air is now also used to expel dynamite smoke after blasting.

The quantity of mine water, though not excessive, increases considerably with the depth of workings. Standard sinking pumps, of the Cameron type, are used in shaft sinking. Station pumps are installed at alternate levels, thus pumping in stages from sinker to first station installation above, and then in 200-ft. lifts to the surface. In Sajunkohl to No. 1 level only, which is a drainage tunnel.

Levels are graded 8 to 10 in. per 100 ft. away from the shaft stations and drain ditches cut on one side only. Station pumps are duplex, 10x6x8 in. Winze pumps are 5¼x3½x5 in. and 6x4x6 in.

TOTAL MINE-OPERATING COSTS

Six Months Ending June 30th, 1913

Stoping	Sajunkohl	Tonkohl
Breaking	$0.611	$0.689
Mucking and tramming	0.097	0.152
Timbering	0.127	0.111
Hoisting	0.128	0.141
Sorting	0.016	0.014
Development to stoping	0.102	0.024
Total stoping cost per ton	$1.081	$1.131
Development		
Shaft	$0.155	$0.063
Tunnel drifts	0.317	0.349
Raises	0.108	0.079
Winzes	0.219	0.101
Crosscuts	0.038	0.038
Sub-drifts	0.014	0.000
Stations	0.028	0.058
Gross development, per ton	$0.879	$0.688
To stoping	0.102	0.024
Net development cost per ton	$0.777	$0.664
Plant and Maintenance		
Buildings	$0.004	$0.001
Headworks	0.002	0.007
Rolling stock, track	0.024	0.043
Pipe lines	0.013	0.014
Total plant and maintenance	$0.043	$0.065
General		
Pumping	$0.147	$0.118
Mine repairs	0.057	0.032
Top tramming	0.011	0.015
Surface expenses	0.013	0.008
Office and general	0.037	0.017
Assaying and surveying	0.037	0.024
Native supervision	0.011	0.024
Foreign supervision	0.164	0.126
Total general	$0.477	$0.364
Total mine operation, per ton	$2.378	$2.221
Tonnage	10,928	6,282

Yangdei Mill

During the year ended June 30, 1913, 33,827 tons of ore were milled, of an average value $9.29 per ton. The 35 stamps added to the original battery of 4 Nissen stamps were started in November, 1912, and the full 39 operated to May 1, 1913, when due to catching up on the reserves, it became necessary to shut down 14 stamps. Twenty stamps were operated to August and increased to 25 in September and to 30 later in October. About 80% of the ore is produced by Sajunkohl and Tonkohl mines, and most of the balance from Chungtarrie.

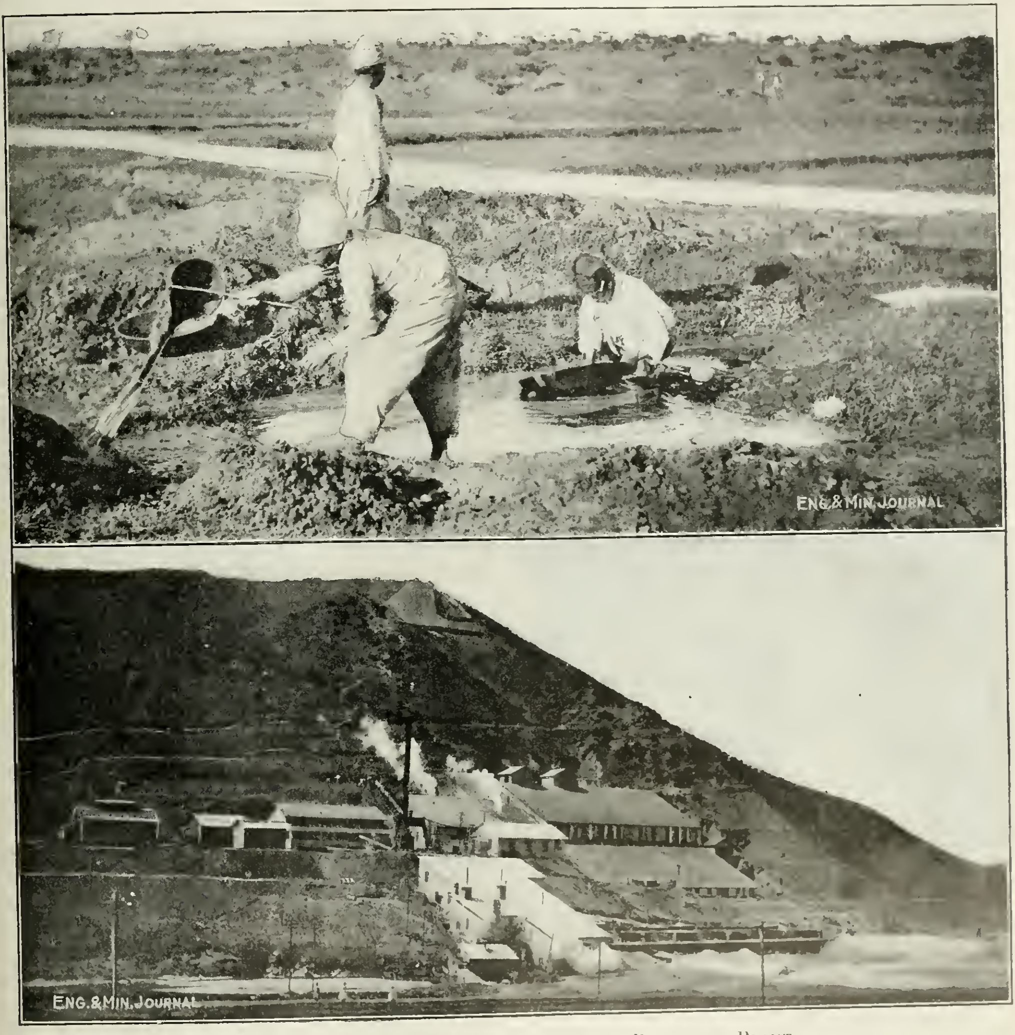
The ore is first passed over grizzlies and the oversize from these crushed in two Blake machines. These run intermittently on day shift only. The ore then drops into the battery bins. Twelve hundred-pound stamps are used, crushing to 40 mesh usually, and their product passes over amalgamation plates. Inside plates are also used and produce a large percentage of the total amalgam, the percentage varying with the temperature of the water during the various seasons. The Pierce type of amalgamators is used, their product passing on to standard concentration tables. Middlings from the first tables are reconcentrated. Tailings are sent to the tailings pile where the drained-off water runs into the settling ponds for removing the slimes, and through a dewatering box, and then is pumped back to the two 12,000-gal. storage tanks above the mill.

TABLE OF MILL DATA

Stamp duty averages 4 tons per day
Average value of heads—$9.29
Average value of tails—1.80
Average recovery, bullion and concentrates—80½%
Concentrates average from $60 to $200 per ton, and accumulate at an average rate of 22 tons per month.
Bullion fineness runs from 500 to 700, averaging about 575.

The mill power plant consists of three 150-hp. boilers. A 300-hp. Ideal compound corliss engine is used to operate the stamps and to drive a 75-kw. generator which furnishes power for motors at the concentrators, machine shop, blacksmith shop, cyanide plant, and assay office. Electric lighting is used throughout the mill, shops, cyanide plant, assay office, hospital, general offices and residences.

The mill foreign staff is limited to the superintendent, who remains on day shift, and the night foreman. A Korean is employed on day shift as assistant amalgamator and chief mill-man; he receives $0.50 per day. A half-dozen other natives complete the staff, being employed about the crushers, batteries and concentrators. These boys receive from 20 to 30c. per day.



NATIVE PLACER MINERS, AND THE YANGDEI REDUCTION PLANT

The total cost of milling for the year ended June 30, 1913, was $0.85 per ton, over a gross tonnage of 33,327 tons. This would be on an average of 23 stamps constantly dropping.

CYANIDE PLANT

A standard leaching plant has been in successful operation since September, 1912. There are six leaching vats, 22 ft. in diameter and 5 ft. deep, which have a capacity of about 60 tons of dry tailings each. The monthly capacity of the plant is about 2000 tons. During the first six months of 1913, 11,765 tons were treated, having an

TOTAL MILL AND CYANIDE EXTRACTION

Mill extraction—80.5% of total feed value
Cyanide extraction—78.3% of mill-tailing assay value = or 15.27% of total feed value
Combined extraction—95.77%

average value of $2.29. A recovery of 78.3% was obtained, the tailings loss being 50c. per dry ton. The cost of treatment was $0.464 per ton.

SUMMARY OF COSTS PER TON

Mining	$2.30	
Transportation	0.09	
Milling	0.85	
Cyanide	0.46	
Superintendence-general	0.50	(Estimated, but known to be high)
Total	$4.20	

Some 600 acres of ground have been declared dredgable after a second drilling with Empire drills. Various problems relative to land purchase, and the financing of a dredge installation are now under consideration.

Assaying and Surveying

A foreign superintendent is provided for the assaying and surveying department. He does all the mine and all the important surface surveying. A graduate of a Chinese mining college, assisted by two Korean coolies, does all of the assaying work. This Chinese receives $25 per month. During the past year about 11,000 assays were made at an average cost of 18c. Two more of the Chinese students attend to the office work and perform practically all the drafting. About $100 is the average total monthly cost of the department.

Incline at Yangdei Mine

A capable foreign medical officer is provided by the company, and a small but well equipped hospital is available. Service is free to all employees and their families. Outsiders are charged at the nominal rate of 10c. per case. The monthly cost of the department approximates $250.

The foreign staff now existing consists of the following: the general manager, a superintendent, a foreman and an accountant at the two large mines; a superintendent for each of two prospecting districts, one of them including Chungtarrie mine; a mill superintendent and a night foreman; a superintendent of cyanide plant who also oversees the machine shop; a superintendent of the department of assaying and surveying; a superintendent of transportation, a general storekeeper; the medical officer and the auditor.

Mining at El Recreo, Colombia

By J. Fred. Dierolf[*]

The El Recreo gold mine is on the east slope of the central cordillera of Colombia, in the Department of Tolima, 20 miles southwest of the town of Ibagué. The ore is crushed in a wooden stamp mill of 15 stamps, an average of seven tons of hard, brittle quartz being crushed in 24 hrs. The stamps are in batteries of five, and the amalgamation plates for each battery consist of two plates of muntz metal near the battery, and two plates of silver-plated copper below. Each plate is 4x2½ ft., laid broadwise, so as to give 10 lin.ft. of plates below the battery. No inside amalgamation is practicable on account of the wooden mortar-boxes. The mill works 95% of full time, because all parts are of wood, so the worn parts can be made and kept on hand, and the stops to replace worn parts are therefore short. In 1913 the yield was 1531 oz. of gold, worth $19.20 per oz. The sand, still containing visible gold, partly rusty and partly in the coarser quartz grains, besides all the sulphides, pyrites, some galena and blend, is run into a tailings pond for storage for further treatment later.

A lower adit, cutting the veins 150 ft. below the present working level, which is 130 ft. from the surface, was started in July, 1912, and was recently terminated. All the work was done by Colombian laborers using hand steel. The total length is 1253 ft., of which 800 ft. is through greenstone-schist, the next 100 ft. through green breccia, in which there is much green clay, and through which runs a streak of leached white, sugary quartz, averaging 2½ ft. thick and running with the adit, the whole distance of the breccia. This quartz shows colors in the pan, but not enough to be profitably treated in the wooden mill. The rock beyond the breccia is extremely hard and does not break well. Gelignite, 62%, was used. This rock is compact, dark bluish-green, and becomes schistlike 100 ft. from the veins, but while still of the same color, looks silky. Still nearer the veins this rock turns gray, and ultimately white, when quartz stringers, each a few inches wide, make their appearance. The hanging wall of the main vein is a much-pressed black schist, with well crystallized pyrites, carrying no free gold. The gouge is also black and shows colors in the pan. The quartz of this main vein is ribboned with more sulphides, bluish-black pyrites in stringers between the quartz ribbons, than higher up. The gold is visible, deep yellow in the white quartz and dull yellow in the dark sulphides.

The total cost of this bore, 6½x7 ft., was $3.96 per lin.ft. Labor was paid at the rate of 70c. to $1 per shift of eight hours, according to the skill of the workman.

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[*] Apartado 7, Ibague, Colombia, S. A.

Dynamite costs $30 per 50-lb. box; caps, $1.50 per 100, and fuse, $1.50 per 100 ft. The work was done without artificial ventilation, and the men did not complain, although the air was rather poor toward the end, but it did not affect their health. Illumination was by acetylene lamps, as tallow candles made locally would not burn well 600 ft. from the portal.

Most of the workmen are Indians from the highlands of the Departments of Cundinamarca and Boyaca, and only a few miners from the Department of Antioquia are employed to teach these Indians. The *antioqueños* are rather unruly, heavy drinkers, and therefore unreliable, but they are fairly good workmen. The Indians, born and bred at high altitudes, are better qualified to work in poor air, without impairment to their health, than Europeans or Americans; besides, they are obedient, reliable, steady, and will do almost any work if treated properly. They are as children.

The mine is situated in a healthful place in a beautiful valley, 6000 ft. above sea level. There are no mosquitos and fever is not prevalent. Each married workman is furnished free of charge with a small hut and a plot of ground where he can raise vegetables. This may account for their cheerfulness and good behavior.

All kinds of vegetables are raised at this mine from imported seeds, and some apple trees have been planted which are doing well. Orange trees are in abundance, planted by a former owner of the land, an Italian, and these provide sweet oranges the year 'round. The only drawback, and rather a serious one for a mine, is the absolute lack of roads. Only one narrow, dangerous mountain trail is available. I am convinced, however, that this will be remedied by the time my mine is ready for a modern plant, because Bogotá, the capital of Colombia, is bound to get in rapid connection with the Pacific Ocean at Buenaventura, sooner or later, as a result of the opening of the Panama Canal, and such a line of communication will pass our valley, because it is the lowest and most easily passed gap in the mountains.

* * *

The War and Business

We take the following rational forecast of the effect of the war upon business from the *Evening Post*, which is always intelligent in its commercial and financial views:

> The reason why so little has yet been said or written regarding the longer effects of this European war on the economic situation, lies clearly in the extent to which the immediate financial and commercial phenomena absorbed all the thought of the business community. Confronted with the problem of emerging from a state of affairs where international finance and trade had pretty nearly stopped, the one consideration was to restore what could be restored of those relations, and to do it with a minimum of delay. In this, there has been encouraging progress.
>
> The difficulties which last week seemed all but insurmountable are now in a way of being gradually overcome. The British Admiralty announces that the channels of neutral commerce, especially between here and Europe, are "fairly safe." Certain European governments, whose ports are protected by the English fleet, are assuming or guaranteeing insurance against capture, at least on cargoes consigned to such ports. Drawing of exchange, in payment for ocean cargoes, is a slower process; but the international bankers are working along the lines of "clearing" such foreign exchange bills, through offsetting drafts of New York on a given foreign market by bills drawn simultaneously by that market on New York. In general, the trade opinion seems to be that solution of the problem of exchange will proceed with reasonable rapidity as soon as ocean commerce is itself restored.
>
> It is difficult to look very far into the economic future. Some general conclusions will be accepted without debate; among them, the inference that a war whose cost must draw much prodigious sums from private capital, which takes away millions of the most competent European workers from productive industry, and which diverts them to the destruction of property, for the repairing of which, when peace returns, another heavy drain on capital will be necessary, must exert a profound and long-continued influence for the worst on Europe's own prosperity.
>
> The problem of the after-effects in neutral countries—notably the United States—is different. To an extent, we are necessarily involved in the financial derangement which has accompanied the outbreak of Europe's war; the forced suspension of Stock Exchange transactions in this country, the recourse to emergency banknote issues, and the blockade of foreign exchange, show that. We shall hardly be able to rely on European capital for our own affairs during some time to come; and for that reason it is most fortunate that we have for so many months been adjusting our plans to the absence of such capital. But these considerations leave the larger problem open, what the subsequent effect on our home activities is to be.
>
> The central point of high importance in our remarkable situation is the international grain trade. European government themselves are showing how clearly they understand the paramount necessity of obtaining the two or three hundred million bushels of our exportable wheat surplus—the largest available supply in the history of our trade. There are other commodities, chiefly agricultural, of which the foreign need will presently be almost as urgent. Our manufacturers also have before them, in the steel and textile trades especially, the task of meeting requirements of neutral export markets, from which the German producer, lately most active in those fields, is now quite cut off; and the home manufacturer must also fill the void left in supplies for the home consumer by the very general stopping of merchandise imports from the Continent.
>
> This, so far as it goes, is the reassuring side. It is impossible that our producers and merchants should not enjoy again that exceptional advantage which, in the infancy of American industry, they captured during the long Napoleonic wars. But it is not to be overlooked that there are troublesome considerations in the way of the smooth achievement of this task, and that a great deal of unsettlement and diversion of activities will be caused in our industrial affairs. The problem of the supply of shipping is not the least of these. Vessels flying the German flag have been carrying 12% of the tonnage annually entered and cleared at American ports; those vessels are at present quite eliminated. Furthermore, the very supposition of larger American exports to South America and the East puts an obstacle in the way of drawing ships from that service into the transatlantic trade.
>
> The problem of foreign raw material, essential to some of our home manufactures, presents other difficulties; the embargo on ferromanganese for steel manufacture, on dyes for textiles, on crude rubber—and these are a few instances—is being felt already. It is to some extent, exaggerated, because the temporary stoppage of commerce with other neutral states (such as Brazil, with its rubber) is a different matter from the absolute embargo on products of Central Europe. Nevertheless, the problem is one which will greatly perplex our manufacturers, at a time when the call on them for export goods is likely vastly to increase.
>
> In due course, trade will find the way to surmount such of these obstacles as are surmountable. Then we shall begin to measure, against the general derangement of finance and industry, the exceptional advantages which must accrue to a rich and highly productive state which is at peace with all the world while the other richest producers are fighting one another.

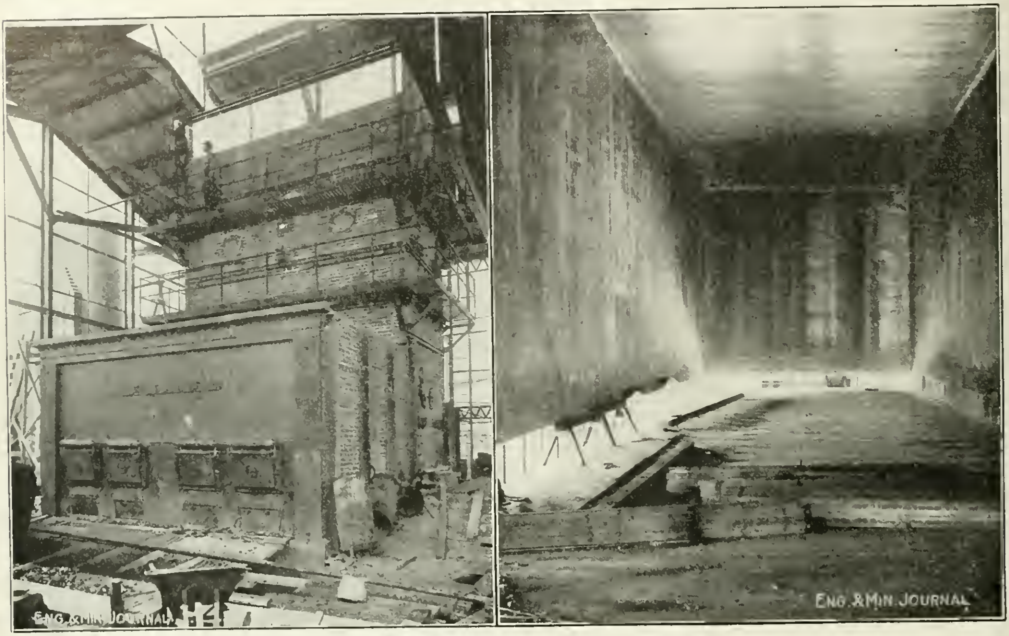
* * *

Shannon Copper Co.

The Shannon Copper Co. treated 56,085 tons of Shannon ore and 11,379 tons from company's outside properties during the three months ended June 30. The production was 3,118,156 lb. of copper, 120 oz. gold, and 20,702 oz. silver. The average cost of copper was 12.695c. per lb., and the average price received, 13.908c. per lb.

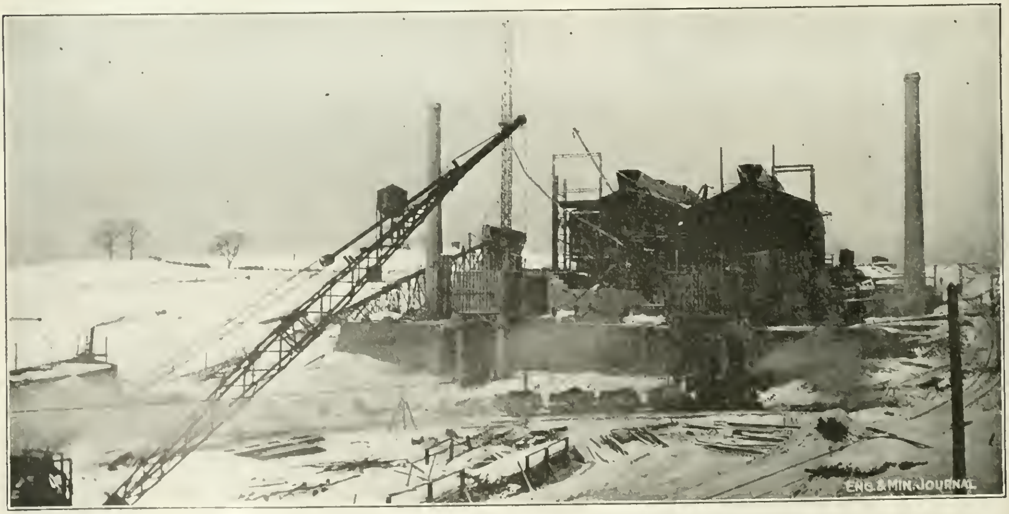
Net income, over interest requirements, of the Shannon-Arizona Ry. Co. was $3187.77. Consolidated net profits for the quarter were $10,952, the decrease from the previous quarter's profits being solely due to the lower price received for copper.

American Zinc & Chemical Co.



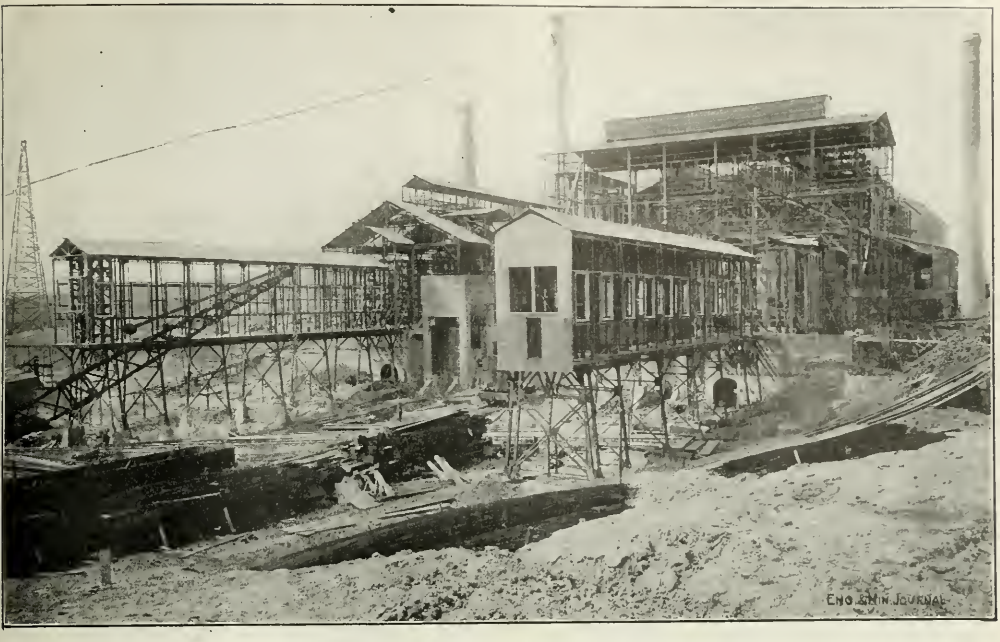
WASTE-HEAT BOILERS AND ACID CHAMBER

During construction work the boilers were equipped for burning coal, as shown in this view.



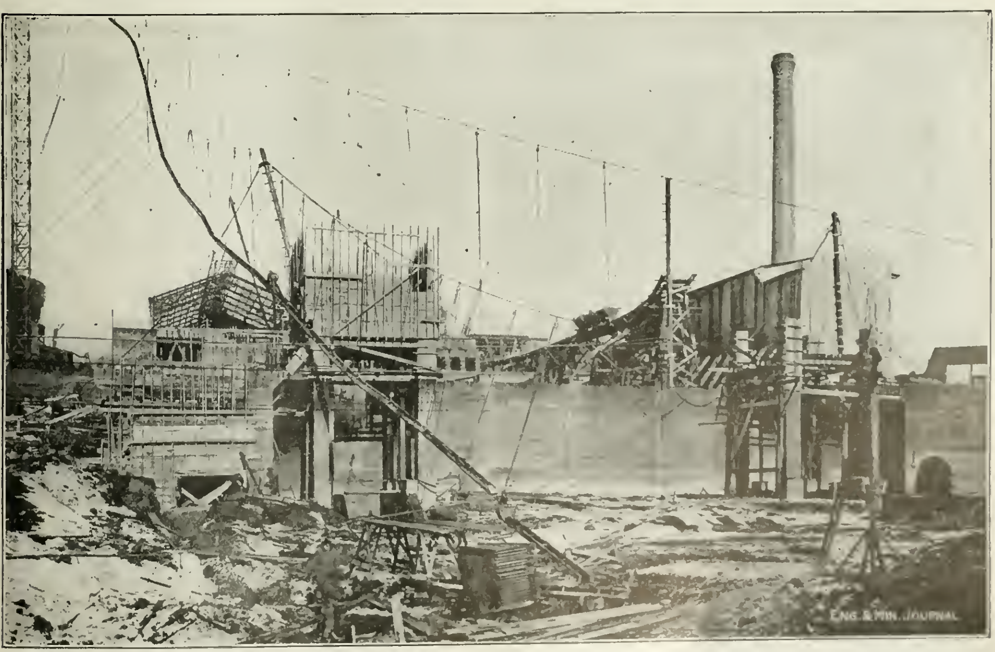
FIRST UNIT OF ROASTER AND ACID INSTALLATION UNDER CONSTRUCTION

Manufacture of sulphuric acid was started in August at this plant nearing completion at Langeloth, Penn.; spelter production will begin this autumn.



ANOTHER VIEW OF THE ROASTER AND ACID PLANT

The two long, narrow sheds house the rake rods for the Hegeler blende-roasting furnaces.



CONCRETE-POURING EQUIPMENT AND STEEL ELEVATOR-TOWER

A hopper at the top of the tower discharged concrete into the wire-supported inclined trough that could be rigged to convey to considerable radius.

NEW PUBLICATIONS

THE AMERICAN FERTILIZER HAND BOOK, 1914. 8x10¾, pp. 122, illus.; $1. Ware Bros. Co., Philadelphia, Penn.

FOREST PROTECTION IN CANADA, 1912. By Clyde Leavitt. 7x10½, pp. 174, illus. Commission of Conservation, Ottawa.

ELEMENTARY PRINCIPLES OF SURVEYING. By M. T. M. Ormsby. 4¾x7¼, pp. 230, illus.; $1.50. Scott, Greenwood & Son, London.

KURZER LEITFADEN DER BERGBAUKUNDE. By F. Heise and F. Herbst. 5x8¼, pp. 217, illus.; 6 marks. Julius Springer, Berlin, Germany.

REPORT OF THE NOVA SCOTIA DEPARTMENT OF MINES, 1913. Pp. 235, illus. Commissioner Public Works and Mines, Halifax, Nova Scotia.

BRASS-FURNACE PRACTICE IN THE UNITED STATES. By H. W. Gillett. Pp. 298, illus. Bull. 73, U. S. Bureau of Mines, Washington, D. C.

ESTADISTICA MINERA DEL PERU EN 1912. By Carlos P. Jimenez. 7x9, pp. 125; paper. Bull. 80, Cuerpo de Ingenieros de Minas del Peru, Lima.

THE MINING WORLD INDEX OF CURRENT LITERATURE, VOL. IV, 1913. By George E. Sisley. 6x9¼, pp. 190. Mining World Co., Chicago, Illinois.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF METALS, VOL. VII, 1913. 6x9, pp. 381, illus. W. M. Corse, Secretary, Buffalo, New York.

INDIAN GEOLOGICAL TERMINOLOGY. By Thomas H. Holland and G. H. Tipper. Pp. 127. Vol. XLIII, Part I, Memoirs, Geological Survey of India, Calcutta.

VULCAN PROCESS INSTRUCTIONS ON OXYACETYLENE WELDING AND CUTTING. 6¼x8¾, pp. 85, illus.; $1. Vulcan Process Co., Minneapolis, Minnesota.

ST. HILAIRE (BELOEIL) AND ROUGEMENT MOUNTAINS, QUEBEC. By J. J. O'Neill. Pp. 108. Memoir 43, Geological Survey, Canada Dept. of Mines, Ottawa.

USEFUL MINERALS OF THE UNITED STATES. Compiled by Samuel Sanford and Ralph W. Stone. Pp. 250. Bull. 585, U. S. Geological Survey, Washington, D. C.

WHEATON DISTRICT, YUKON TERRITORY. By D. D. Cairnes. Pp. 153, illus. Memoir 31, Geological Survey Branch, Canada Department of Mines, Ottawa.

ELECTRIC FURNACES FOR MAKING IRON AND STEEL. By Dorsey A. Lyon and Robert M. Keeney. Pp. 142, illus. Bull. 67, U. S. Bureau of Mines, Washington, D. C.

SAFETY AND EFFICIENCY IN MINE TUNNELING. By David W. Brunton and John A. Davis. Pp. 271, illus. Bull. 57, U. S. Bureau of Mines, Washington, D. C.

THE MIDDLESEX AND MOUNT CLAUDE MINING FIELD. By W. H. Twelvetrees. Pp. 129; maps under separate cover. Bull. 14, Tasmania Geological Survey, Hobart.

CRYSTALLOGRAPHY: AN OUTLINE OF THE GEOMETRICAL PROPERTIES OF CRYSTALS. By T. L. Walker. 6x9½, pp. 204, illus.; $2. McGraw-Hill Book Co., New York.

GEOLOGY AND MINERAL DEPOSITS OF THE TULAMEEN DISTRICT, B. C. By Charles Camsell. Pp. 198, illus. Memoir No. 26, Canada Dept. of Mines, Ottawa, Canada.

MAPS OF THE MINING DISTRICTS OF MINNESOTA, 1914. Compiled by E. H. Comstock. 12x17¼, 13 sheets; $1. Minnesota School of Mines, Experiment Station, Minneapolis.

REPORT ON MINING OPERATIONS IN THE PROVINCE OF QUEBEC DURING THE YEAR 1913. Pp. 163, illus. Department of Colonization, Mines and Fisheries, Mines Branch, Quebec.

THE SAMPLING AND EXAMINATION OF MINE GASES AND NATURAL GAS. By George A. Burrell and Frank M. Seibert. Pp. 116, illus. Bull. 42, U. S. Bureau of Mines, Washington, D. C.

REPORT ON THE BUILDING AND ORNAMENTAL STONES OF CANADA. Vol. II: Maritime Provinces. By William A. Parks. Pp. 274, illus. Canada Dept. of Mines, Mines Branch, Ottawa.

PORTIONS OF PORTLAND CANAL AND SKEENA MINING DIVISIONS, SKEENA DISTRICT, B. C. By R. G. McConnell. Pp. 107, illus. Memoir 32, Canada Department of Mines, Ottawa.

PRELIMINARY REPORT ON THE SERPENTINE AND ASSOCIATED ROCKS OF SOUTHERN QUEBEC. By John A. Dresser. Pp. 105, illus. Memoir No. 22, Canada Department of Mines, Ottawa.

SUMMARY REPORT OF THE CANADIAN GEOLOGICAL SURVEY, DEPARTMENT OF MINES FOR THE CALENDAR YEAR, 1912. Pp. 544, illus. Canadian Department of Mines, Ottawa.

LES POUDRES ET EXPLOSIFS ET LES MESURES DE SÉCURITÉ DANS LES MINES DE HOUILLE. By L. Vennin and G. Chesneau. 6¼x9¾, pp. 573, illus.; 25 francs. Ch. Beranger, Paris and Liege.

A REPORT ON THE ASBESTOS, TALC AND SOAPSTONE DEPOSITS OF GEORGIA. By Oliver B. Hopkins, Assistand State Geologist. 7x10½, 310 pp., illus. Bull 29, Geological Survey of Georgia, Atlanta.

THE GEOLOGY OF THE AROHA SUBDIVISION, HAURAKI, AUCKLAND. By J. Henderson and J. A. Bartrum. Pp. 127, illus. Bull. 16, Geological Survey Branch, New Zealand Department of Mines, Wellington.

HEATON'S ANNUAL. The Commercial Handbook of Canada and Boards of Trade Register, 1914. Edited by B. A. Heaton, J. Beverly Robinson and W. J. Dobson. 5x7½, pp. 590. Heaton's Agency, Toronto, Canada.

DIE THEORIE DER BODENSENKUNGEN IN KOHLENGEBIETEN MIT BESONDERER BERUECKSICHTIGUNG DER EISENBAHNSENKUNGEN DES OSTRAUKARWINER STEINKOHLENREVIERES. By A. H. Goldreich. 6½x9½, pp. 260, illus., paper; 10 marks. Julius Springer, Berlin.

DIE BESTIMMUNGSMETHODEN DES ARSENS, ANTIMONS UND ZINNS UND IHRE TRENNUNG VON ANDEREN ELEMENTEN. By H. Wölbling. XVII./XVIII. Band, Die chemische Analyse, edited by B. M. Margosches. 6x10, pp. 377, illus., paper; 13 marks. Ferdinand Enke, Stuttgart, Germany.

THE MINING ADVANCE INTO THE INLAND EMPIRE. A Comparative Study of the Beginnings of the Mining Industry in Idaho and Montana, Eastern Washington and Oregon, and the Southern Interior of British Columbia; and of Institutions and Laws Based upon that Industry. By William J. Trimble. 6x9, pp. 254; 40c. Bull. 638, University of Wisconsin, Madison.

MINES OF AFRICA, 1914 EDITION. By R. R. Mabson. 5x7¾, pp. 662, illus.; 22s. The Statist, London.

This is the tenth annual edition of this publication, known as "M. O. A." It gives, in alphabetical order, for ready reference, a list of the mining companies, with details as to their organization, officers, dividends, ore reserves, etc. A number of maps are included, and an introductory chapter gives data of African gold production, labor conditions, mine share valuations, etc.

COMPRESSED AIR. A Treatise on the Production, Transmission and Use of Compressed Air. By Theodore Simons. 6¼x9½, pp. 173. McGraw-Hill Book Co., New York.

There is nothing new in this book and none to be expected; novelty is not a characteristic of technical books. Its value lies in its manner of presentation and its arrangement, which are excellent. The material is well selected; the descriptions are clear and are skinned down to essentials. The theory, generation, transmission and use of compressed air are covered. The little volume should prove an excellent textbook.

CHEMICAL REAGENTS: THEIR PURITY AND TESTS. Authorized Translation by Henry Schenck of "Prüfung der Chemischen Reagenzien auf Reinheit." By E. Merck. 6¼x9¼, pp. 199; $1. D. Van Nostrand Co. New York.

This is the translation of the second edition of "Prüfung der Chemischen Reagenzien," which does not differ in scheme of treatment from the first edition. However, there have been many reagents added to the list, new tests have superseded some of the older ones, and tests have been added for new impurities. The book is a valuable one for the library of the analytical chemist.

THE SILICATES IN CHEMISTRY AND COMMERCE. Including the Exposition of a Hexite and Pentite Theory and of a Stereo-Chemical Theory of General Application. By W. Asch and D. Asch. Translated, with critical notes and some additions, by Alfred B. Searle. 6x10, pp. 456, illus.; $6. D. Van Nostrand Co., New York.

This is, as might be imagined from its title, a complete treatise on clays, glass, glazes, etc., regarding silicates as having the power of forming "chains," as does carbon, a view which will, by the way, appeal to the metallurgist from his work with slags. We think the book well worth while for any one greatly concerned with the theoretical side of the ceramic industry.

A NEW ERA IN CHEMISTRY. By Harry C. Jones. 5¼x8, pp. 326, illus.; $2. D. Van Nostrand Co., New York.

As Doctor Jones says, there is a difference between the old and the new chemistry, "not alone of degree, but of kind." This book is the explanation of that difference; using the historical order of growth and development of the new chemistry as its framework. To quote Doctor Jones again, "My apology for adding another book to the literature of chemistry is that I have known well most of the men who have been instrumental in bringing its about, and have been a student of the three leaders—Van't Hoff, Arrhenius and Ostwald." He might too have quoted Aeneas and remarked of the new chemistry, "a great part of which I was."

His divisions of the subject are: The condition of chemistry in 1887; the development of the law of mass action, energy changes in chemical reactions; the origin of stereochemistry; the phase rule of Willard Gibbs; chemical dynamics of Van't Hoff and chemical equilibrium of Le Chatelier; rôle of osmotic pressure in the analogy between solutions and gases; Arrhenius and the theory of electrolytic dissociation; the solvate theory of solution; the work of Wilhelm Ostwald; investigations by Ostwald's students and co-workers; the electron and radiochemistry.

All of this is told in Doctor Jones' usual clear style, known already to readers of the "Journal," which, those of us who know Doctor Jones, is simply the Doctor sitting down and telling us about it.

Correspondence and Discussion

Table Concentration vs. Flotation

I would like to say a few words on the subject of the concentrating table *versus* the flotation process. In these days of enthusiasm over the flotation process, it may be well to analyze the problem of the proper application of either. While I am one of the originators of the flotation methods, perhaps particularly for this reason, I am not inclined to see in the flotation methods a process so fully applicable as it is now thought to be and hoped for.

The cost of fine grinding must be considered. For instance, in the case of the Miami ores, there are over 15% of carbonates and oxides. This portion of the ore is not at all subject to flotation, while tests show that the concentrating table will extract a large percentage of these carbonates and oxides.

The cost of the flotation process is in all cases much higher than the table treatment. The pyrite is not so well recovered as in the table process, and the silica is usually rather high in the flotation concentrates.

I cite as an example the results obtained in a test at Humboldt, Ariz., where the table made concentrates running 7% insoluble and 38% iron, as against the flotation process making concentrates running 27% insoluble and only 25% iron. Crediting the iron with the usual 6c. per unit and penalizing the silica with 10c. per unit gives a showing strongly in favor of the table process. So far as extraction is concerned—if the ores are crushed in steps so as to eliminate slimes as much as possible, and the mineral is extracted between each step of crushing, a great deal of unnecessary crushing can be eliminated, and an extraction of 80% to 90% is possible. If the flotation process is then applied, a nearly complete extraction can be obtained.

Alfred Schwarz.

New York, Aug. 3, 1914.

⁂

Running Joint to Replace Unions

I notice in the March 21, 1914, Journal an article entitled "Running Joint to Replace Union." It brought back to my mind the experiences I had with running joints and unions some years back. We used a great many running pipe joints, believing them better than the various type of unions that we had tried.

I was not satisfied, however, that a running joint was the ideal joint, so set about to try out every type of union I could lay my hands on. The principal fault with the unions was that they would rust together (and the running joint had this fault), and then, too, the gaskets needed replacing in the unions.

At last I tried out a gasketless union, with brass-to-iron seat and brass-to-iron thread connection. After that I found that my troubles were solved, for the union held up splendidly, and on several occasions when I had to take the line apart, I had not the least bit of trouble disconnecting this union. After that I used no more running joints.

I do not think a running joint is economical. Considering the cutting of the long thread, providing the lock nut, caulking the thread with oakum, painting the thread, and so forth—I think the cost of labor and material exceeds that of a good union.

As to durability, I always found trouble with the pipe rusting at the thread. When you stop to think that you are cutting away about half of the thickness of the pipe wall for 5 or 6 in. at one end, and exposing the weakened section to corrosion, it can be seen why there is trouble with the joint rusting out. All in all, there may be certain places where a running joint is an advantage, but I think a union such as I have been using and describe above will make a stronger and more durable connection, and without any increase in cost.

A. P.

Pittsburgh, Penn., July 31, 1914.

⁂

What Becomes of All the Mining Engineers?

J. I. Blair's article in the Journal of May 30, 1914, is questionable in certain respects and the figures he uses are purely fictitious.

He should qualify the term "mining engineer" when arriving at conclusions as he has. In one of our leading mining schools, less than 66% of the graduates can be called mining engineers because the rest graduate in "general science." It is a fact that 35% of all the graduates of this school are actively engaged in mining, metallurgical, geological or chemical work. Therefore, of the mining engineers that this school has put out, 53% are now "in the ring" and practicing their profession. That differs radically from Mr. Blair's figure of 1 per cent.

Furthermore, of the mining engineers who started into the practical work after graduation, 85% stayed in, instead of 75% dropping out, another error in the article.

Mr. Blair should visit other operations than zinc-oxide plants, of those that come within the field of the mining engineer, before generalizing so broadly, and a few more districts than New York, Illinois, Missouri and the "West"—and preferably a few other continents.

Moreover, a mining engineer has a little higher ambition than to run a Joplin mill. While his farmer friends can probably "strong arm" a bit better in the start, the technical man can learn more in one day than one of them can in a week. He makes mistakes, but with a few weeks of oiling, belt lacing and repair work, he excels the farmer in getting results.

If a man has an ambition, he is foolish not to get his education in the easiest manner. In the absence of a college, he must burn his midnight oil at home. This was the method followed by the older men in the profession, for the mining school is a relatively new institution. But, nowadays, these schools are provided to educate efficiently: everything is arranged and provided to encourage and guide study; and a person can get his education there infinitely more easily and rapidly than in the old-fashioned way. He must be educated some way; if by years of hard knocks he has succeeded, he ought to welcome a more rapid, modern manner of accomplishing the same thing, instead of shutting his eyes to facts and being a doubting Thomas. If a man has it in him to succeed, he surely will succeed much more quickly and easily via the "mining engineer" route than in the old-fashioned way.

In following Mr. Blair "across the continent," did we *follow* him in a covered wagon as we would have years ago? No, we both took trains. Why? For the same reason that a young man goes to college to study mining, that is, to "get there." Why not the modern way?

C. C. Conover.

Springfield, Ill., June 2, 1914.

⁂

Tailing Samples

The criticisms offered by W. H. C. Jerome in the Journal of July 4 on the "Simple Sampling Device," illustrated on page 1052 in the issue of May 23, seem not altogether fair.

The inequality of the cut, due to the fact that a sampling trough actuated by a falling weight moves with accelerated speed, is for the most part compensated by the condition that each alternate cut is in the opposite direction.

The second objection, that the area of the orifice changes in accordance with its position, does not apply if the cutting trough is wider than the pulp stream. However, the trough should usually be much narrower than the stream, for the reason later noted, and hence theoretically this objection is well taken. While it is only a question of what length of arm is necessary to make the arc of oscillation near enough to a straight line for practical results; yet this defect can be removed by introducing a level guide track for the collecting trough, the oscillating arm of the water box working in a slot to actuate the collector.

Neither the Elmore sampler nor the "Reformed" sampler illustrated on page 19 of the Journal of Jan. 3, 1914, nor any other form of sampler which uses a horizontal revolving collector will take a correct sample unless its cutting trough is patterned from a sector. In other words, the cutting sides of the collecting trough must be radial to the center of revolution. In no other form will every point of the falling stream be taken for the same period of time. This most important fact has been overlooked in many samplers otherwise mechanically perfect. As far as can be judged from the cuts on pages 19 and 1017, Vol. 97, both of these samplers are defective in this particular; but the defect is easily corrected by a new cutting trough. Further, it should be noted that with an adjustable extension arm, like the Elmore, whenever the length of the arm is changed a new cutting trough is required in order to take a correct sample.

One of the principal uses of these devices is the sampling of tailings. As the tailings are usually even in grade and regular in flow, only a small per cent. is required to secure a correct sample. Moreover, the large quantity of water with which they are commonly discharged prohibits taking a large sample. This applies especially to samples of slimes which are at once the most essential to secure and the most difficult to handle because they require much time and space to dewater. In most cases from 1 : 1000 to 1 : 10,000 is as much as it is practicable to handle.

The best possible sample from a pulp stream consisting largely of water is secured by making a quick cut with a narrow trough, taking the smallest practicable amount at each cut, and thus allowing more frequent cuts without getting a sample of impossible size to handle. Indeed, the crude device taking frequent small cuts may return a more correct sample than the more perfect machine acting at less frequent intervals. Without going into details, I should say that the Elmore sampler and others of this type, even with the narrowest allowable collector, normally give too slow a motion across the stream for good results with highly diluted pulps. That is to say, that while the machine can be adjusted to cut any percentage required it must be difficult, if not impracticable, in its present form to adjust it to, say 1 : 10,000 without making too long a period between cuts. The desired motion can doubtless be secured by a reconstruction of the Elmore pattern, introducing a new train of gearing from the pulley shaft to engage the toothed segment *N*, independent of the worm, leaving the worm gear solely to operate the slow-motion ratchet. This would make a machine somewhat similar to the Scobey tailings sampler, which by a few interchangeable intermediate gear wheels is made to take different ratios betweeen 1 : 500 and 1 : 10,000.

Passing to the strictly practical side of the subject, with ordinary even-grade tailings, and with a rather long oscillating arm in relation to the diameter of the pulp stream, I believe that the error in the sample taken with the "Simple Sampling Device" would be smaller than would be disclosed by the assay balance. Under certain conditions, as before noted, its sample might be more correct than one taken with a more perfect machine. In any case I submit that it is so much better than the old millman with his tin cup once every half hour that it should be encouraged rather than decried. That is, better have one of these home-made samplers than none.

One of the main advantages of the water-box samplers, and one which must not be overlooked, is that they can be put in places where is would be impossible to operate a belt-driven machine. The tailings-discharge launder is frequently outside and at some distance from the mill building, where a small water pipe can be run for its operation, but where it would be impracticable to extend a shaft or belt.

V. G. Hills.

Denver, Colo., July 11, 1914.

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Radium Output of the Standard Chemical Co.

I regret to note a typographical error in the Journal of July 4, in the percentage of radium contained in pure crystalline radium bromide. This figure should be 53.6% instead of 63.6% as it appears on p. 25.

Charles H. Viol.

Pittsburgh, Penn., July 14, 1914.

Editorials

The War

It is Germany and Austria against the world. Actually fighting with England, Belgium, France, Russia, Montenegro and Servia, with Japan ready to join them in the Far East if necessary; deserted by Italy and without sympathy even in neutral countries, the Germanic people are marked in their isolation. How long will it be before the Slavs of Austria turn against them and the Magyars separate themselves? Not long if victory fails Germany's banners.

At present we know but little of what is going on. After the veil is drawn, what shall we see? And in the end what will there be? German victory means hegemony of Europe, and probably hegemony of more. German defeat may mean disarmament, a relief from staggering burdens, and a republican Europe. There will not be another Armageddon.

The Paralysis

Some people have sought to draw a parallel between the situation of the metal markets in 1907 and at present. There is no parallel. In 1907 the trouble was essentially financial and was especially confined to the United States. Even in the United States consumption was well maintained while in Europe it continued large. The liquidation in copper, for example, was bound to strike a reasonable level at which all that anybody wanted to offer would be absorbed. In fact, when the price dipped under 12c., there were such large purchases that the market steadied and soon rallied.

In 1914 there was the sudden elimination of customers who had been taking 50 to 60% of our production, which naturally paralyzed the market. Of course, the producers might have flung their supplies upon the domestic market, unloading them down to 5 or 6c., say, and bankrupted themselves, but there would have been no good in having a market on such terms. In 1907 there was a live market even at the crisis. In 1914 there is paralysis.

A similar paralysis affects the silver market, the larger part of which product is marketed through London without any means for getting it there at present. Since July 31 there have been no official quotations from London, although within the last few days some unofficial quotations have been cabled over. The bullion brokers, who handle the American output report, however, that the situation is in no wise helped inasmuch as they cannot sell over there. Mine owners at Cobalt who turn out fine silver find themselves in the same predicament. The U. S. Mint has been buying a little silver, but its purchases are too small to make a market.

In our other great export commodities—wheat, cotton and petroleum—there are analogous conditions with differences in degree and prospects. The wheat market is mainly domestic, but this year we have an unusually large surplus to export and it is recognized that it is going to be wanted badly and consequently it is being held at a rising price in anticipation thereof. The petroleum refiners promptly refused to buy any more crude or enforced a curtainment of production of the domestic market and the consumption of its products being a day to day matter there appears to have been in this case a rather quick adjustment to the new conditions. The cotton crop not yet being grown is not yet on the market. The disposal of it excites much concern and there is talk of Governmental or banking assistance. However, the cotton will be needed abroad once the high seas are open for commerce. We wish we could be equally confident about the need for copper.

Looking at the things that we need, we see an absence of tin, ferromanganese and chemical products among the essentials. All of our tin supply comes from abroad and just at present we cannot get any and there is no commodity market for the reason that there is no supply. The extravagant quotations for this metal that are talked about represent transactions in trifling lots that happened to be in the hands of dealers here, which are very interesting and profitable to the lucky holders, but are without any broad commercial significance.

Summing up briefly, what we have witnessed during the first fortnight of August, 1914, is a stoppage of international commerce, and to a considerable extent of domestic also, just as we have had a stoppage of trading in securities on the stock exchanges. Such a thing has never happened before in the history of modern civilization. With regard to domestic trade we shall soon have an adjustment to the new conditions. Foreign trade will improve when ships can freely sail the sea. In the meanwhile the stoppage is so physical that our railways are beginning to feel it.

Thoughts about Copper

The situation that has arisen is so unprecedented, so infinitely complex, so fraught with surprises that no man knows enough to foresee what is going to happen. At the moment, business has come to an absolute standstill. From 50 to 60% of our refined product heretofore has been marketed abroad. With that outlet entirely closed, the situation is too confused to permit of anything but sporadic domestic business being done.

All that occurs to anybody are random thoughts, such as these:

Most of the big mines have curtailed about 50%, thinking so to reduce their output to about the expected domestic requirement.

The refiners are curtailing; with no market for silver, there is no use in incurring expense in turning crude copper into refined. For the same reason some of the mining companies will pile up blister copper at their smelteries rather than at the refineries.

The absence of a market and the disruption of the ocean-carrying trade will keep a good deal of foreign copper at home.

Some new producers that were coming into the market next year will be checked.

Were the huge exports of copper to Germany last spring, which excited so much discussion at the time, for stocking up in anticipation of this war?

The shock struck the copper market when it was in the best possible condition, the price being low and there being no bull position, there having been a sweeping liquidation of accounts early in July.

Workmen's Compensation Law

W. L. Saunders, president of the Ingersoll-Rand Co., is authority for the statement that studies of the National Civic Federation revealed that something like eighty millions of dollars was paid annually by American industries on account of accidental injuries and deaths of workmen before we had any compensation laws, and of that sum not more than 20% went into the homes of the injured, the rest of it having been eaten up by agents, lawyers, and through expenses. This is a mighty good justification of the compensation laws that the states have been adopting in recent years. The lawyers get less and the workmen or their families get more. If the compensation remained at the previous rate, the cost to the employer would be no more.

However, the rates that have lately been put in the laws increase the cost without doubt. One big mining and metallurgical company, whose accidents cost about $250,000 per annum, estimates that if the law of a neighboring state be adopted in its own, the cost of its accidents will be about $800,000 per annum. In such circumstances an Irishman might say that the cheapest way to pay for accidents is not to have them. This is the economic basis of the "Safety-First" movement. Of course, there is also the humanitarian basis.

Those compensation laws, like New York's, which permit an employer to insure himself, give an incentive to him to eliminate accidents. He is trying to do this by making his machines, etc, as nearly fool-proof as possible. It will be only the square deal if the state steps in and helps him to enforce discipline. If an employee who engaged in a dangerous practice contrary to the law of the state could be summoned before a magistrate and fined, as in Great Britain, there would be a powerful stimulus toward discipline, but in this country, unfortunately, such laws are only for the employer. He may not even discharge an unlawfully acting employee without risking offense to the labor unions and perhaps experiencing a strike.

The Federal Trade Commission

The bill creating a Federal Trade Commission having now become a law, it is the duty of the President to appoint the five members of the commission. They will take over the duties now performed by the Commissioner of Corporations, but will have enlarged authority, having pretty full powers to investigate the business, financial condition, conduct and management of corporations doing an interstate business, and to issue and enforce orders against unfair competition by corporations. It is authorized to require corporations to open their books, disclose their records and produce documents, contracts, memoranda, etc. The inquisitorial powers of the commission are very large.

Whether the adoption of this radical measure was wise or not is no longer a subject of useful discussion. It has become the law, and doubtless will so remain. The important thing is to have a competent administration of it. The sweeping power conferred upon the commission demands that its members be men of a high order of intelligence. They must partake equally of the qualities of administrators of business, of economists, and of judges of the law.

Equally important is it that they should be acquainted with the great branches of industry upon which the prosperity of this country is based, such as mining, milling, manufacturing and merchandizing. It is our special purpose in this article to bespeak a representation of the mining and metallurgical industry, one of the great basic industries, upon which more than any other is the manufacturing industry based. The U. S. Steel Corporation, for example, is the greatest of all of our corporations, and it is a mining and metallurgical enterprise. Many are our mining companies that are concerns of huge capitalization, many are they that individually employ thousands of men, and many are they upon which entire communities solely depend. With them link hands the smelters, and with them again the rollers of sheet metal and the drawers of wire, and so on down the line to the makers of all kinds of finished products, ranging from the heavy steel rails of Pennsylvania to the complicated clocks and watches of Connecticut.

In this complex industry, whose raw ores alone represent an annual value of upward of one billion dollars, there are conditions and problems peculiar to itself. No one man may hope to be familiar with all of them, but in the study of them a man who has lived in the atmosphere of the mining and metallurgical industry can enter more intelligently and more sympathetically than one who has not had such training; and for this reason we hope that one of the new commissioners may be such a man.

The Zinc Smelters of Europe

The military operations around Liège are taking place in the very heart of the zinc-smelting district of Belgium. Angleur, Ougreé, Engis, Hermalle sous Huy and Sclaigneaux, all of them important smelting towns, are stretched along the Meuse, above Liège, right on the route that the Germans are trying to travel. Presumably all of these works have been, or will be, affected.

In Upper Silesia, the mines and smelteries, which cluster around Beuthen and Kattowitz, are only five or six miles from the Russian frontier. Just over the boundary are the Polish works at Bendzin and Dombrowa. The main line of railway from Warsaw to Vienna passes through this part of Poland, and there are connections with the German lines in Silesia, wherefore there are probably military operations going on in this region.

In Rheinland and Westphalia and elsewhere in Germany, the smelters are probably called to the colors and the working forces decimated, and many of the plants are no doubt closed.

It was estimated that the International Zinc Convention had a stock of 90,000 long tons of spelter at the midyear. How much of this was in England is unknown. The British zinc smelters are unable to supply the spelter requirement of the United Kingdom. It is likely therefore that England will take spelter from the United States if she succeeds in clearing the ocean of hostile cruisers. In the meanwhile, Canada will have to get her supply from the United States.

BY THE WAY

The conditions of petroleum production are similar to those prevailing in copper production. A very large part of the American petroleum is normally exported, and for the moment there is no export market. Consequently the refiners have notified the producers that they will take only 50 or 60% of the ordinary deliveries of crude, and in some cases they will take none at all.

Wheat and cotton are our other great commodity exports, but it is anticipated that the blockade in those essential bases of food and clothing will soon be raised.

*

A new use for a Ford is reported from Nevada. The gravels of Tule Cañon are difficult to work through a shaft because of the heavy flow of water. The owners of one property possessed a Ford, known locally as a "road louse," which they thought ought to work for its board. They jacked up the rear axle, took off the tires, hitched the machine to their pump with a rope drive, and started her on the high. By this means they are handling 500 gal. per min. in the 35-ft. shaft and are going to find nuggets as big as pullets' eggs—so they say.

*

When a metallurgical plant is dismantled it usually has only a scrap value which may be 5 to 10% of its original cost. If our recollection be correct the experience in scrapping the old Anaconda smelting works at Anaconda, Mont., was about like that. The Calumet & Hecla company is about to dismantle its smelting plant at Black Rock, N. Y., a suburb of Buffalo, and we hear that it is going to reverse most previous experiences, the present market value of the smelting site in this case being in excess of the sum for which the smelting works have been carried on the books of the company.

*

At the Tamarack mine, on the Upper Peninsula of Michigan, there toiled a Cornishman, who was very economical with his supplies; reducing his charges of explosive to a minimum when drifting on contract at so much per lineal foot. The shattering effect being diminished, there was less muck-stick work and George had a nice tight little drift, which harmonized perfectly with his diminutive and thrifty self. One day the superintendent, making his rounds of inspection, had the misfortune to bump his head rather severely when nearing the face of George's drift. Recovering himself, he indignantly stammered: "P-p-pretty low roof, G-g-george, p-p-pretty low roof. "No, no, Cap.," George soothingly replied, "roof's on a perfect grade, but I expect mebbe the track's a bit 'igh."

*

There has been a platinum excitement in Colombia, near the mines of the Frontino & Bolivia Co.'s properties, in the vicinity of La Salada. This is not the recognized platinum area of Colombia, but after having heard of some platinum being shipped out by the company, some of the natives employed at the property began denouncing mines in this vicinity. The facts of the case are as follows: Many years ago this company sent out to Colombia a platinum parting dish. Someone in the London office happened to remember that this was purchased when platinum was low, and as the small number of bullion assays made by this company did not necessitate the use of it, it was decided that the platinum should be returned and sold at the fancy prices now offered. It was therefore ordered that the manager at the mine should return it in the next bullion shipment. It was the declaration of this shipment that caused the natives to reach the conclusion that the company was obtaining platinum from its mines; they proceeded to denounce the surrounding territory, but have not yet produced any platinum.

*

The Congressional Committee was investigating alleged cases of assault on the Coppper Country strikers. Mrs. Boris Fodor was testifying regarding a little run-in she had with officers of the law:

> Attorney for Sheriff. Did you get a kettle of boiling water and attempt to scald him when he asked for your husband?
>
> The Witness. No; I didn't do anything with him.
>
> Attorney for Sheriff. Didn't you attempt to throw some red pepper in his face?
>
> The Witness. No; I didn't attempt.
>
> Attorney for Sheriff. You didn't do a thing, and he simply grabbed you by the hair and pulled you out in the yard; is that right? Is that what you want this committee to understand?
>
> The Witness. Yes; he grabbed me and pulled me out because I stood in the door and didn't want to let him in.
>
> Attorney for Sheriff. Did you have a club in your hand?
>
> The Witness. No; I had a club, but that is not the club what they call it here. We used them to make noodles.
>
> Attorney for Sheriff. About how large a club was it?
>
> The Witness. A roller, they call it.
>
> Congress Taylor of Arkansas. Explain what it is.
>
> The Interpreter. They use them to make noodles—home made noodles. It makes a roller. That is what they call it. It would be about that long [indicating].
>
> Congressman Howell. We all know what it is.

Sure, we do, Congressman; they use 'em to make piecrust and cookies, too. The rolling pin and the flatiron—woman's time-honored weapons! Small wonder the deputy felt constrained to resort to means of self-defence.

*

Chronology of Mining for July, 1914

July 1—Anaconda Copper Mining Co. closed down the concentrator at Great Falls, Mont.

July 2—Cananea striking miners returned to work.

July 3—Suit brought against the American Smelting & Refining Co. by Sidney Norman and others, representing minority stockholders of the Federal Mining & Smelting Co., was dismissed by Justice Philbin. Railroad strike in the Cripple Creek district, Colorado.

July 6—Circuit Court of Appeals at San Francisco reaffirmed its decision in case of Mineral Separations. Ltd., vs. James Hyde.

July 15—Seven miners were killed by a rush of sand into a raise at the Vulcan mine at Alpha, Mich.

July 18—Announcement made that Phelps, Dodge & Co. had taken over the Tombstone Consolidated mines in Arizona.

July 29—Twelve miners were killed by an explosion of dynamite in sinking a shaft in the Krajaii potash mine, near Cassel, Germany.

July 31—Anaconda Copper Mining Co. closed down the Great Falls smelting plant and also seven mines in the Butte district, because of impending war in Euro

PERSONALS

F. W. Guernsey is in Nevada.

W. A. Dunn is at Lead, South Dakota.

Pope Yeatman sailed from New York, Aug. 10, for Chile.

E. W. Talbert is manager of Oro Hondo property, Lead, S. D., succeeding J. E. Carr, resigned.

H. W. Seaman ,of Chicago, president of the Trojan Mining Co., recently visited the property, at Deadwood.

H. S. Vincent, general manager of the Trojan Mining Co., has returned to Deadwood, S. D., from a visit to Denver.

B. R. Shover has resigned as general superintendent of the open hearth plant of the Brier Hill Steel Co., Youngstown, Ohio.

Edgar Huntley has been appointed general mine foreman of the Homestake mines, Lead., S. D., succeeding W. S. O'Brien, deceased.

John Tait Milliken recently visited the Oro Hondo property, at Lead, S. D., and is now enjoying a brief vacation in Yellowstone Park.

B. J. Falkenburg of the firm of Falkenburg & Laucks, Seattle, Wash., will be in California for several weeks on professional business.

Lloyd B. Smith of the Associated Geological Engineers has returned to Pittsburgh after seven months' geological work in the Oklahoma oil fields.

F. E. Lasier, of Detroit, Mich., after attending the American Institute meeting at Salt Lake City, will go to the Cripple Creek district in Colorado on business.

W. F. Stevens is at present engaged in making preliminary examinations in Southern Siberia and his address is c/o Russian & English Bank, St. Petersburg, Russia.

H. L. Waste, for a number of years superintendent of the Midas mine in Shasta County, Calif., will continue in that position under the Victor Power & Development Co., the new owner.

C. T. Griswold of the Associated Geological Engineers, Pittsburgh, Penn., has returned from Newfoundland, where he spent July examining copper mines and prospects around Notre Dame Bay.

J. T. Smith of New York, president of the Argonaut Consolidated Gold Mining Co., recently attended a meeting of stockholders and directors at San Francisco, and in company with W. J. McGee, assistant U. S. treasurer at San Francisco, visited the Argonaut mine in Amador County.

Judge Elbert H. Gary, chairman of the United States Steel Corporation, was among the Americans abroad at the opening of the war. He took a prominent part in the organization of the committee to look after Americans detained by the financial confusion arising from the sudden outbreak of hostilities.

W. J. Loring, of Bewick, Moreing & Co. of London, was in San Francisco Aug. 4. and then visited the Plymouth Consolidated Mine in Amador County, now operated by the London Consolidated Gold Mines. The new reduction plant, recently installed, began operation on July 30. Mr. Loring was superintendent of these mines during their production period about 25 years ago.

H. C. Hoover is always interesting and useful. According to a press dispatch from London he opened an office on Aug. 5 in the American consulate and advanced sums of $25 and upward to stranded Americans who were unable to get money by other means. On that day Mr. Hoover rendered assistance to about 300 Americans who were without cash and announced that he would continue to give aid as long as his currency lasted.

OBITUARY

Captain Elija Toms, one of the best-known mining captains on the Marquette range, was killed at the American mine at Diorite on July 24 He was descending the shaft on the bail of the skip, when, in some unknown manner, he fell to the bottom, the 16th level. For 11 years he was employed as underground captain at the Hartford mines at Negaunee, later being the superintendent. Prior to going to the Hartford he worked at the Queen mine at Negaunee. He was a native of Cornwall, England, and was considered a first-class mining man. He was 52 years of age. His wife and one son survive.

Chief Justice William H. Beatty of the California Supreme Court died at San Francisco, August 4. Mr. Beatty was born in Ohio in 1838. He went to California at the age of fifteen, and at seventeen returned East to the University of Virginia, where he remained until 1858. Although he did not graduate from the university, he returned to Sacramento and read law with his father, being admitted to the Bar in 1861. In 1863 he went to Nevada and for nine years was a district court judge. In 1875 he was elected associate justice of the Nevada Supreme Court, serving until 1878 when he became chief justice, serving two years. He returned to California and in 1889 was elected to the Supreme Court, and has served as chief justice of the California Supreme Court for twenty-five years. Both in Nevada and California, Justice Beatty was famous for his decisions in mining cases. One of the most important was that which concerned the Hale & Norcross Mining Co. His standing in his profession was high, and as a citizen he was in great esteem.

William S. O'Brien, for 15 years general foreman of the Homestake mines, died at his home at Lead, N. D., Aug. 1, from a hemorrhage induced by miners' consumption. He was born at Calais, Washington County, Maine, Feb. 25, 1846. With his parents he moved to St. Anthony, now East Minneapolis, Minn., in 1855. In 1863 he enlisted in the 9th Minnesota infantry, serving three years; after the close of the civil war he was in Indian campaigns in the West. In the early seventies he removed to Montana, and followed mining in that state, Utah, Nevada, Idaho and California for 20 years. Going to the Black Hills of South Dakota during the gold rush, he remained for two years, when he left, returning in 1884 to remain. He was a delegate from Lawrence County to the state constitutional convention, which organized the states of North and South Dakota from the Territory of Dakota, in 1889. He was a member of the first three state legislatures of South Dakota, was state mine inspector and at the close of his incumbency of the latter office entered the employ of the Homestake Mining Co., remaining until his death as one of that company's valued employees. He leaves three daughters, residents of Lead, two of them married.

Donald M. Philbin, prominent railroad and mining man of Minnesota, died at his home in Duluth on Thursday, Aug. 6, after an illness lasting about a year. Until the first of this year he was the general manager of the Great Northern Ore properties, resigning to take a trip abroad in the hope that his health would improve. He returned to Duluth five weeks ago. He was born in Montreal, Canada, 56 years ago. At the age of 17 he entered the employ of the Chicago & Northwestern line as a clerk. In 1876 he was made assistant superintendent of the company's ore docks at Escanaba, remaining there 10 years. For three years he was in the West for the Northwestern, and in 1889 he went with the Duluth, South Shore & Atlantic as superintendent, with headquarters at Marquette. In 1893 Mr. Philbin went with the Duluth, Missabe & Northern as general manager, and in 1896 was appointed superintendent of the Duluth & Winnipeg. When that road was absorbed by the Great Northern he went with the latter company, holding several different offices. Three years ago he was placed in charge of the ore properties of the company in Minnesota, an important position. He was considered an expert in ore transportation, as well as a first-class mining man, and was well known throughout the middle west. Mrs. Philbin survives him.

INDUSTRIAL NEWS

The Ball Engine Co., Erie, Penn., recently let a contract for the construction of an addition, 150x203 ft., to be used for the erecting of the company's new line of steam shovels.

The Central Iron Works, Quincy, Ill., which makes a variety of foundry equipment, has recently developed a line of concrete mixers, which it intends to place on the market in the fall. The first machines will be power mixers, of 5 and 10 cu.ft. capacity, but these will probably be followed later by a hand mixer.

Orders for the following tube mills have been received recently by the Chalmers & Williams Co., Chicago Heights, Ill.: One 5x16-ft. mill for the Tonopah Extension Mining Co., at Tonopah, Nev.; one 5x22-ft. mill for the Cordova Mines, at Cordova, Ont.; and two 5x20-ft. mills for the St. John del Rey mine in Brazil. The two latter mills are to be made entirely of manganese steel.

Editorial Correspondence

SAN FRANCISCO—Aug. 6.

Government Suits Against the Southern Pacific and the subsidiary oil companies will not be dismissed in consequence of the recent decision in the Burke case in the U. S. supreme court. The technical ground upon which the suits will be further prosecuted, is that the maps made by Jerome Maddern, Southern Pacific land agent, were known to be false at the time they were made.

Suspension of Work on the Comstock Lode at the Consolidated Virginia, Ophir and Sierra Nevada mines in the north end was ordered by the several companies Aug. 3. The temporary closing of the mines is due to the effects of the European war on the stock exchanges. The San Francisco stock exchange is closed and will not reopen until the New York stock exchange reopens. The Mexican and Union mines will continue work, although the shutting down of the others may cause some change in the plans of the Mexican and Union. The Crown Point, Belcher and Yellow Jacket at Gold Hill, and the Overman and Caledonia are working. All the mines at Gold Hill are in fine shape, increasing extraction and shipping bullion. It is expected that the north end mines, now closed will reopen as soon as the financial situation clears. The Comstock Pumping Association has completed the concrete bulkhead and door in the north lateral of the Sutro tunnel, and has begun construction of a similar bulkhead and door connecting the Union and the Ophir on the 1600-ft. level. The pumping plans worked smoothly during the week.

Work of the Petroleum Department of the U. S. Bureau of Mines recently established with W. A. Williams, as chief, has been outlined. The application of the plan of work to the oil fields of California will prove beneficial. The plan contemplates four general features. The actual and comparative composition and other qualities of the various types of crude petroleum, a comparison of the petroleum in the United States with that of other countries, and the study of the methods and facilities of production, transportation, storage and refining of crude petroleum will prove very useful in California. The department will investigate technologic and economic conditions affecting not only petroleum, but natural gas. The prompt publication of data obtained in connection with these inquiries and investigations, together with such conclusions and recommendations as may be most useful to persons engaged in the development of the petroleum industry will bring the work of the department before the operators and investors and serve a useful purpose. The lack of prompt publicity regarding conditions in the California oil fields has been a great detriment to the industry, and though the State has increased its production each year, and has always had a surplus in recent years, there has been lack of opportunity for study and comparison of methods employed and suggestions of improvements that would have followed regular investigation and prompt publication of conditions and suggestions. The State Mining Bureau has issued several bulletins on the oil industry and these have been very useful, but the bureau has never been supplied with sufficient funds to make its work in this line of such value as the industry is entitled to. The Bureau of Mines will be assisted by the State Mining Bureau in the work to be undertaken, and the two will work in harmony to the advantage of each and to the benefit of the industry in general.

DENVER—Aug. 6

New Schedule of Prices for Tungsten Ores and concentrates has been announced in the Boulder County districts by the Wolf Tongue Mining Co., a prominent purchaser of these products. In general, this schedule means a 10% reduction from the prices that have prevailed for several months and which were printed in the "Journal" of Jan. 10, 1914. This cut is explained on the basis of over-supply in the Eastern steel manufacturing plants through curtailment in the market demand for tool steels and heat-resisting products.

Drainage of Downtown Mines at Leadville was finally assured by ex-Gov. Jesse F. McDonald a short time ago, when his newly organized company let contracts to the Colorado Power Co. for electrical service and to Sulzer Brothers Co., of Switzerland, for powerful centrifugal pumps to be installed in the Penrose shaft. In view of European conditions, the project is now doubtful. Should delay in delivery of the machinery prove indefinite, it is probable that the Swiss orders will be cancelled and some type of domestic pump be selected.

A Prospectors' Partnership Suit was settled recently in district court at Leadville. The suit was brought June 22 by Al. G. Borah against J. O. Kempf et al., owners of the Lady Belle mine, near Eagle. Decision was handed down Aug. 3, when Judge Charles Cavender rendered his opinion denying the plaintiff's claim to an undivided half interest. This case has been watched with interest among prospectors because it involved the contention of a tacit partnership such as occasionally prevails between prospectors. The opinion recites: "He (the plaintiff) asks the court to find that such a contract was made by reason of the fact that at several times during the period of four or five years they had been together for a day or two prospecting or examining properties owned by others. The court cannot make a contract between parties; it can only declare the contract found from evidence to have been entered into between the parties." Costs were charged to the plaintiff and the case dismissed.

BUTTE—Aug. 7

U. S. Commission on Industrial Relations came to Butte Aug. 6 to make inquiry into local conditions, and had as witnesses some representative men for the mining corporations, but failed to call anyone who could speak for labor and citizens in general. They had several Socialists and a noted personal-injury damage-suit lawyer. C. F. Kelley, managing director of the Anaconda company, was on the witness stand nearly the entire first day and gave the commissioners some interesting facts and suggestions that had not occurred to some of them before. Only four members of the commisison came to Butte. The others were otherwise engaged. Commissioner Austin B. Garretson could not understand why miners' wages in Butte were on a sliding scale, governed by the price of copper, and the dividends were not. Mr. Kelley said that in some years the dividends have been cut off entirely, but the wages of miners never. Mr. Garretson also thought the Anaconda company might sell its product if it cut its price, but Mr. Kelley explained that just then there was no market at all, and drafts for copper already delivered were coming back from Europe, and that not a pound of copper had been sold within 10 days. In 1913 the Anaconda company paid $2,000,000 more in wages than in 1912, the aggregate being higher but the individual wage lower, due to the difference in the price of copper. The Anaconda company introduced the "rustling card" system, about which the commissioners inquired, because 25% of the miners employed are "floaters," and through them a great deal of trouble is experienced because of their character and the fact that they work under many different names. The information required from the applicants for work is just such information as the government asks of the company. Mr. Kelley said underground mining conditions were better in Butte than anywhere else in the world; 1,000,000 cu.ft. of fresh air is pumped into the mines every minute, and the cost last year for this item alone was $275,000. He also observed that in no community is organized labor more consistently recognized than in Butte.

SALT LAKE CITY—Aug. 6

Tintic Mines Are Operating as Usual, with a small decrease in the working forces at one or two properties, or by reducing operations to one shift. At Park City, the Daly Judge, Silver King Coalition and the Silver King Consolidated have been operating, but may curtail the shipment of their high-grade silver-lead ores. The Utah Copper proposes to cut down its output. The Arthur mill will be closed, but outside of this, operations will be continued, and arrangements will be made to take care of employees as far as possible under the present market conditions. Those who remain with the company will be given employment half of the time. This will mean half of the regular output of 23,000 tons of ore per day. The Utah Consolidated at Bingham has laid off some men, and the Yampa, Bingham-New Haven and Ohio Copper are expected to reduce forces. Under normal conditions, between 4000 and 5000 men are employed at Bingham, 2500 in Tintic, 1000 in Park City and 1000 in smaller camps. The mills at Garfield and the four smelters in the valley and at Tooele bring the number of men employed in the mining and smelting industry of Utah to between 12,000 and 15,000.

Smelter Settlements on ores will be made in Salt Lake valley and vicinity, due to be paid for after July 31, by a provisional arrangement going into effect Aug. 7. The following basis is proposed: Gold will be paid for as usual. Silver will be paid for at the rate of 25c. per oz. until further notice, and the smelters will give the shippers their pro rata proportion of the first sales of silver, made at the prices then obtaining, in final settlement for the shipment on which the advance of 25c. per oz. has been made, or on some other equitable basis, as may be agreed upon between the shippers and the smelters. Advances on copper will be made at the rate of 10c. per lb., the final settlement to be made when market conditions right themselves, adjustment to be made to each shipper on the actual sales prices, giving him his pro rata proportion of all sales up to the total amount of copper against which advance at the rate of 10c. per lb. has been made, or on some other fair and equitable basis or agreement as above. At present no change will be made in arriving at the price to be paid for lead. For the last six months 8 to 10% of the lead production of the United States has been exported. This is now impossible, and even if domestic business were not affected by the war in Europe, there would be an excess production. It is suggested that it might be advisable for the large shippers of lead to consider curtailing their output. It is impossible for the smelters to indicate when quotations will be available on silver and copper, but shippers are advised to get in touch with their respective smelters to learn more in detail in regard to this matter, or to make special arrangements in particular cases as to settlements. The proposed settlement plan as outlined by the smelters may relieve to some extent the closing down of various mines; briefly, it means that silver and copper will be settled for with the difference paid as soon as quotations are made in New York.

CALUMET—Aug. 8

Calumet & Hecla Has Stopped All Construction Work with the exception of the work on the hydraulic dredge which is to be used on the tailings piles. This work will be completed within the next three weeks, when the dredge will probably be tried out, but will not go into commission. This company will continue with the erection of the stamp mill at the White Pine property. All other construction work at the subsidiary companies has been stopped. The large work under way was the completion of the addition to the Ahmeek mill, the building of a rock house at No. 3 Osceola mine, excavating for the leaching plant at the Calumet & Hecla, and finishing up the No. 2 regrinding plant with its equipment for the working of the tailings piles. The Tamarack had started excavating for a regrinding plant at the stamp mills. The men employed at this work have been laid off indefinitely, as well as a number in the various shops where new work was being handled. Men have been laid off from the underground force. The conditions in the copper country threaten to be worse than they have been for many years, if not for the entire history of the district.

HOUGHTON—Aug. 13

Suspension at the Winona is most unfortunate, coming just at a time when the large rock tonnage made it seem possible that Winona would solve the problem of making ends meet and when concentrating experiments were being conducted with a view of securing better copper extraction. The Winona will continue its experiments with leaching processes during the suspension of mining operations. Manager Seeber regretted the necessity for suspension at this time because he believed that he had the most capable and efficient underground working force that the Winona ever had been able to secure. Furthermore, all of the underground openings at the mine were in good-looking rock, quite the equal of the best average of any of the shafts at any time in the history of the property.

Effect of the European War, while less damaging, perhaps, on the Lake Superior copper region than upon other copper-producing districts, will be to put many copper mines of this region out of business. Managers of mines here are hoping for the best, but fearing orders for suspension or curtailment or wage reduction at any time. At this writing the effect has not been serious, less than 1000 men having been laid off because of the war. The Hancock mine, employing 200, suspended. This mine operated on borrowed capital, pending the sale of its product. With no market for copper, further financing was out of the question. Winona likewise shut down, laying off 450 men. At the Ahmeek, Isle Royale, Osceola, La Salle and other Calumet & Hecla subsidiaries, all exploration and construction work has been suspended for the time being, but there are as yet no curtailment orders, and production of copper will be maintained as long as the companies can finance the payrolls. The lumbering interests will take care of a good many of the men thrown out of employment. Mines that contemplated increasing their working forces and adding to their production have suspended such plans for the time being.

MARQUETTE—Aug. 8

No Hope of Improvement in Iron Trade during the closing months of the season of navigation is entertained by the average Lake Superior operator. It was expected that with the decision in the Eastern freight rate cases announced by the Interstate Commerce Commission, the industry would benefit, in common with others, but no sooner had the uncertainty confronting the railroads been removed than there arose the European war, a result of which has been the stoppage of American exports of steel. The ore shipments from the Lake Superior region to date aggregate only 60% of the amount forwarded in 1913, approximating on Aug. 1, 14,500,000 gross tons, as against 23,000,000 a year ago. The operators will be satisfied if only this ratio will be maintained the rest of the season.

LEAD—Aug. 8

U. S. Commission on Industrial Relations was in Lead last week, taking testimony. Supt. T. J. Grier, of the Homestake, was on the stand several hours, answering questions regarding conditions of labor, attitude of company toward unionism, politics, etc., card system, employment office and numerous benefices of company. Bishop Joseph F. Busch, of the Roman Catholic church, on the stand told of his endeavor to have company make Sunday a compulsory day of rest. Supt. Grier later stated men did not desire to lay off; that all who wished to do so were given privilege by shift bosses. Some petty grievances were aired by individuals. In closing hearing, Prof. Commons, acting head of commission, highly praised Supt. Grier and Homestake management for work done for employees. He believed conditions of laboring men in this mine to be better than at any mine commission had yet visited. He praised recreation hall, free hospital, employees' aid fund, hours of labor and efforts of company to maintain cost of living at low figure. He stated that he was pleased with practically everything except lack of compulsory Sunday observance, and gave his hearers impression that he would recommend Congress to pass laws compelling it. He also referred to control of city of Lead by Homestake company as a "benevolent despotism."

SILVER CITY—Aug. 10

The El Paso Smelter has a large quantity of ore in bins awaiting treatment and it is understood that it will not close down. However, it is believed it will be forced to slightly curtail operations until there is a turning point in the European situation and a rise in the price of copper.

Chino Production Has Been Reduced by half. The entire night shift of eight shovels has been discharged and the operation of the concentrator at Hurley reduced to five days, being idle Saturday and Sunday. The number of men laid off at Santa Rita will not exceed 500 out of a total of 1500 employees. It is reported that the company took into consideration efficiency and seniority of service, also the fact of employees having families in making discharges. Situation has been brought about by the general demoralization of the copper market developing from the European crisis. It is the opinion of men in charge of Chino Copper Co. operations that these conditions will not last over three months, when the usual capacity of the company will be resumed. The Burro Mountain Copper Co., subsidiary of Phelps, Dodge & Co., operating in the Burro Mountains, has laid off all mill-construction-work employees. The company, however, has not curtailed mine development. Reports come from Mogollon that forces in the gold and silver mines have been lessened owing to the stringent money market.

TORONTO—Aug. 8

Effect of the War on Silver Mining at Cobalt has been seriously felt, due to the decline in the price of silver. The last settlement made by the smelters for the month of July was on a basis of 52½c. per oz., being 7c. lower than the average for 1913, and since then the American Smelting & Refining Co. has notified producers that owing to market uncertainties it will advance only 25c. per oz. on silver, and settle by arbitration later when conditions have become stable. As a consequence, some mines which have been operating on a narrow margin will close down until the market becomes normal again. Among the mines which have already shut down are the Beaver and the Timiskaming.

The Mining News

ARIZONA

Cochise County

COPPER QUEEN (Douglas)—A reduction of 10% in wages of 2000 men employed by Copper Queen and Calumet & Arizona smelteries was put into effect last week; 500 men were laid off. Similar reductions in the Bisbee mines of the two companies were made.

Gila County

MIAMI COPPER CO. (Miami)—Wages have been reduced 10% in the case of the men who continue to work full time. However, a large part of the force is now engaged only part time in view of the company's curtailment of production.

Pinal County

RAY CONSOLIDATED (Ray)—As a result of conditions caused by European war, mines have reduced working forces to half time; 2000 men are affected.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Thirty stamps are now dropping. Mine is looking better than for some time. Work will be resumed on 700-ft. level.

PLYMOUTH CONSOLIDATED (Plymouth)—New 30-stamp mill and Hardinge mills were in commission July 30. Mine was developed by California Exploration, and has now been turned over to the London Consolidated Gold Mines. Mine is an old one, a large producer in early days, but had been idle for 24 years before present operators took it over.

Butte County

PENNSYLVANIA DREDGING CO. (Oroville)—Purchase of 40 acres of prune orchard on Feather River near Oroville is reported. Land on all sides of this 40 acres has been dredged.

FORBESTOWN CONSOLIDATED GOLD MINES (Forbestown)—It is reported that negotiation for sale of property to Minissing Mining Co. of Canada, has been practically completed. It is understood that company will develop mines on a large scale. Scarcity of water for power has interrupted operation of 20-stamp mill but development has progressed. Shoots of good ore have been recently developed by crosscuts.

Calaveras County

MELONES (Melones)—Leaching plant is being installed to treat tailing from 100-stamp mill.

CALAVERAS COPPER CO. (Copperopolis)—Reopening of mine is delayed it is reported by lack of funds, but mine water is being treated for copper.

ARGONAUT (Jackson)—A good orebody has been disclosed on 4050-ft. level, showing same width and grade as in upper level. The 40-stamp mill is running full capacity. Preparations are being made for removal of mill and probably addition of 10 stamps.

Eldorado County

PACIFIC (Placerville)—Diamond drilling is in progress at lower stations. Old shaft had been deepened to 2000-ft. Diamond drilling had been done previously, but results have not been made public.

Inyo County

TECOPA—This property owned by Graves lead interests of Philadelphia, is shipping 50 tons of ore per day over Tonopah & Tidewater R. R.

CERRO GORDO (Bishop)—Financial affairs and litigation are said to have been satisfactorily settled. Mine is in good working order. Regular shipments of 15 tons per day of high-grade gold-silver-copper-lead ore are being made.

WILSHIRE BISHOP CREEK (Bishop)—Arrival of tube mill completes shipments of machinery for new plant. Mine is now clear for inspection. Development of orebody is in progress. Recent careful sampling showed minimum low-grade ore at $3.60 and minimum high-grade at $24.60 per ton.

Modoc County

HESS (Canby)—A 12-hp. engine, pump and 1200 ft. of pipe are being installed. Development has disclosed ore in west shaft.

Nevada County

HENKS (Nevada City)—This property in Secret Cañon, including Bull Moose placers and Squires claims are reported to have been leased to Western States Mining & Development Co.

GOODWIN (You Bet)—Anti-Débris Association has secured an injunction in superior court of Sutter County to restrain dumping of hydraulic tailing in Yuba River. Mine was recently reopened and said to be especially equipped to avoid damage to water of river, but association claims that damage is being done.

Placer County

NEW YORK MINING CO. (Auburn)—Preparations are being made for developing Trinidad mine on north fork of American River. New water flume is being built.

DAIRY FARM (Sheridan)—Narrow-gage railroad will be built between Sheridan and the mine seven miles, for transportation of materials and hauling out ore to Southern Pacific R. R. for shipment. Mine, which has been a producer of both gold and copper, has been taken over and is under development by Guggenheim interests.

Shasta County

MILKMAID (French Gulch)—Lower levels will be explored with diamond drill. Results will determine whether or not shaft will be deepened.

MIDAS (Harrison Gulch)—First payment is reported to have been made by Victor Power & Development Co. on purchase price of mine, purchaser to take over property Aug. 1.

Trinity County

DEMOCRAT (Weaverville)—A 60-ton crushing plant and other machinery is contemplated by owner E. E. Harrigan.

COLORADO

Boulder County

BLACK CLOUD (Boulder)—Local men are remodeling plant with view to doing custom milling. Seaman & Girard are in charge of work.

WHITE HAVEN (Ward)—Since L. A. Ewing secured this mine in March, 1913, he has shipped 1875 tons of ore. Present production is three carloads per week. Ore contains silver and lead.

YELLOW PINE (Crisman)—Trio Mining Co., successor to late George R. Williamson, owner, struck lens of ore above 8th level, 1000 lb. of which ran over 300 oz. silver per ton. Shipments of good grade continue. Property is credited with total production of $750,000 and an output, so far this year, of $100,000.

CARIBOU (Caribou and Cardinal)—Norton H. Brown, superintendent for new company is directing reconstruction of old mill at Caribou, and is unwatering Caribou and Poorman shafts. No Name shaft will be used as mouth of mine for proposed new operations. Company is also retimbering long Boulder County tunnel and fixing up Cardinal mill at its portal. Electric power will be used throughout.

Clear Creek County

ONEIDA-STAG MINING & MILLING CO. (Freeland)—Two companies, the Oneida and Old Stag, have consolidated. Properties are near the Lamartine mine and are credited with a production of $40,000. New 50-ton mill will be erected to treat ore by continuous decantation.

HUBERT (Black Hawk)—Stroehle concentrator treated lot of ore from this mine, recovering first-class concentrates assaying 60% lead, 30 oz. silver and nearly 3 oz. gold. Second-class concentrates ran over 1 oz. gold. Same mill has recently treated shipments from Homer, Bonanza, Senator and Argo mines.

Gunnison County

LEXINGTON MINES CO. (Crested Butte)—Company was recently incorporated to operate Hope group in Italian Mountain district.

MONTE CRISTO (Crested Butte)—C. C. Bruner, manager, is preparing to install mechanical equipment to handle placer heretofore washed by primitive methods.

Lake County

WALKER TUNNEL (Leadville)—Compresser has been installed and electric transmission line is nearly completed. This bore is being driven into Mosquito range at eastern margin of Leadville district to intercept a known mineralized fault. A large, low-grade orebody is anticipated.

TENDERFOOT (Leadville)—Some weeks ago a serious cave-in occurred along a drift leading to principal stopes. As ground is treacherous and caves through to surface, it was deemed necessary to drive a long curving drift around the bad ground. This is nearly finished and shipping will soon be resumed. The ore is high-grade lead. Same shoot extends into Antelope property where J. B. Stewart is driving to reach it.

YAK TUNNEL (Leadville)—John Moyle, foreman, was killed by a blast after all miners had left Silver Cord mine July 31. He entered a stope to post instructions for next shift regarding placing of timbers. When he did not come from tunnel in due time, some of his men began a search and found him badly injured and covered with ore. A delayed round of shots had caught him just as he entered. He was taken first to a local hospital, then to a Denver hospital where he died next day without regaining consciousness.

San Juan County

SLIDE (Silverton)—Contractors driving new crosscut adit into this group on Stony Pass reached Slide vein 700 ft. below its outcrop and found it 6 ft. thick.

SILVER LEDGE (Silverton)—Lessee Louis Bonavedi who, some time ago, constructed a cement wing-dam to divert a creek from seeping into his workings, now has unwatered to fourth level and, while continuing this work, will begin mining in upper levels.

San Miguel County

TOMBOY (Telluride)—Building of new cyanide mill is proceeding since delivery of lumber, and management expects plant will be completed in time for winter operation.

SUFFOLK MILL (Ophir)—Reinohl cyanide mill is completed and has been tried commercially. Equipment includes crusher, stamps, plates, tube mill and agitators; capacity is 70 tons.

IDAHO

Bonner County

BONNER MINING CO.—Contracts for 200 ft. of development on Marguerite property on Trestle Creek, two miles from Pend Oreille Lake, in northern Idaho, have been let. Considerable work has been done on the claim and gold-silver ore has been opened in upper workings, according to Chester C. Robbins, secretary-treasurer, and work will be an extension of a lower tunnel, which should open oreshoot at a depth of 500 or 600 ft., when company expects to commence shipping ore to smelter. Present work will be done with machine drills, with current furnished from power plant owned by Black Bear Mining Co., a short distance from the Marguerite. Bonner Mining Co., owning Marguerite and other valuable claims, is a reorganization of old Marguerite Gold Mining & Milling Co. The stock is assessable and four assessments a year will be made to continue development. Idaho Power & Construction Co. has under construction a power plant on Trestle Creek, 1½ miles below mine, with view of furnishing it and other properties in that district with electric power for development and milling purposes.

Coeur d'Alene District

CALEDONIA (Kellogg)—At a recent meeting, directors decided to carry but a comparatively small amount in treasury and to disburse remainder of earnings in monthly dividends of 1 to 1½c. per share, and that if nothing unforeseen arises, payments will be begun in 60 days. Earnings in July, when 700 tons of concentrates were shipped, were 1½c. per share on entire outstanding capitalization of 2,600,000 shares. One unit of Bunker Hill & Sullivan mill that has been set aside for treatment of Caledonia ores has a capacity of 300 tons, but has been working but one shift to date. When operating at full capacity it will handle three times amount of ore being put through it now. All workings connecting Caledonia with lower main tunnel of Bunker Hill & Sullivan have been completed, and Caledonia company contemplates operating at capacity as soon as possible.

IDORA HILL (Wallace)—Operations were resumed July 30 at mine on Sunset peak, which has been closed down since Apr. 10. For present but a small force will be employed, and later it will be increased. Just before property was shut down, an 80-ft. stope was opened in No. 2 level. Ore is high grade, and engineers who have examined mine, report that there is between $8000 and $10,000 worth of ore ready for immediate extraction. This will be shipped at once and profits applied on company's outstanding indebtedness. Last assessment levied, 1c. per share, is being paid into treasury rapidly, and there is no doubt that funds on hand will be sufficient to retire $13,000 second mortgage, due in September. Affairs of company are being slowly straightened out, arrangements having been made that are satisfactory to all claimants, except a few who have small labor liens and are endeavoring to mulct heavy penalties.

Shoshone County

MONTANA-IDAHO (Adair)—This company, owning a group of eight claims near Adair station, on Chicago, Milwaukee & St. Paul R.R., in northern Idaho, has been perfected and the following officers and directors elected: H. F. DeBowers, Chicago, president; W. J. Kirby, Spokane, vice-president; John L. Dirks, Spokane, secretary-treasurer, and Otis Hall, Spokane, formerly president of the Monitor Consolidated Copper Mining Co., general manager. Company was organized to purchase and develop group above mentioned and Monitor Consolidated copper mine, which it owns, to furnish an outlet to railroad for ores of adjoining properties, among which may be mentioned Richmond, St. Lawrence, Copper Age & Edison and Wampum. It is proposed to drive a 7500-ft. tunnel to and under 700-ft. shaft on Monitor.

MICHIGAN

Iron

BAKER (Iron River)—This property has been closed, management deciding not to mine any more ore until market improves.

MILLIE (Iron Mountain)—Dessau Mining Co. has closed this mine and all hands have been discharged. Property has been active but a few months and a small force was employed. Company's lease expires within a few years and it was believed that operations would continue until that time, but trouble was experienced in selling product.

OLIVER IRON MINING CO. (Ishpeming)—This company has started to pay its employees with scrip on Marquette range, and it is thought that same policy will be adopted other places where mines are being worked. It is believed that money is going to be tight and officials deem it advisable to take precautionary measures. Miners do not object, as they know that scrip issued by Steel Corporation is good, and no comment is heard. The last time that scrip was seen on iron ranges was in 1907.

CLEVELAND-CLIFFS IRON CO. (Ishpeming)—This company is now shipping in a satisfactory manner from most of its properties, and a number of big stockpiles will be cleaned up by fall. However, there are some places where it is moving little ore and arrangements are now being made for more stocking room. A large part of ore in stock at Ishpeming will go forward, but there are several large piles in Gwinn district and at Negaunee. Shipments from Marquette during July were close to 300,000 tons, most of which was sent out by Cleveland company. A total of 1,500,000 tons will be shipped by this concern during season.

MINNESOTA

Duluth

MINNESOTA STEEL CO. All construction work has been discontinued and approximately 600 men have been laid off.

Cuyuna Range

COMPARATIVE VALUATIONS OF CUYUNA PROPERTIES—As to comparative valuations, in eyes of tax assessor, of different Cuyuna range mines, following valuations for current year's taxes have been fixed, subject to change by state tax commission: Rowe mine (pit), $3,000,000; Armour No. 2 (underground), $1,000,000; Thompson (pit), $1,000,000; Iron Mountain (underground), $25,000; Duluth-Brainerd (underground), $15,000; Kennedy (underground), $200,000; Wilcox (underground), $200,000. All ore in stockpile was valued at 75c. per ton.

SEVILLE (Virginia)—Will begin shipments from stock pile Aug. 3. Property will ship but 8000 tons this season.

KENNEDY (Cuyuna)—Has started shipping from its 90,000-ton stockpile at rate of 2500 tons daily. Also shipping its daily product of 500 to 600 tons.

ARTHUR IRON MINING CO.—Leasing of another 160 tract in Sec. 11, 57-21, by this company to Tod-Stambaugh company indicates policy of Great Northern Ore Securities Co. in regard to its Mesabi range iron ore properties, this being second lease given within last month. New property adjoins Morton mine of Tod-Stambaugh Co., and it is stated that property will be mined through that shaft.

BRAINERD-CUYUNA (Brainerd)—Considerable difficulty is being experienced in getting down second shaft, due to sand and water troubles. It was planned to drive sheet piling through quicksand strata to ledge from inside the lath shaft, but this has been unsuccessful, and operations are now at a standstill until other methods can be devised. First shaft, also a lath shaft, was temporarily abandoned because of sand and water boils.

ROWE (Riverton)—County board of equalization recently placed a valuation, for taxation purposes, of $3,000,000 on this property, being highest valuation on any mining property on Cuyuna range. Deposit is variously estimated from 25,000,000 to 100,000,000 tons, latter figure being that given by operators themselves. Shipments are going forward to dock daily, but output is leaner than it will be later on, when better grade portion of deposit is reached. Hydraulic stripping apparatus continues at work enlarging pit.

BARROWS MINING CO. (Barrows)—Company just organized, $250,000 capital, shares par $1, for purpose of exploring property in Sec. 16, 44-31, controlled by Northern Pacific interests. Property is near town of Barrows. It is planned to sink a three-compartment concrete shaft, under direction of C. B. Rowley, who has recently patented a number of improvements especially adaptable to shaft sinking under Cuyuna range conditions. Directorate of new company is practically same organization that has developed Cuyuna Iron & Manganese Ore Co. property, adjoining Pennington pit, on which property Jones & Laughlin now have drills checking up tonnage.

Mesabi Range

MESABI RANGE INJUNCTION SUITS—At both Mountain Iron and Buhl, Minn., where mining companies have enjoined village officials for alleged extravagance, efforts are being made to compromise matters. At Buhl, proposed tax levy has been reduced for 1915 by $40,000, and at Mountain Iron 200 men previously employed on concrete street work have been shifted to other work.

MONTANA

Silver Bow County

BUTTE & SUPERIOR (Butte)—During July, zinc tenor of concentrates, produced at company's mill, reached 55%. In first quarter of 1914, in spite of low price of spelter, company's earnings were nearly twice as large as in first six months of 1913.

CHICAGO, MILWAUKEE & ST. PAUL RY.—C. A. Goodnow, assistant to President H. B. Earling, of the company, announced, July 31, that contemplated work on electrification of road will be stopped for an indefinite period. No work has been done for past few weeks. It was stopped when railroad company refused to treat with labor organizations made up of men not actually in employ of company. Result was a strike. Electrical workers made demand for an 8-hr. day at $5. Controversy centered on right of electrical workers to set poles for transmission lines.

SALE OF PARROT MINING CO.'S PROPERTY—Judge Bourquin, in Federal court, July 31, ordered decree to be entered to effect that sale of Parrot company's property to Anaconda company, which took place in 1910, was valid and legal. Suit to have sale set aside and for an accounting was brought against Anaconda company by W. E. Wall and others as minority stockholders of Parrot company. Plaintiffs alleged that in 1899, A. C. Burrage, William Rockefeller, H. P. Rogers and 15 others purchased controlling interest in Parrot stock and thereafter conspired to dispel assets, acquiring them at less than their real value and finally selling them to Anaconda company. Decision says that two-thirds of Parrot stockholders consented to sale, that plaintiffs had secured an appraisal of Parrot property in court, that no fraud was shown, and that Parrot company probably got a better price from Anaconda company than it could have gotten from any other purchaser.

BUTTE MINES AND GREAT FALLS SMELTER CLOSED DOWN Aug. 1, according to announcement by Anaconda Copper Mining Co. that Great Falls smelter, reduction and refining plant and seven of company's Butte mines would close down immediately to curtain present production, made necessary by demoralization of export trade to Europe. In selecting mines to be closed those were chosen where production costs averaged highest, viz.: Mountain Consolidated, Pennsylvania, High Ore, Badger State, Poulin, Tropic and Ella. Shutdown will result in laying off of 2000 miners in Butte and 700 smelter men in Great Falls. Daily output of closed mines was 3000 tons of ore, corresponding to amount of ore shipped daily to Great Falls. Washoe smelter at Anaconda will continue to handle usual amount of Butte ore, approximately 11,000 tons per day, and all other Butte mines of Anaconda company will be kept going unless future developments in political and industrial conditions make further curtailment necessary. C. F. Kelley, of Anaconda company, states that shutdown of company's mines has no reference to local conditions. Butte & Superior, North Butte, East Butte and other smaller independent companies in Butte camp will continue operations and maintain normal output for the time being. Opinion prevails that larger companies, such as Amalgamated, Phelps-Dodge and others, would reduce copper output sufficiently to take care of decreased demand. News of shutdown was received with tranquility in Butte. It is generally believed that trouble in Europe could not last many weeks because of tremendous cost of a war between nations involved.

NEVADA

Elko County

ELKO PRINCE (Gold Circle)—Option held by Goldfield Consolidated has been relinquished after thorough examination.

Esmeralda County

JUMBO EXTENSION (Goldfield)—During July, 2550 tons of ore was milled at Goldfield Consolidated plant and four cars shipped to Miller's plant of Western Ore Purchasing Co. Ore is being stoped above 921-ft. level in Velvet claim, and southeast crosscut on 1017-ft. level is being driven in shipping-grade ore.

SILVER PICK (Goldfield)—Winze is being sunk from 500-ft. level on 2-ft. shoot of good-grade ore; other development work is being done on this level. North drift toward Red Ton property of Goldfield Consolidated, is being driven on 3-ft. shoot of ore assaying $5 to $7. Total of 352 ft. of development work was done in July.

Lincoln County

AMALGAMATED PIOCHE (Pioche)—Increased volume of water is entering workings. Water in Black Ledge winze has been lowered 3 ft. Pumps at No. 4 shaft have been giving some trouble.

Lyon County

MONTANA-YERINGTON (Yerington)—Option has been granted on this property which was recently relinquished by Mason Valley Mines Co., and work will commence at once.

Mineral County

ROCKLAND MINE (Rockland)—Installation of new mill is under way. Power line of Truckee River General Electric Co. is being extended from Pine Grove.

Nye County

MINE RESCUE AND FIRST AID TO TONOPAH is being taught by Government rescue crew. Six teams have been organized and drilled. A team will be drilled in Round Mountain; car will then go to Blair.

TONOPAH MIDWAY (Tonopah)—Work through No. 1 shaft will be discontinued and property will be developed through new main working shaft.

HASBROOK (Tonopah)—This mine, south of Tonopah, is shipping ore to McNamara mill. Development work is progressing with satisfactory results. A 10-stamp mill may be built.

MANHATTAN CONSOLIDATED (Manhattan)—Mill is being overhauled and will be ready for operation Aug. 1. Ores from Consolidated company, Consolidated Leasing Co., and White Caps lease will be treated. Water supply will be obtained from Earl workings of Consolidated company and White Caps. A large tonnage of low-grade ore has been developed.

Storey County

UNION CONSOLIDATED (Virginia City)—Triplex, electric pump has been installed underground, preparatory to commencing work on 2650-ft. level.

Washoe County

ARKELL (Reno)—Good-grade lead-zinc ore is being opened in development work. Shipments have been made. A mill may be built, it is stated.

White Pine County

WILLOW CREEK GOLD MINING CO. (Ely)—Drifting on main vein and sinking below tunnel level are under way. Both faces are in good-grade ores.

WIDE WEST (Cherry Creek)—Right to work through tunnel of North Mountain Mining Co. has been obtained and tunnel will be driven into Wide West ground. North Mountain mine will be put in condition to operate, by Wide West Co., which is part of agreement.

NEW MEXICO

Grant County

NOVEMBER MINING & MILLING CO. (Granite Gap)—Tram is being built from upper workings to ore bins at No. 3 workings. Crushing plant is under consideration. Five exploration drills are in operation.

C. & O. MINING & MILLING CO. (Pinos Altos)—Company continues to mine bankable ore from Langstone mine, Pacific vein. Over $60,000 now deposited in Silver City American National Bank. Ore is richest in gold ever mined in Southwest in recent years.

Sierra County

SILVER MONUMENT MINE (Chloride)—Property has closed down indefinitely.

Taos County

CARIBEL (Red River)—Underground development is being hastened. Experimental cyanide treatment is being done.

ANACONDA (Red River)—Orwig & Farris are experimenting with leaching process for treatment of low-grade carbonate-copper ore.

OREGON

Baker County

AZURITE—(Homestead)—Company is considering building a mill for this mine on Snake River.

CAÑON MOUNTAIN—Mine, which has been closed for some time, is to be reopened, and men are retimbering main tunnel.

LAST CHANCE—(Sumpter)—A 20-stamp mill has been purchased and is now being installed. Other improvements are contemplated.

MOON ANCHOR—This property in the Cable Cove district has been purchased by Anthony Mohr and others of Portland. It is intention of new owners to increase scale of operations.

SOUTH DAKOTA

Lawrence County

CUSTER PEAK (Roubaix)—Reported this company will resume development of its copper property.

JUNGLE (Roubaix)—Work of erecting copper leaching plant is progressing. Portion of machinery has been secured second hand, in this district.

ORO HONDO (Lead)—Shaft has been deepened 100 ft. since J. T. Milliken authorized work commenced. This makes shaft 1150 ft. Three shifts of miners, using jackhammer drills, are employed.

HEIDELBERG (Two Bit)—Announced that state securities commission, which enforces South Dakota's "blue sky" law, has authorized company to sell to public block of treasury stock for development purposes. Proposed to sink shaft to quartzite, following ore. Planned to raise to surface, about 100 ft., from incline tunnel. Steam machinery will be used.

HOMESTAKE (Lead)—Recreation Hall gradually is being opened to public as various departments are completed. Swimming pool, billiard rooms and Hearst library have been opened. Other features will be opened as soon as finished. Building, with equipment, including large theatre, cost over $250,000, and is gift of company to employees. Courtesies of building are extended to all residents of Lead, Deadwood and other towns.

CANADA

Ontario

NORTH THOMPSON (Timmins)—Satisfactory results have been obtained by diamond drilling. A surface vein has been cut at 200 ft. indicating good milling ore over a width of 16 feet.

VIPOND (Schumacher)—Underground development has been resumed at this mine, which has been closed down for nearly two years. Mill is expected to be in running order in September.

COBALT LAKE—(Cobalt)—At a meeting held in Toronto on Aug. 5, shareholders formally adopted resolutions passed by directors for winding up of the company involving distribution among shareholders of 750,000 shares of Mining Corporation of Canada, the English company with which the Cobalt Lake has been merged.

LA ROSE (Cobalt)—Company has taken an option on Kensy claims in Boston township. This is first outside property La Rose has shown any disposition to acquire. Surface showing is small but grade of ore reported satisfactory. Financial statement sent out with June dividend shows that surplus has been reduced to $1,359,920 from $1,528,776, at which figure it stood Dec. 31, 1913.

HOLLINGER (Timmins)—The 20-stamp addition to mill has been completed. Next month foundations will be laid for the 20 stamps to be reserved for ore from the Acme gold mine, which has already enough ore blocked out to keep it going for some time. The main vein of the Hollinger has been cut at the 675-ft. level, where it is 12 ft. wide and carries usual grade of ore. No. 41 vein has been picked up on the 200 ft. level.

MEXICO

Sonora

MINNEAPOLIS COPPER CO (Cumpas)—J. W. Christy who hase been in charge of affairs of company since former manager retired has shipped six cars of ore to Douglas smelteries. Christy has put different departments on a strictly business basis and as a result property is being developed, back bills are being paid off and future outlook is better than it has been for many years.

GREENE-CANANEA (Cananea)—Furnaces are again running normally and camp would be as quiet as ever if it were not for the fire which was started by some dissatisfied strikers in the Oversight and Veta Grande mines. Both are now reported to be under control without having bulkheaded the shaft. Fourteen of the ringleaders were recently deported and sent to Naco and on being refused admission to the United States were sent to Agua Prieta where they were photographed and their pictures sent to the different camps so that if they were in the camps they could be watched.

NACOZARI CONSOLIDATED COPPER CO (Nacozari)—New mill is making a much better saving than was expected and production is increasing. At present mill is making 8 tons of lead concentrates and 6 tons of zinc concentrates per day. Tables are being added as gray copper in ore has been sliming and a large part of it has been lost. Company has secured leases on several other properties close by and will start to work on them at once and mill ore from these mines as until now this ore could not be handled as it was too low a grade to ship and there is no other custom mill in the district.

PERU

CACHI-CACHI—These placer gold mines, not far from the Aporoma mines, in the Province of Sandia, Department of Puno, at an elevation of 5000 ft., are planning to begin operations and it is stated that a majority of the stock has been subscribed in Chile and the United States. It is proposed to organize the company with a nominal capital of $250,000 U. S. currency, under Delaware charter. All the equipment and supplies will be shipped from points of purchase to Tirapata station of the Peruvian Southern Rys. From there such supplies and equipment as conform to the limitations of llama transportation will be so shipped, and the rest will be shipped in on mules, except a few pieces too heavy for mules, which will be carried to Ancocala by wagon and then carried by Indians to Cachi-Cachi

CHILE

CHILE EXPLORATION CO. (Chuquicamata)—Production will not be delayed by European war; what little machinery—principally for power plant—not yet arrived from Europe has been reordered in U. S., and no delay is expected. Reorders of machinery placed before war was declared

The Market Report

METAL MARKETS

NEW YORK—Aug. 12

A daily trade paper, which is identified with a metal brokerage firm, finds fault with us for suspending our quotations of the copper market, ignoring our very plain statement regarding it; and also ignoring its own remarks, on Aug. 3-5, which were in harmony with the statements of the agencies that there was no market at that time. The precisely similar situation in silver was also ignored. A reprinting of the previously published remarks of this paper, it they were worth the space, would show the maliciousness of its subsequent criticism, just as a comparison of its quotations in the past with the average of the sales effected by the producers would show how ridiculous they often are. We do not quote the markets on the basis of carload business or of the relatively small transactions among speculators but we record on the basis that the great bulk of our copper output goes into consumption, which business is done directly by the producers and selling agencies, without the intermediary assistance of speculators and brokers.

Copper, Tin, Lead and Zinc

Copper—In the early part of our review week, one producer sold 500,000 lb. of electrolytic copper to a consumer at 12½c., delivered, usual terms; another sold 500,000 lb. at 12⅜c., delivered, usual terms; another sold 300,000 lb. of a special brand at 12⅝c., delivered, usual terms; other producers and agencies report no sales at all during the week. The daily papers have been quoting copper all the way from 12¼ to 12¾c. The fact is that wire drawers, rollers and brassmakers at present are inert in the market. Those needing copper can obtain it at prices somewhere within the range mentioned, but producers cannot find customers for what they would naturally want to sell, and pending readjustment from the paralysis there is no market, properly speaking, and consequently we do not quote. The situation in silver is exactly the same.

Smelters and refiners who have heretofore been settling for receipts of copper on quotations are making advances upon consignments with the understanding that final adjustment of accounts is to be made when there is once more a market; and intend so to continue until further notice. In the meanwhile, shippers have been urged to curtail their production as much as possible, and in conformity with the steps that have been taken by other producers. Smelters buying ore from Colorado, Utah and elsewhere are for the time being, or until further notice, advancing 10c. per lb. on copper and 25c. per oz. on silver, final adjustments to be made when there is a market; in other words, when the metals can be freely sold.

Base price of copper sheets is now 18½c. per lb. for hot rolled and 19½c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14¼@14½c. per lb., carload lots at mill.

Copper production of the Phelps-Dodge companies in July was: Copper Queen, including custom ores, 7,817,318 lb.; Detroit, 1,966,526 lb.; Moctezuma (Mexico), 2,866,527; total, 12,750,371 lb. blister copper.

Tin—Sales of small quantities are made at fancy prices, but there is no wholesale market for the reason that there is no wholesale supply.

Lead—A scattering business in moderate tonnages was reported right through the week. There was considerable confusion respecting prices reported, and on the face of things this market looks rather paradoxical. The explanation is that there is a wide difference of opinion among sellers. At the close of last week there was some emphatic pressure to sell. During the week of Aug. 6-12, some sellers were anxious to dispose of their supplies and were willing to accept relatively low prices, being of the opinion that the outlook for this metal is not good. Other sellers thought that the trouble in the silver market would cause a curtailment of the lead output in Idaho and Utah and have consequently been stiffer in their position. Exponents of both views made sales, what buyers had to pay being governed apparently by the extent of the "shopping" that they did or did not do.

Spelter—A large business has been done at steadily advancing prices, the governing condition being the anticipation that England will shortly have to buy large quantities of American spelter. At the close of the week there were rumors, which we were unable to confirm, that sales for export had actually been made. However, it was certain that producers and agencies here had been in receipt of inquiries from abroad, and export sales will probably happen shortly if they have not already been made. The market advanced from day to day, but especially on Aug. 11, when there was a sharp rise from the opening to the close of business. Sales of a large tonnage on that day, divided among numerous transactions, as reported to us, averaged about 5.15c., basis, St. Louis. At the close of the day 5.25c. was realized, at which price there were sellers on Aug. 12 at St. Louis.

Other Metals

Aluminum—Very little new business is reported. Transactions in imported metal are at a standstill. What business is being done in domestic aluminum is chiefly on contract. The quotation today is 19@20c. per lb. for No. 1 ingot, but is entirely nominal.

Antimony—The market has advanced rapidly during the week. Stocks here are small; it is estimated that there is not more than a month's supply on hand, and it is impossible to say when any new supplies will be available. Quotations today for ordinary brands—Chinese, Hungarian, etc.—are 16@18c. per lb.; some special brands can be had at 20c., but 22c. per lb. is paid for Cookson's.

Quicksilver—The price of this metal has advanced sharply but without checking sales. The advance is due to the war, which has made this country the only present available source of supply. Quotations have more than doubled during the week, and sales have been made at $90@100 per flask. No London quotations are available

DAILY PRICES OF METALS

NEW YORK

Aug	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
6	*	*	*	*	3.80 @3.90	3.70 @3.72½	4.90 @5.00	4.75 @4.85
7	*	*	*	*	3.80 @3.90	3.70 @3.72½	4.95 @5.00	4.80 @4.85
8	*	*	*	*	3.80 @3.90	3.70 @3.72½	4.95 @5.05	4.80 @4.90
10	*	*	*	*	3.80 @3.90	3.70 @3.75	5.05 @5.15	4.90 @5.00
11	*	*	*	*	3.80 @3.90	3.67½ @3.72½	5.20 @5.40	5.05 @5.25
12	*	*	*	*	3.80 @3.90	3.67½ @3.70	5.37½ @5.42½	5.22½ @5.27½

*No market.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c.

Nickel—Quotations for ordinary forms—shot, blocks, or plaquettes—are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb higher.

Gold, Silver and Platinum

Gold—The open market in London is at an end for the present, and the position of gold is too indefinite to permit more to be said than that there is a demand for it everywhere.

The $10,600,000 taken out by the "Kronprinzessin Cecilie" from New York two weeks ago and brought back to Bar Harbor last week, has been transferred by train to New York and lodged in the Subtreasury there.

Gold in the United States Aug. 1, as estimated by the Treasury Department: Held in Treasury against gold certificates outstanding, $1,024,046,869; in Treasury current balances, $230,891,204; in banks and circulation, $632,332,591; total, $1,887,270,664, a decrease of $3,407,640 during July.

Gold production in the Transvaal in July was 732,485 oz., being 14,559 oz. more than in June, and 77,096 oz. more than in July, 1913. For the seven months ended July 31 the total output was $109,464,393 in 1913, and $99,429,562 in 1914; a decrease of $10,034,831, or 9.1%, this year.

Platinum—There has been an advance in price, which is variously gaged at $10@15 per oz. for refined platinum, making quotations $55@60 per oz. Dealers are reluctant to quote, however, expecting a further advance, as supplies from Russia are cut off entirely.

Silver—Messrs. Handy & Harman issued the following statement on Saturday, Aug. 8, regarding the situation of the silver market: "From cables received today we learn that the official price of silver was established in London yesterday at 26d., covering spot transactions only. News items state all silver in London has been taken over by the English Government. Due to delays in cable transmission, we do not know whether there was any market established in London today or not. An official quotation in London of 26d. would warrant a New York quotation of 52c., as the cost of freight and war insurance, with usual charges, at the present time amounts to 6¼c. per ounce. We are not, however, able to sell in London even if a market is established there owing to delay in the transmission of cables and difficulties of transactions in foreign exchange. A New York market, therefore, cannot be established until cables can be transmitted promptly and transportation can be made safe and the financial condition clears up."

The suspension of silver quotations produced a critical condition among silver miners, although the facts of the situation were promptly and fully recognized. Pressure was immediately exerted from Colorado, Utah, etc., upon Washington to induce the U. S. Mint to buy silver. The Mint authorities consequently entered into negotiations with the smelters, as a result of which the Mint on Aug. 11 agreed to take 1,175,000 oz. at 52c. per oz., delivered at the Eastern mints, on condition that the smelters would agree to liquidate all silver that would have to be settled for up to the end of that day (Aug. 11) at the same price. To this the smelters and refiners immediately agreed, being desirous of assisting the situation, notwithstanding the fact that the quantity they had to take at the Mint price was grealy in excess of what they were selling to the Mint.

Shipments of silver from London to the East, Jan. 1 to July 30, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£4,251,500	£4,351,500	I £100,000
China	462,000	42,000	D. 420,000
Total	£4,713,500	£4,393,500	D. £320,000

Coined silver in the United States Aug. 1 is reported by the Treasury Department as follows: Standard dollars held against silver certificates, $487,157,000; in Treasury current balances, $8,701,521; in circulation, $69,981,742; total dollars, $565,840,263; subsidiary coins, $182,417,443; total silver, $748,287,706, an increase of $177,573 during July.

Zinc and Lead Ore Markets

JOPLIN, MO.—Aug. 8

The high price of blende is unchanged at $42.50, the assay base being $38@40 and the metal base $36@38 per ton of 60% zinc. Calamine sold at $20@21.50 per ton of 40% zinc. The average selling price of all grades of zinc is $36.50 per ton. The highest price paid for lead ore was $47, the base continuing at $46 per ton of 80% metal content, and the average of all grades is $45.96 per ton.

Some producers declined to sell on the midweek drop to a $39 base and received later an advance to a $40 base, the market strengthening notably at the close.

SHIPMENTS WEEK ENDED AUG. 8

	Blende	Calamine	Lead	Values
Totals this week	9,958,700	1,084,330	1,709,420	$240,860
Totals 32 weeks	327,592,620	23,781,180	55,870,780	$7,977,800

Blende value, the week, $189,260; 32 weeks, $6,396,440.

Calamine value, the week, $12,310; 32 weeks, $268,795.

Lead value, the week, $38,290; 32 weeks ,$1,332,565.

PLATTEVILLE, WIS.—Aug. 8

The base price paid this week fo 60% zinc ore was $38 per ton. The base price paid for 80% lead ore was $44 per ton.

SHIPMENTS WEEK ENDED AGU. 8

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore. lb.
Week	3,229(720	204,000	506,100
Year	92,590,950	2,520,500	23,162,670

Shipped during week to separating plants, 3,969,020 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Aug. 12

The market preserves a conservative front, with signs of increasing strength, as is well shown by our Pittsburgh report, which follows. Opinion differs as to the effect of the war upon trade, the more general belief being that it will be beneficial, at least for a time.

Steel Corporation unfilled orders on July 31 were 4,158,589 tons, an increase of 125,732 tons in July.

Pig Iron Production in July was on about the same scale as in June. The reports of the furnaces, as collected and published by the "Iron Age," show that on Aug. 1 there were 188 coke and anthracite stacks in blast, having a total daily capacity of 63,950 tons; an increase of 250 tons over July 1. Making allowance for the charcoal furnaces, the estimated make of pig iron in the United States in July was 1,985,500 tons; for the seven months ended July 31 it was 14,350,700 tons. Of the total 10,114,050 tons, or 70.1%, were made by the furnaces owned or operated by steel companies.

PITTSBURGH—Aug. 11

Following their adoption of a conservative attitude in naming prices, as noted in last report, the steel manufacturers have advanced prices in several important products, bars, plates and shapes having been advanced $1 a ton, to 1.20c., and sheets about $2 a ton, to 1.90c. for black and 2.90c. for galvanized. An advance in wire products, following that of three weeks ago, is expected within a week.

The steel manufacturers do not ascribe these advances wholly to the European war, as they insist that an advancing tendency had already distinctly manifested itself and that the market was on the road to recovery after having been for more than six months on the basis of practically profitless prices. At the same time the war is a direct influence in that it has made ferromanganese very scarce, with a possibility that some works will have to close before imports of the alloy or of manganese ore can be resumed. It is also an influence in that it promises, even according to the most conservative reasoning, a very large expansion in iron and steel exports from the United States. Hitherto these exports to neutral markets have been about 2,500,000 tons annually, while the countries now at war have had exports of fully three times this amount to the same markets. For the moment exports are almost entirely shut off, except to Canada, but it is understood that arrangements have been practically concluded whereby upon the passage of the pending Underwood bill, permitting American registry to American owned but foreign built vessels, a number of vessels will be purchased. It is also felt that English naval supremacy will soon be established.

The Steel Corporation's gain of 125,732 tons in unfilled tonnage in July was less than expected, a gain of 200,000 tons or more having been predicted, but still it makes a very favorable comparison with preceding months, June having shown a gain of 34,697 tons and May a loss of 278,908 tons. Bookings in July appear to have been at about 75%, shipments having been clost to 65% of capacity.

Shipping orders received for finished-steel products have been running thus far this month at about the July rate, or at an average of 65 to 70% of capacity, and production in averaging the same rate. Orders placed always require prompt shipment and thus the mills are unable to accumulate at a rapid rate if they desired, but they are anxious to keep down obligations of this sort, because contracts do not insure specifications of this sort, because contracts do not insure specifications unless the market rises and in that event contracts at low prices are a liability rather than an asset. Prices now quoted are as a rule only for specifications through September, fourth quarter deliveries being quoted $1 to $2 higher than prompt.

The advance in sheets, being to 1.90c. for black and 2.90c. for galvanized, involves a greater advance in galvanized than in black, the present differential being $1 per 100 lb. against 95c. formerly, the divergence being attributed to fears of a rapid advance in spelter.

Pig Iron—The market is very quiet, generally speaking, showing much less activity than in July. Prices are steady, but stationary. The Standard Sanitary Manufacturing Company has bought 5500 tons of foundry iron, for August and September delivery, at approximately $13 at furnace for No. 2. Basic and bessemer are very quiet. We quote: Bessemer, $14; basic, $13; No. 2 Foundry, $13@13.25; forge, $12.50@12.75; malleabel $13@13.25, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—It is rumored that a minor steel plant in Ohio is closed through having run out of ferromanganese already. A similar rumor regarding a large eastern steel interest is regarded as incredible. The steel works in general are supposed to have a supply sufficient for two or three months off operation. The Steel Corporation, making its ferromanganese from imported ores, is believed to have a fairly good supply of the latter. It has been importuned to sell or loan ferromanganese but absolutely refuses to do so and it is doubted that it will become a seller until the situation clears up. The probability is that manganese ore imports will be resumed before ferromanganese is imported, as India and Brazil have been large sources of supply and the only desideratum is transportation facilities. There are small transactions in re-sale ferromanganese at fancy prices, one lot of about 200 tons having gone late last week at $100 a ton while later another lot, 100 tons, went at $120.

Steel—Late last week the Youngstown producers advanced their quotations $1 a ton on billets and 50c. on sheet bars, making the Youngstown market $20 on billets and $21 on sheet bars, at maker's mill. Pittsburgh producers, who had not been actively in the market, are now naming similar prices, f.o.b. maker's mill, Pittsburgh. Rods are quotable at $25, but consumers are well covered by contracts at lower prices.

IRON ORE

Shipments of iron ore from the Lake Superior region in July were 5,784,514 long tons, being 2,419,902 tons less than in July, 1913. For the season to Aug. 1 the total shipments were, in long tons:

Port	1913	1914	Changes
Escanaba	2,659,299	1,740,741	D. 918,558
Marquette	1,556,501	681,361	D. 875,140
Ashland	2,264,031	1,416,825	D. 847,206
Superior	7,073,413	5,690,413	D. 1.383,000
Duluth	5,934,664	2,949,286	D. 2,985,378
Two Harbors	4,841,552	2,930,004	D. 1,911 548
Total	24,329,460	15,408,630	D. 8,920,830

The total decrease this year was 36.7%. The smallest proportional decrease was in the shipments from Superior.

COKE

Coke shipments from the Connellsville region for the week are reported by the "Courier" at 269,591 short tons. The production was 269,575 tons. Output of the Greensburg and Upper Connellsville districts was 39,578 tons.

Connellsville Coke—The market continues altogether stagnant. There are no serious negotiations for contract furnace coke, and practically no demand for prompt. Foundry coke is also quiet, about 95% of the shipments being on contracts recently made for the twelve-month to June 30 netx. Prompt furnace coke can readily be had at $1.75, while some sellers on contracts to the end of the year could probably be found at this same price, though there are a few operators who still maintain that $2 is their minimum. Foundry coke is quotable at $2.25@2.35 for prompt and at $2.35@2.50 for contract, per net ton at ovens.

Anthracite Shipments in July were 5,391,857 long tons, being 738,339 tons less than in June and 96,005 tons less than in July, 1913. For the seven months ended July 31 the total shipments were 40,339,706 tons in 1913, and 38,337,646 in 1914; a decrease of 2,002,060 tons, or 5%, this year.

CHEMICALS

NEW YORK—Aug. 12

The general markets have been active and disturbed. There have been some extraordinary advances in articles which are chiefly imported, but no changes or only moderate ones in staple chemicals. A disturbed point is in potash sales, the supplies having been cut off by the war.

Arsenic—The market is quiet, with only a moderate demand. The producers' agreement still holds and there is no change in prices, $3 per 100 lb. being named for both spot and futures.

Copper Sulphate—Business is on a fair scale with steady sales. Prices are unchanged. Quotations are $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Potash Salts—Exports of potash salts from Germany half-year ended June 30, in metric tons:

	1913	1914	Changes
Crude salts potash	768,895	727,042	D. 41,853
Potassium chloride	192,059	159,348	D. 32,711
Potassium sulphide	68,234	50,062	D. 18,172
Pot.-magnesium sulphide	41,859	37,702	D. 4,157
Totals	1.071,047	974,154	D. 96,893

Of the total this year 406,675 tons, or 41.8% of the whole, were sent to the United States.

COPPER SMELTERS' REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments	2,069,960	1,279,537	585,387	1,114,758	....
Anaconda	23,800,000	22,900,000	23,500,000	23,800,000	....
Arizona, Ltd.	3,286,000	3,570,000	3,092,000	3,742,000	...
Copper Queen	7,637,042	7,562,723	8,388,203	7,613,719	7.817.318
Calumet & Ariz.	5,875,000	5,450,000	5,495,000	4,630,000	5,940,000
Chino	5,399,814	5,926,591	5,496,875	5,486,419	...
Detroit	1,973,725	1,790,926	2,105,034	2,129,100	1,966,526
East Butte	1,546,180	1,178,000	1,179,762	1,215,323	....
Giroux	287,980	45,948	429,553	425,000	....
Mason Valley	1,250,000	862,000	916,000	950,000	....
Mammoth	1,800,000	1,850,000	1,750,000	1,725,000	1,950,000
Nevada Con.	5,218,257	4,880,043	4,959,589	4,483,175	....
Ohio	597,520	610,518	625,000	605,000	....
Old Dominion	2,997,000	2,779,000	3,302,000	2,937,000	2,962,000
Ray	6,036,908	6,089,362	6,300,847	5,947,567	....
Shannon	1,082,000	1,012,000	1,056,000	1,049,227	....
South Utah	406,381	247,641	55,394	84,000	....
Tennessee	1,262,184	1,370,800	1,336,950	..	....
United Verde*	3,100,000	3,000,000	3,100,000	2,900,000	....
Utah Copper Co.	12,323,493	12,739,757	13,208,483	12,870,063	....
Lake Superior*	11,000,000	13,000,000	12,500,000	16,000,000	....
Non-rep. mines*	8,200,000	8,000,000	8,200,000	8,000,000	....
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	....
Total prod.	109,649,444	108,644,846	110,082,077	....	....
Imp., bars, etc.	22,676,605	17,043,191	19,081,487	....	....
Total blister	132,326,049	125,688,037	129,163,564	....	....
Imp. ore & matte.	7,029,646	10,400,122	10,586,506	....	....
Total Amer.	139,355,695	136,088,159	139,750,070	.. ..	....
Arrivals-Europe†	17,572,800	17,299,520	13,558,720	19,010,000	....

† Does not include the arrivals from the United States.

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev.	Aug 10	Aug. 31	$0.03
Aurora-Sampson, Ida.	July 18	Aug. 18	0.002
Buffalo, Mont.	Aug. 2	Sept. 2	0.004
C. & R., Ida.	July 14	Aug. 18	0.001
Emerald, Utah	July 15	Aug. 18	0.0033
Enterprise, Ida.	July 31	Aug. 17	0.002
Evergreen, Utah	July 23	Aug. 22	0.01
Exchequer, Nev.	Aug. 13	Sept. 3	0.02
Federal-Ely, Nev.	July 20	Aug. 21	0.005
Four Timbers, Wash.	July 29	Aug. 29	0.0015
Franklin, Mich.	....	Aug. 26	2.00
Great Western, Nev.	Aug. 10	Aug. 31	0.01
Huron, Mich (Iron).	....	.....	3%
Jack Waite, Ida	July 21	Aug. 18	0.01
Macnamara, Nev.	July 27	Aug. 17	0.03
Maryland, Ida.	Aug. 5	Sept. 5	0.003
Moonlight, Ida.	July 13	Aug 20	0.005
Nabob, Ida.	July 20	Aug. 17	0.005
North Bunker Hill, Ida.	July 18	Aug. 22	0.002
North Star, Ida.	Aug. 8	Sept. 10	0.0015
O K, Utah	Aug. 17	Sept. 2	0.005
Old Evergreen, Utah	July 23	Aug. 22	0.01
Oreano, Ida.	July 24	Aug. 24	0.002
Rockford, Ida.	Aug. 14	Sept. 4	0.0015
Sierra Nevada, Nev.	Aug. 18	Sept. 8	0.010
Spider, Utah.	July 21	Aug. 18	0.0025
Sunrise, Ida	July 14	Aug. 24	0.002
Tuscumbia	July 10	Sept. 8	0.003
Wasatch, Utah	July 27	Aug. 31	0.05
Wasatch-Utah, Utah	July 13	Aug. 17	0.04
West Century, Utah	Aug. 2	Aug. 24	0.005

The Engineering and Mining Journal

VOLUME 98 AUGUST 22, 1914 NUMBER 8

The Organ Mountain District

By Norval J. Welsh*

SYNOPSIS—General description of this lead-copper-precious-metal district in South-Central New Mexico. Chief feature of geology is the lime-monzonite contact. Contact-metamorphic deposits, replacement veins in limestone and fissure veins in intrusives are found. The district is an old one, with a probable total production to date of $3,750,000. Present inactivity does not indicate exhaustion. Principal mines are the Torpedo and the Stephenson-Bennett. There are other properties of promise.

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From a point beyond the Rio Grande, in old Mexico, and the extreme west corner of El Paso County, Tex., there extends north through Dona Ana and Sierra Counties, N. M., a series of mountain peaks and ranges which are links in the long chain of north-south ranges terminating in the Sandia Range of Bernalillo County, N. M. From the river north for about 20 miles, to a broad gap in the chain, extend the Franklin Mountains; thence, another 25 miles or so, to the San Augustine Pass, is covered by the Organ Mountains, known by the Mexicans in early days as *Sierra de los Organos* on account of the conspicuous granite spires along their western front. From the Pass, for 80 miles farther north, lies the San Andres Range. These three ranges form a link in the chain over 130 miles in length and from four to 15 miles wide, rising abruptly from a broad, semi-arid desert plain which slopes south and west to the Rio Grande, and is still mapped in part as the dread *Jornada del Muerto,* approximately translated "Journey of Death." This expanse of plain has an average elevation above the sea of approximately 4500 ft., while Organ Peak has an elevation of 9108 ft.

The three ranges, here considered as one, are composed of pre-Cambrian granites and Paleozoic limestones, shales and other sedimentary rocks, and are generally mineralized. Development of the various known mineral districts, with one exception, has been in great part retarded by the scarcity of water and the remoteness from transportation facilities. Near El Paso, in what are known as the Franklin Mountains, tin occurs in the granite, but attempts to develop the mineral in commercial amount have met with failure. To the north and west of the tin claims, deposits of hematite and magnetite occur. Through the more northerly portion of the range, deposits of copper and lead ores are known, but these have been but little prospected or developed. In that section of the range just north and south of the San Augustine Pass, mines of copper, lead, silver and gold have been developed, some of them to the point of success, and these are embraced in what is known as the Organ Mountain mining district, herein described.

Surface Plant of the Stephenson-Bennett

View North from Torpedo Mine in Foreground

Features of the District

The Organ Mountain district is centered in and around the small settlement and post office of Organ, situated in the east-central part of Dona Ana County, about 11 miles by stage road northeast of Las Cruces, the county seat, and 50 miles, more or less, north of El Paso. The region surrounding is semiarid in character and water is scarce. The climate is extremely healthful and permits of all-year work in the open.

The principal mines of the district are located in the foothills of the steep western slope of the range, at an average elevation of 5000 ft. above sea level and about 1200 ft. above the line of the Atchison, Topeka & Santa Fé, which traverses the valley of the Rio Grande, to the west of the range.

General Geology

The predominating rocks of the Organ Mountains are limestones, minor strata of shale and quartzite, and an intrusive, coarsely granitic rock, porphyritic in structure, in the form of a stock. This granite rock has been referred to by Lindgren[1] as "evidently a quartz-monzonite." It forms the great mass of the mountains, and its intrusive origin "is proved by the structural relations at the contacts and by the contact metamorphism of the limestone." The sedimentary rocks are best exposed as a narrow belt along the western base of the range, north and south of Organ settlement, and are prominent as heavy-bedded limestones, dipping west-northwest 40° to 45° from the main contact. Dikes of aplite, syenite porphyry and dark diorite cut both the sedimentary and the intrusive rocks at fairly sharp angles.

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*Mining engineer, Organ, N. M.

The main contact strikes more or less regularly in a north-south direction along the western base of the range, from south of the Modoc mine, which lies six miles south of Organ, to beyond the Merrimac mine, three miles north of Organ, where it turns and swings to the east. It is well exposed on the Modoc, Bennett and Excelsior claims and is particularly well shown on the Memphis claim, where garnet, specularite and other minerals, characteristic of contact metamorphism, are shown, together with oxidized copper and zinc minerals and some residuary calcite. The zone of contact varies in width up to two hundred and more feet. Near the Torpedo mine, the limestones are silicified at the contact, the zone of silicification extending south to the Stephenson-Bennett mine; again, in Torpedo ground, near the contact, which is here poorly exposed, the limestone is almost wholly converted to hornfels.

MINERAL DEPOSITS

The mineral deposits of the district are of several distinct types. Lindgren considers them all as closely related and as having been formed in one epoch of mineralization. Speaking in general terms, copper seems to have been deposited at the contacts, lead in deposits in the limestone, away from the contact, and gold and silver in fissure veins.

The types of deposits are:

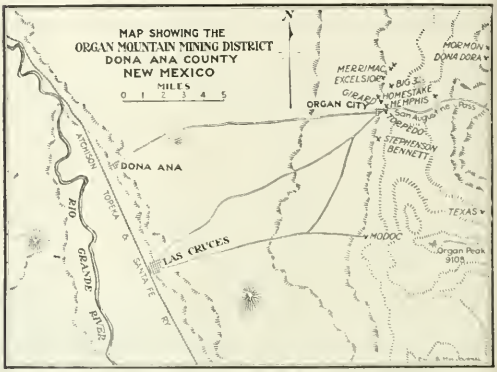
(1) *Contact-metamorphic deposits.* These carry chiefly copper and occur for a long distance along the main contact of limestone and quartz monzonite, from the Torpedo mine northward. They form irregular masses roughly following the stratification. The zone of oxidation is irregular in depth and is known in one instance to extend to at least 300 ft.; elsewhere, sulphides may be found at the surface. This type is exemplified by the Torpedo mine.

(2) *Replacement veins in limestone.* Deposits of this type follow the stratification planes of the limestone, the latter being but little altered. They carry chiefly lead and are characteristic of the Stephenson-Bennett and Girard properties.

(3) *Fissure veins in intrusive rocks.* These are usually narrow, quartz-filled veins striking east and west. Most of them contain silver, associated with tetrahedrite or galena; others contain gold associated with pyrite. Deposits of this type are found generally on the east side of the range, as the Mormon, Texas and other mines, and of the three types described have so far proved of the least importance in the district, although some of them are considered promising.

HISTORY OF THE DISTRICT

The Organ district has long been known as a center of mining operations. It was first described by Antisell, who traveled through this section of the country in 1854. He makes mention[2] of the Stephenson mine then operating, the ores of which were smelted in an adobe furnace at Las Cruces, and of the still earlier operation of the Barilla mine, probably that now known as the Modoc, the ores of which were smelted in a furnace at the mine. Subsequently, during the Civil War period and later, the Stephenson property was operated by army officers stationed at old Fort Selden, above Las Cruces, on the highway through to the California coast. Later years witnessed the opening of the Excelsior and Memphis copper mines, the ores of which were in great part smelted in a water-jacketed furnace erected on the latter property in the early '80's. The Torpedo mine, the most spectacular and prominent of the copper-producing mines, was not developed until the late '90's. Located originally as a lead prospect, this property added in no small measure to the total output of the district.



Map of the District

Reliable estimates of total production are difficult to obtain. J. Bond[3] estimates a total yield, prior to 1900, of $2,500,000. No authentic records of the production subsequent to 1900 are obtainable, but renewed activity meanwhile, including development and operation of the Torpedo mine, brings the total estimated yield at this time to more than $3,750,000 in copper, lead and silver, of which $1,850,000 came from copper ores, $1,500,000 from lead ores and $400,000 from silver ores.

PRESENT CONDITIONS

Those best qualified to speak, account for the state of inactivity that has prevailed in the district for several years past by the bad organization of the larger operating companies and by the incompetent general managements and resultant faulty operations of the several larger mines in the past. Undoubtedly another reason, and perhaps of greater prominence at this day, is the fact that at least three of the larger properties are owned or controlled by persons of large means, who, while making no efforts themselves to develop and operate their holdings, yet refuse to entertain terms covering them that would make the properties attractive for development to responsible mining men. This attitude stands in the way of progress in the district and makes it a difficult matter for the smaller, but perhaps more enlightened, claim owner to interest the capital that he frequently needs for legitimate work. With the larger mines inactive, for reasons here intimated, no incentive is offered strangers to look into the camp's possibilities.

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[1] U. S. Geol. Surv., Prof. Paper No. 68.

[2] "Pacific R R Surveys, Vol. 7, 1857.

[3] "Mining World," Mar. 17, 1906.

Another factor that has influenced opinion regarding the camp, to its detriment, is the prevalent idea that the mines with depth encounter such quantities of water as to make their operation unprofitable. This is not the case. Undoubtedly water has caused trouble in the past, particularly in those mines located along the main limestone and quartz monzonite contact, but it did not prove insurmountable. A typical case is that of the Torpedo and the Stephenson-Bennett mines. In the early development and operation of the former, which is a mine of the contact-metamorphic type, large quantities of water, up to 600 gal. per min., were encountered, a condition similar being met with in the Bennett mine. The Stephenson-Bennett company subsequently drove a long drainage adit, tapping the workings at about 400 ft. in depth. Thereafter, continuous draining and pumping of water in both mines so reduced the head and flow that, at 300 ft. of depth in the Torpedo shaft, an ordinary 9-B Cameron sinking pump, having a rated capacity of 200 gal. per min. at regular speed, could, when occasion required, be made to discharge the entire flow of water making in the mine, reliably estimated today at 250 gal. per min.

The district is best known by the results heretofore obtained in development and operation of the Torpedo and the Stephenson-Bennett properties, which, in point of development, are, respectively, the youngest and the oldest mines in the district. They have made by far the greatest production of the district, and each is typical of its respective type.

The Torpedo Mine

The Torpedo property is located practically on the main contact, immediately at and east of Organ settlement. Development consists of three shafts, 200 to 300 ft. in depth, and at about 3000 ft. of drifts and crosscuts. The equipment embraces a 210-hp. steam-power plant, a 60-hp. steam hoist at No. 3 shaft, a 15-hp. gasoline hoist at No. 1 shaft, a small electric generator plant, a pumping plant, etc.

Originally located, in 1896, as a lead-silver prospect, the owners early became disheartened at the appearance of "green ore," the value of which they failed to recognize, and later disposed of their property to Chicago interests at a small fraction of its real value. Efforts at systematic development were first exerted about 1900 and continued intermittently until the financial stringency of 1907 caused all work to cease. During the intervening time, for a total operating period of more than three years, the mine was explored and developed to 300 ft. in depth and produced copper ore variously estimated in value up to $1,000,000.

The mine is notable for the large masses of copper silicate ore, developed and stoped to 235 ft. below the surface, overlying chalcocite pseudomorphic after galena. The deposits of silicate ore were lenticular in form, of varying lengths and up to 25 ft. in thickness, consisting of crysocolla, averaging 10% copper and some silver, in a soft kaolinized lime-iron-manganese gangue partly replaced by lower-grade ore. Native mass copper occurs in considerable amount in the kaolinized material. Oxidation has been noted to a depth of 300 ft.; at this level chalcocite was first encountered in the mine, more than 200 ft. below the level at which water in quantity was met with. It is reliably reported that the mine was closed down at the most promising period of its career, a condition seemingly induced by friction among the owners and by inefficient general management. It is now undergoing examination.

The Stephenson-Bennett Mine

The Stephenson-Bennett property is located a mile and a half south of Organ settlement. Development consists of a 350-ft. double compartment shaft, two adit levels with lengths of 2000 ft. and 700 ft., respectively, and a number of intermediate levels and crosscuts. The equipment embraces a steam-power plant, a 60-hp. steam hoist, a 100-ton wet concentrating plant of the Joplin type, a compressor plant, etc.

The mine is thought by some to be the oldest developed property in the district, dating from the early '40's of the last century. It has since been operated intermittently and developed to a depth of 400 ft. The mine is credited with a production valued at about $1,000,000.

The principal product of the property has been lead, carrying some silver and occurring as both carbonate and galena. Isolated bodies of both copper and zinc are occasionally developed in small amount. Masses of smithsonite, the carbonate of zinc, and of wulfenite, the molybdate of lead, remarkable for the form and color of the individual crystals, are frequently encountered. The ore deposits occur in replacement veins in the limestone, away from the contact. Of these veins, which are four in number, the Bennett is the principal one and has been stoped to more than 400 ft. in depth for a distance laterally of from 500 to 600 ft. The old stopes are open and in places show a width of as much as 30 ft. The mine is now being prospected and operated in a small way by lessees. In common with its neighbor, the Torpedo, it warrants new development and has suffered in the past from friction among the owners and from inefficient general management.

Other Properties

Of less prominence in the district as producers, but with good records, are the Memphis and Excelsior copper properties, located north of Organ settlement, and the Modoc lead mine, to the south. The Excelsior group is undergoing new development, with encouraging results. Other properties are the Girard, a claim of more or less promise as a prospective producer of concentrating lead ore, but now idle; the Homestake group of silver-lead claims, from which an occasional shipment is made; the Merrimac and Little Buck copper and silver properties, north of the Excelsior; and the Big 3 group. The [illegible] is a copper property of promise, located to include the main contact and a strong east-west fissure; development of the fissure has resulted in the production of considerable high-grade copper and silver ore. The group is being developed by the owners.

On the east side of the range are the [illegible], Dona Dora and Texas properties, located to cover east-west, quartz-filled fissures carrying galena, silver and gold.

The Mormon mine has been the most developed and is equipped with hoist, small stamp mill and concentrator. The Texas mine is located high up in the range. A small amount of development is said to expose a wide vein, with a pay streak of pyrite-bearing quartz running up to $8 per ton in gold. This section of the district is at present wholly inactive.

The several mines and prospects herein described and referred to, located over a wide area, indicate in a general way the thorough mineralization of the Organ Mountain district. Since it is, furthermore, situated close to smelting and supply points and is easy of access it warrants intelligent investigation.

Colorado Geological Survey

The Colorado Geological Survey has two parties in the field this summer constructing a general topographic and geologic map of the carnotite districts in the western portion of the state. This will not be a contour map; it is an endeavor of the engineers and geologists to produce a reconnaissance map such as will prove of practical value to prospectors, operators and others who may have interests in the country. It is hoped to have this map ready for publication before the end of this year, and when printed it will be for general, gratuitous distribution. A brief gazetteer accompanying the map will locate places, mines, etc., by marginal letters and numerals. Contemporaneously with the map, there will be published a short bulletin giving important facts concerning the region, such as the geology and ore occurrences.

One field party is in charge of Clare Coffin, who has been with the Survey five years. The other party is headed by P. G. Worcester, assistant professor of geology at the University of Colorado. During a temporary leave of absence, Prof. Worcester's duties are assumed by O. E. Smith, formerly assistant professor of geology at the Colorado School of Mines. The stratigraphic work is being directed by Junius Henderson. Dr. R. D. George, state geologist and director of the Survey, is also doing field work in studying ore deposits and working up materials for his report. He plans to look up all the isolated carnotite deposits that are outside of the area covered by the map.

Dr. O. C. Lester, professor of physics in the university, and his assistant, J. H. V. Finney, are visiting all the mineral springs in the state, investigating their radioactivity. Two years ago, they visited the springs and observations were recorded relative to temperature, rate of flow, gases emitted and geological surroundings. Complete analyses of about 200 spring waters were made at the time. All of these data, together with illustrative materials and a general statement as to the therapeutic properties of the waters, will be embodied in a bulletin that Dr. George hopes to issue before long.

The Survey has ready for immediate publication a bibliography of Colorado geology and mining, prepared on the same general plan as the corresponding bulletin issued by the United States Geological Survey. It will contain references to every important bit of literature bearing upon the state's mineral resources. Another bulletin, prepared two years ago by G. M. Butler, then assistant professor of geology at the School of Mines, will be in press very soon. Its title will be "The Clays of Colorado."

Ray Consolidated Copper Co.

Production of copper by the Ray Consolidated Copper Co., for the second quarter of 1914, was 18,748,343 lb. divided into 6,226,373 lb. in April, 6,396,643 lb. in May and 6,125,327 lb. in June. The average monthly production for 6 months of 1914 was 5,997,115 lb., 314,212 lb. additional of copper was produced from ore shipped to smelters.

Total ore milled for the quarter was 764,040 dry tons, averaging 1.786% copper, or a daily tonnage of 8396. Average mill recovery was 68.69% of the copper content.

Milling costs for the quarter were 47.24c. per ton. Mining and coarse crushing cost 65.078c. per ton, of which 3.337 was for coarse crushing. Underground development amounted to 31,515 ft., making the total development to date 438,319 feet.

Average cost of net copper produced from milling ores, after allowing for smelter losses and applying dividends of the Ray & Gila Valley R.R., but no other miscellaneous income, was 8.628c. per lb. Combined cost of copper from both milling and shipping ore was 8.623c. per lb. Those costs include all operating and general charges, as well as 12½c. per ton of ore milled which is applied to the retirement of mine-development costs. Crediting all miscellaneous income, the average cost of net copper for the quarter was 8.541c. per lb. The fifth quarterly dividend, amounting to $545,364, was paid on June 30. Net surplus over bond interest and dividend requirements was $414,130.

Earnings for the quarter are based on a price of 13.9198c. per lb. for copper. The total amount of it on hand and in transit, sold and unsold, at the end of the quarter, was 25,819,674 pounds.

Utah Copper Co.

Report of the Utah Copper Co. for the second quarter of 1914 shows a gross production of copper in concentrates of 40,017,562 lb., divided into 13,132,463 lb. in April, 13,616,993 lb. in May and 13,268,106 lb. in June, a monthly average of 13,339,187 lb. Both plants treated a total of 2,006,157 tons of ore, 58% at the Magna plant and 42% at the Arthur plant. Average grade of the ore was 1.1573% copper, and average extraction, 68.44%. Operations were said to be the most satisfactory in the history of the company.

Average cost per pound of net copper was 7.539c. after allowing for smelter deductions and without crediting miscellaneous income. If miscellaneous earnings in Utah, including those from the Bingham & Garfield Ry., were credited, the cost of copper would be reduced to 6.773c. per pound.

Total net profit for the quarter is $2,819,104; dividends paid, $1,201,710; net surplus, $1,617,394. Earnings are computed on a basis of 13.916c. per lb. for copper. Total amount on hand and in transit, sold and unsold, was 46,704,098 lb. The unsold copper is inventoried at 13.511c. per lb. Earnings of the Bingham & Garfield Ry., amounting to about $100,000 per month, will accrue almost wholly toward increasing the earnings of Utah Copper Co., which owns almost all the stock and bonds. The railroad carried a daily average of 16,596 tons of ore and 3498 tons of other freight.

Amalgamation at Liberty Bell Mill

By C. Lee Peck*

SYNOPSIS—Amalgamation in cyanide solution, often deemed impossible, has been successfully done for eight years at the Liberty Bell mill. Plates are prepared by coating with quicksilver and amalgam, and are maintained wet. Frequent cleaning and dressing are necessary conditions being different from those obtaining in water amalgamation. 50% of the gold and 11% of the silver are saved on the plates.

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The evolution of cyanide practice seems to foreshadow the abandonment of the combination of amalagamation with cyanidation. It has formerly been considered good metallurgy to remove by amalgamation particles of gold and silver too coarse to be dissolved in the cyanide treatment to follow. Fine grinding and agitation, and cyanide treatment of concentrates, have narrowed this field. The combination still remains practicable, however, where shipping concentrates are recovered and it is desirable to keep the grade of such concentrate as low as possible, to save shipping and smelting charges and the percentage deducted by the smelters from the value of the gold-silver content. Other considerations may also render advisable the retention of amalgamation with cyanidation. In such cases, the advantages of crushing in solution render important the feasibility of amalgamation in solution.

For eight years the Liberty Bell Gold Mining Co.: of Telluride, Colo., has successfully amalgamated in cyanide solution. The flow sheet, so far as it concerns amalgamation, consists of stamp crushing through 12-mesh screens in NaCN solution, strength, 2 lb. per ton, in terms of KCN., with a protective alkalinity of about 2 lb. lime. The ratio of solution to ore at battery discharge is four or five to one. Thence the pulp runs over 16 amalgamating tables having an exposed surface of amalgamated copper of 32 sq.ft. each, and through traps to four Richards 3-spigot, hindered-settling vortex classifiers. The spigot products are concentrated on Wilfley tables. The Wilfley tailings are reground in tube mills, 90% of the discharge passing 80 mesh. The reground ore is diluted with cyanide solution and classifier overflow to six or eight to one and passed over eight plate tables of the same dimensions as the battery tables.

Care of Plates

The plates are of cold-rolled, annealed, electrolytic copper, weighing about 7 lb. per sq.ft., and are prepared for amalgamation as follows: They are bedded on two or more thicknesses of tarred felt, beaten to a plane surface, secured with brass screws, scoured clean with lumps of cyanide, sprinkled with mercury and rubbed with brooms until mirror bright. About ½ oz. per sq.ft. of gold-silver amalgam is then brushed evenly over the surface. The new plate so treated does full duty from the start. If amalgam is not used in the first dressing, the plate becomes dark and hard, requiring several days' careful attention to get into shape. The battery plates are all cleaned with whisk brooms every 8-hr. shift, and the upper half at the fourth hour between, making six clean-ups per day. The description of methods of dressing which follows is quoted from "suggestions to amalgamators" posted in the pan room.

> The object sought in dressing plates is to leave all amalgam remaining on the plates after the clean up plastic, evenly distributed, with no loose crumbs, and stiff enough to resist the flow of the pulp.
>
> Such results may be obtained by proceeding as follows: After cleaning up, lightly sprinkle the entire plate; then thoroughly rub until the plate is uniformly bright, with no dark or silvered spots. Lightly brush toward the head any loose amalgam. Riffle with your brooms, being careful to smooth down any loose amalgam on edges or corners of plate.

The bottom one-half of the battery plates is scraped once each day. Cabinet makers' scrapers with a 4-in. blade are used for this purpose. The blades are filed square each time used. The principal clean-up occupies about one hour for the 16 tables. A half-hour later the plates are sprinkled with mercury at the lip of the mortar, and at hourly intervals thereafter. The amount of mercury used is, of course, regulated by the rate of amalgamation. The condition sought to be maintained is to keep "points" of mercury hanging to the lower edge of the plate without dropping off; in other words, the exact point of saturation.

Tube-Mill Plates

Amalgam deposited on these plates contains a much greater proportion of silver than that on the battery plates. Silver amalgamation in solution seems to offer greater difficulties than gold. Whenever the solution is high in silver the effects of precipitation are apparent. The plates cease to amalgamate. The copper is bared in spots which rapidly enlarge until half or more of the plate is affected. The tube-mill tables have four plates each, arranged in steps, with a 1-in. fall between. The bare spots always appear on the bottom plate first, then on the one next above; never on the two upper plates. When bare spots appear on a plate, the balance become dark and dry and refuse to take mercury. The material removed at the clean-up is a precipitate similar to that obtained in the zinc plant. The mercury used on such a plate which is not mechanically lost, goes into solution to turn up later in the zinc boxes and precipitate melts. Some of it, no doubt, serves a useful purpose in breaking up alkaline sulphides.

The following method of treatment has overcome these difficulties: The tube-mill plates are all scraped with steel each shift. All movable amalgam is removed. The plates are then well wetted with mercury, about 6 to 10 oz. being required for each of the eight tables. This is rubbed in until the amalgam formed is smooth and plastic. This amalgam contains some copper, and rapidly discolors upon exposure to the air, but remains bright under solution. At the four-hour interval between clean-ups, all the plates are dressed. It might be expected that such treatment would result in more copper in the amalgam deposited, and in shorter life for the plates. On the contrary, the retort metal shows no increase in copper and the plates last just as long as when scraped not oftener than once in two weeks.

Unequal dissolution of the plates tends to render them rough. Frequent scraping rectifies this. Alkaline solutions harden amalgam and render plates capable of retaining but little surplus mercury. This makes frequent clean-ups, sprinkling and dressing necessary. An excessive amount of mercury has the same effect as too little. The amalgam is loosened, channels are formed, down which the mercury flows, leaving the plate dry and hard. The loosened amalgam in part escapes from the plates, the trap recovery is not perfect, and a portion of the escaped amalgam finds its way into launders, tanks, etc. where recovery is difficult.

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*Head amalgamator, Liberty Bell Mill, Telluride, Colo.

The excess of mercury used in dressing and sprinkling, over that used in fresh-water amalgamation, requires closer attention to the traps following the plates. The traps are cylindrical in shape, about the size of a milk pail, and are fed through a pipe from the launder at the foot of each table. All traps are dumped each day. Pulp from tube-mill plates is collected in a launder which discharges into a baffle box. This box is about 8 ft. in length, a foot deep, and 2 ft. wide. It is divided into two compartments by a baffle extending longitudinally. The plate launder discharges into one of the compartments thus formed against the baffle which breaks and distributes the current. On the opposite side of the box are outlets to seven traps similar in shape to the battery-plate traps, but larger, being designed of the maximum size that will induce a current sufficient to free them from the pulp. This baffle box is emptied from beneath, each shift. The traps, baffle box, and riffles which follow, recover practically all mercury and amalgam escaping the plates, with the exception of such mercury as goes into solution. The amount of amalgam and mercury found in other parts of the mill does not exceed a few ounces per year.

Mercury does not flour or become "sick" in cyanide solution. The stock of mercury in use is not treated for removal of impurities, except that portion distilled in retorting. The total loss of mercury from all causes is about 2500 oz. per month or about 0.2 oz. per ton of ore. This is 1000 oz. in excess of the average loss before the temperature of solutions was raised. As less is found through the lower part of the mill than formerly, it is concluded that the increase in loss is chargeable to the greater solubility in warm solution.

Effect of Solution on the Plates

A detailed record is kept of the consumption of copper plates. Before May, 1912, the temperature of the solutions varied with the seasons from about 50° F. in winter to 60° F. in summer. During the summer of 1912, the practice of specially heating was adopted. Since that time solution temperatures at the plates have been maintained at about 70° F. at the battery plates and two degrees lower at the tube-mill plates.

TABLE 1—PLATE RECORD

	Factors of Destruction				Life	
Plates	Temp.	Ag. Deposited	Dressing, per Day	Scraping	Months	Days
Upper half battery to May 31, '12...	55	Little	6	Rarely	7	18
Upper half battery to May 31, '13...	70°	Little	6	Rarely	4	28
Lower half battery to May 31, '12...	55°	More	3	1 in 3 days	5	16
Lower half battery to May 31, '13...	70°	More	3	1 in 3 days	3	27
Tube mill to May 31, '12...........	56°	Most	5	Rarely	5	14
Tube mill to May 31, '13...........	68°	Most	6	3 per day	3	7

Table 1 is compiled from the plate record. The average life of the plates replaced during the six months prior to May 31, 1912, and for the same period prior to May 31, 1913, was taken as representative of the temperature factors of plate destruction. There is a marked difference in the life of the plates depending upon their relative position. To make this clear, in the table, they are classified according to position. There are probably other factors of destruction than those given which will occur to the technical mind, but the writer is not certain of them.

The following facts may have some bearing upon the reasons for the wide difference in the life of the three classes of plates. During the first period, 20,000 oz. of silver were recovered by amalgamation; during the second period, 30,000 oz. During the first period the recovery of amalgam per unit of area was greatest on the upper half of the battery plates. During the second period the lower half of the battery plates and the tube-mill plates were in excess per unit of area, with little difference between them. The upper battery plates have always been the only ones which presented the familiar appearance of free-gold amalgamation. The lower half, and the tube-mill plates receive a uniform deposit on every part of their surface, with none of the little spots and ridges of amalgam as seen in water amalgamation.

Silver is precipitated from cyanide solutions by mercury, and probably to a much greater extent by copper or copper amalgam. An amalgamation test of battery-head solutions, free from pulp, shows (1) that silver is amalgamated; (2) that the proportion of silver amalgamated is increased by increasing the temperature; (3) that the actual increase in the percentage of silver recovery by amalgamation corresponds closely with the computed increase due to precipitation from solution.

The tube-mill plates receive a pulp less abrasive than the battery pulp, a solution weaker in cyanide and lime, cooler, and formerly were dressed least often and scraped rarely. Nevertheless they show more rapid destruction than the other plates. Recent change in the practice of dressing and scraping the lower plates from partial to close cleaning, and from occasional scraping to skinning each 8-hr. shift, other factors remaining the same, has not shortened the average life of the plates.

From the above tests and from observation of the effects of varying grade in the ore milled, and other factors noted, the conclusion is formed that precipitation of silver, and other metals and compounds from solution, and their replacement in solution by the copper of the plates (and mercury in the amalgam), is the chief factor in plate destruction, with the increased dissolving power due to higher temperature second.

Effect of Plates on Solutions

So far as investigated, there is no deleterious effect. About 7% of the copper dissolved is accounted for in the zinc plant. It gives no trouble there, nor in refining. Battery-head solution shows but one part copper in 600,000, which might be accounted for from other sources.

The purpose of amalgamation in conjunction with cyanidation is stated above, and it may be considered as an auxiliary, performing a function which the cyanide treatment cannot perform, or cannot perform as well. Methods of crushing, pulp-solution ratios, plate area, etc., are all designed primarily with reference to cyanide treatment. The resulting conditions are rarely ideal for amalgamation, but so long as amalgamation fulfills the requirements, the recovery of the metallic particles not readily dissolved by cyanide, no matter how small that percentage may be of the total value, or total recovery, it has justified its use.

No metallics occur in the concentrates recovered after amalgamation. Any gold or silver susceptible to amalgamation or cyanidation going into the concentrate tailings and through the tube mills is fine enough for solubility. It is therefore concluded that amalgamation has performed its duty.

From 1898 to 1905 amalgamation in water was practiced. The average percentages of gold and silver contents of the ore recovered during that period were 64.6% of the gold and 4.16% of the silver. From 1905 to 1912 amalgamation in cyanide solution resulted in the recovery of 57.3% of the gold and 8.08% of the silver. During the former period there was no regrind of sands.

Raising the temperature of solutions from 55° F. to 70° F. has resulted in the following change in the percentage of total value recovered by amalgamation.

	Au.	Ag.
Six months prior to April, 1912............	48.98%	7.12%
Six months subsequently....................	50.20	11.30

Costs of amalgamation for 5 months are given.

TABLE II. COST OF AMALGAMATION

Month	Labor	Suppleis					Cost per Ton
		Mercury	Plates	Brooms	Misc.	Total	
January........	$640.75	$54 18	$346 52	$44 00	$33 07	$477.77	$0 08158
February.........	589.19	112 28	380.34	42 62	25.53	560.77	0 0793
March..	548.59	106.83	237.61	33.00	25.87	403.31	0 06449
April............	621.44	105.78	490 05	34 37	30.32	660.52	0.07952
May............	643.10	88.20	601.64	42.63	24.18	756.65	0 08077

I wish to acknowledge the assistance of the staff of the Liberty Bell company in the preparation of this article.

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Platinum in Westphalia

A correspondent of the London *Mining Journal* calls attention to a paper read at the last general meeting of the Association of German Metal Smelters & Miners by Professor Krusch, an authority of high international repute. It deals in detail with the geology and petrography of the supposed platiniferous areas in Westphalia, and, shortly summarized, states that according to special surveys of the area, the tectonic formation of which is difficult to determine, platinum does indeed occur in the Silurian and Lower Devonian formation of the Siegen district, where strata of graywacke, quartzite, sandstone, etc., continuously alternate with strata of argillaceous shale. The explorations and experimental investigations of the last few years have been almost exclusively restricted to the graywacke and allied strata, it being believed that the extraction on a large scale of platinum from the argillaceous shale is out of the question.

The graywacke appears to be an ancient alluvial created by the breaking up of elder rocks into fragments, which were subsequently joined by the binding material to a solid mass. The metal association—platinum, chrome, nickel, iron—suggests basic eruptive rocks as the primary deposits; probably they form part of the up to now unknown primeval rock which is now covered by the palæozoic sediments. The platinum recovered in the Ural and in Colombia from loose alluvials has its origin likewise in basic eruptive rocks.

There is but little prospect that the primary deposits will ever be discovered; but, in view of the fact that the analogous occurrences in the Ural and Colombia are not payable, the conclusion seems to be justified that those in Westphalia will likewise have no practical importance.

Union Miniere du Katanga

Two steam shovels, having a capacity of 200 tons in 10 hr., were placed on the Star of the Congo mine, in January of this year, and at the time of the recent annual meeting were reported to be operating satisfactorily, says the London *Financial Times*. Two more steam shovels have been ordered for the Kambove mine, which are more powerful than those at the Star and will have a capacity of from 500 to 600 tons in 10 hours. General operation at the Kambove mine is expected to begin in 1915; six months' work at this mine in 1913, produced 11,000 tons of smelting ore. The Star of the Congo mine produced 50,000 tons of smelting ore in 1913; the Luushia mine produced 20,000 tons of ore, most of which had to be made into briquettes. The copper production in 1913 amounted to 7245 tons of copper, made at a cost of £32 per ton, at the works. The cost of marketing and refining is about £12, according to Robert Williams. There was much difficulty owing to labor shortage in 1913, which has been somewhat improved by recruiting in neighboring colonies.

In the latter part of June, 1914, the third furnace was blown in and the production for the first six months of this year was 4520 tons of copper bars, averaging 96 to 97% copper, and 100 tons of matte containing 65% copper. Since Archer E. Wheeler's appointment as consulting engineer, four new blast furnaces have been ordered for the smelting plant at Lubumbashi. A 50-ton experimental concentration plant has also been ordered and is on its way to Africa. Development work in the Kambove No. 2 and the Likasye has indicated that these will be among the richest mines owned by the company. It is expected that work will be started soon at the Likasye.

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Chino Copper Co.

Report of the Chino Copper Co. for the second quarter of 1914 shows a production, in concentrates, of 6,109,888 lb. of copper in April, 5,266,881 lb. in May and 5,656,102 lb. in June, a total of 17,032,871 lb. In addition 1,008,580 lb. were produced from ore shipped to smelters.

Total ore treated was 587,900 tons, containing 2.165% copper. Extraction was 66.897%, or 28.972 lb. of copper per ton milled. There were 52,323 dry tons of concentrates produced, containing 16.276% copper.

The cost per pound of net copper from milling operations, after allowing for smelter deductions, but without crediting miscellaneous income, was 7.67c. per lb. From both milling and shipping ores, the cost of copper was 7.78c., but by allowing credit for miscellaneous income, the cost is reduced to 7.49c. These costs include all usual operation, administration and general charges, and 30c. per ton for extinguishment of mine development and stripping cost.

Milling profit was $1,012,409; crude ore profit, $89,832; miscellaneous income, $19,863. Deducting dividends paid of $652,080, the net surplus is $450,024. Earnings are based on a price of 13.9191c. per lb. for copper.

Steam shovels moved 1,434,778 cu.yd. of material in place, of which 1,119,805 cu.yd. were stripping, and the remainder equaled 654,176 tons of ore. Average cost of stripping was 30.7c. per cu.yd., and of mining ore 20.4c. per ton

Ampere Efficiency in Electrolytic Refining

By Kenneth S. Guiterman*

SYNOPSIS—A research to determine what current or ampere efficiency might be expected during the electrolytic refining of copper, and also to ascertain how certain impurities which might be present in the electrolyte would affect this normal, or, under such governing conditions the maximum efficiency. The impurities which were dealt with in this connection were arsenic and iron, as these are the most common and deleterious foreign elements which are present in copper electrolytes.

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Inasmuch as the results from an investigation of this character would likely have not only a theoretical but also a practical value, it was aimed to maintain the various factors entering into the problem at close approximation to those obtaining under actual operating conditions.

In accordance with this plan, the following factors were kept as constant as possible throughout the entire investigation:

a. Current density, 12 to 14 amperes per sq.ft.
b. Copper in the electrolyte, 3% to 4%.
c. Free sulphuric acid (H_2SO_4), 12% to 14%.
d. Circulation, 6 gal. per min. per each 131 cu.ft. of tank volume.
e. Temperature of the electrolyte, 135° F., or 57.5° C.

Apparatus

The apparatus with which the research was carried out consisted of the following: Three lead-lined stoneware tanks, terraced in order to facilitate the flow of the electrolyte from one to the other. In so far as it was possible, the electrolyte flowed into the tanks at the bottom and was drawn off at the top. These tanks were 24 in. long, 12 in. wide and 10 in. deep. The tanks were connected in series with the electrodes in parallel. Current was carried to the electrodes by means of double triangular busbars giving knife-edge contacts, thus insuring the minimum voltage drops at these points. The current which was used in the investigation was supplied by a small motor-generator set, which insured a current at a fairly constant potential.

The electrolyte was heated by means of steam coils placed in the main reservoir tank. The circulation of the electrolyte was accomplished by means of a small "Blair" pump which delivered the solution from the heating tank to a constant-level overflow tank above. From here the electrolyte passed to the electrolytic tanks under a constant head, thereby maintaining a constant rate of circulation.

In each tank were suspended seven 9½x8½-in. cathodes and six 7½x8-in. anodes, the latter being ½ in. thick. Under the above conditions the effective cathode area per tank was 6.75 sq.ft. The electrodes were spaced one inch apart from surface to surface.

Under a current density of 14 amp. per sq.ft., the above cathode area would necessitate a total current of 94.5 amp., which figure it was endeavored to maintain constant at all times.

The electrodes were carefully insulated from each other by means of glass blocks, and the tanks themselves were raised from the floor by mounting them on glass knobs. As a consequence of these precautions, the loss of current as a result of grounds or other short-circuits was made impossible, and all of the current used passed through the electrodes.

Experimental

In order to obtain a "standard of efficiency" under the best possible conditions, experiments were first made by using pure copper electrodes and a pure copper-sulphate electrolyte containing free sulphuric acid.

After this standard had been established, measured impurities were gradually added to the electrolyte, while the electrodes used during the electrolyses continued to be of pure copper. These experiments were then followed by others in which anodes of commercial blister copper were substituted for those of the refined material. For details of electrolyte analysis, and other conditions affecting individual experiments, reference may be made to Table 1 for all experiments.

Two sets of experiments run under the conditions of wire-bar copper anodes and a pure electrolyte gave efficiencies for the three tanks of 93.8% and 95.4% of the theoretical. This average of these figures is taken as the equivalent of 100% actual efficiency in the subsequent

TABLE 1. AMPERE EFFICIENCY IN ELECTROLYTIC COPPER DEPOSITION

Exp. No.	Av. Total E. Volts	Av. Tank E. Volts	Av. I Amperes	C.D. Amps., Sq Ft.	Temp. Deg. C.	Sp. Gr.	Glue Added, Grams per Day	NaCl Added, Grams per Day	Free H_2SO_4—%	Cu—%	As—%	Fe—%	Metered-Amp.-Hr.	Theoretical Deposit, Lb.	Actual Deposit, Lb. 1	2	3	Efficiency, % 1	2	3	Av. Efficiency—%
1	1.15	0.38	95	14.0	64	1.14	...	...	8.95	4.15	.....	....	4,114	10.75	10.0	10.1	10.1	93.25	94.1	94.1	93.8
2	1.13	0.37	96	14.2	61	1.15	...	...	8.80	4.19	.....	....	4,716	12.3	11.75	11.60	11.85	95.5	94.2	96.5	95.4
3	1.20	0.40	92	13.7	62	1.155	5	5	8.70	3.99	.....	....	4,478	11.7	11.15	6.75*	11.25	95.4	.	96.3	95.8
4	1.20	0.40	92	13.7	57	1.14	5	5	10.30	3.90	.....	.....	7,125	18.6	17.75	18.05	18.10	95.5	97.5	97.5	96.6
5	1.08	0.36	94	13.9	55	1.163	5	5	9.15	3.6	0.023	....	4,764	12.5	12.15	12.25	12.15	97.2	98.0	97.2	97.5
6	0.73	0.36	92	13.7	53	1.155	5	5	9.95	3.8	0.065	....	7,448	19.4	18.5	18.7	.....	95.5	96.5	...	96.0
7	0.60	0.30	91	13.5	47	1.14	5	5	9.85	2.52	0.270	....	9,435	24.7	23.1	23.1	.....	93.6	93.6	....	93.6
8	0.83	0.41	96	14.2	57	1.145	5	5	10.30	2.90	0.705	....	12,221	32.0	30.5	27.75*	.....	95.3	86.7*	....	95.3
9	0.88	0.41	93	13.9	63	1.15	5	5	10.55	3.01	1.040	....	11,968	31.3	29.5	29.75	.....	94.5	95.2	....	94.8
10	0.60	0.30	94	14.0	62	1.16	5	5	11.10	3.13	1.84	....	12,061	31.6	29.75	29.75	.....	94.3	94.3	....	94.3
11	0.99	0.49	93	13.9	57	1.17	5	5	10.5	2.98	1.71	0.43	8,807	23.0	22.6	22.6	....	97.9	97.9	....	97.9
12	0.95	0.47	90	13.4	59	1.18	5	5	8.60	3.05	1.70	0.85	14,085	36.8	34.5	34.4	.....	94.0	93.5	....	93.8
13	1.00	0.50	98	14.5	56	1.18	5	5	8.40	3.40	1.66	0.85	2,304	6.03	5.6	5.6	.....	93.0	93.0	....	93.0
14	0.73	0.36	95	14.1	66	1.23	5	5	5.90	5.15	1.65	0.98	8,425	22.02	20.31	21.0	.....	92.5	94.5	....	93.5

*Result disregarded.

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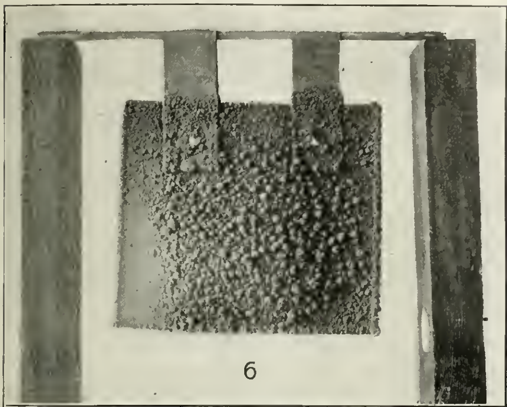
*Chief chemist, research laboratory, A. S. & R. Co., Perth Amboy, N. J.

investigation. The cathode (No. 6) showed a distinct crystalline structure.

ADDITION AGENTS

Still keeping the pure anodes, glue and salt were tried as addition agents in amounts equivalent to 12 to 16 lb. per day per 100,000 cu.ft. of electrolyte, giving an efficiency of 95.8%.

By referring to the table, a discrepancy in the weight of the deposited copper will be seen in tank 2. This shortage was accounted for by a short-circuit which occurred between the electrodes of the tank during the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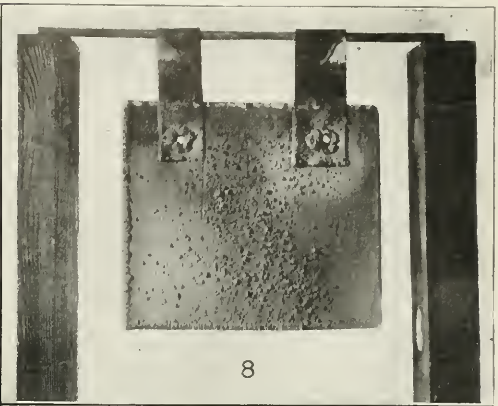
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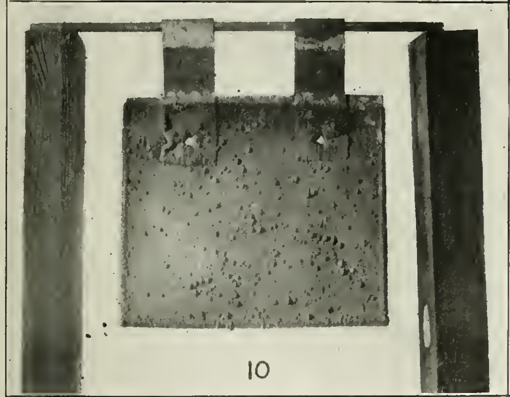
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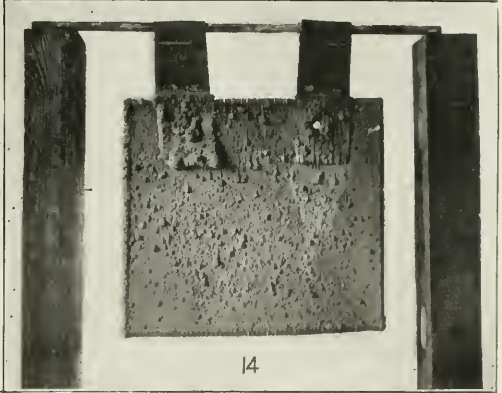
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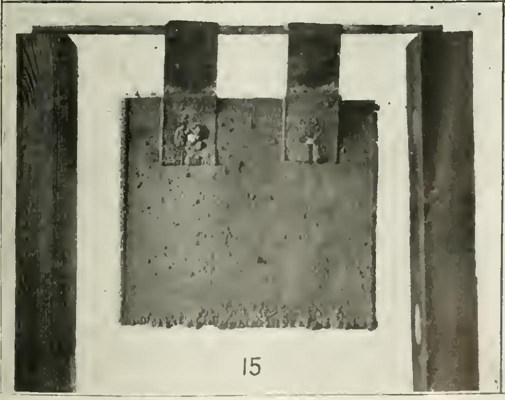
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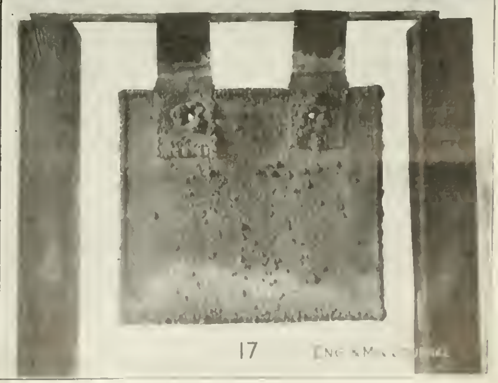
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Fig. 6. Pure Electrolyte. No Addition Agents
Fig. 10. Electrolyte Containing 0.023% Arsenic
Fig. 15. Arsenic in Electrolyte, 1.86%

Fig. 8. Pure Electrolyte, with Glue and Salt
Fig. 14. Arsenic in Electrolyte, 1%
Fig. 17. High Arsenic and Iron in Electrolyte

night, when the process was without supervision. From the results obtained in tanks 1 and 3, where the short-circuit was without influence, it is evident that the presence of glue and salt is without deleterious influence upon the current efficiency. A change in the physical structure of the deposited copper is seen, however, by referring to the cut of cathode 8. The extreme tree-like and crystalline formation evident in cathode 6 is no longer apparent. The cathode appears smoother and more rounded. A repetition of this gave 96.6 efficiency, a similar result.

Arsenic (0.023%) was next added. The physical structure of the deposited copper remains about the same, as can be seen by cathode 10. The efficiency was 97.5%.

It will be noticed that so far no substantial effect upon the current efficiency is apparent as a result of the presence of glue, salt or small amounts of arsenic in the electrolyte. Small increases in the efficiency were indicated from time to time, but I believe these to be absolutely inconsequential and inevitable, as such variations would naturally be anticipated under the conditions of the experimentation.

An increase of arsenic in the electrolyte to 0.065%, still continuing the use of pure copper electrodes, had no perceptible effect on character of deposit or efficiency, nor did the further increase of 0.27% of arsenic. (See table.)

The arsenic was then increased to 0.7%. By referring to the accompanying Table 1, it will be seen that the current efficiency obtained in tank 2 was low, being only 86.7%. This low value was again the result of a short-circuit which occurred in the tank during the electrolysis. The current efficiency obtained in tank 1, where no short-circuit occurred, remained good and practically constant at 95.3 per cent.

The arsenic was then raised to 1%. Cathode 14 shows the cathode copper produced. This copper, though somewhat nodular, is still very good in appearance. The average current efficiency remains unchanged at about 94.8 per cent.

The arsenic content of the electrolyte was again raised, to a value of 1.86%. The current efficiency obtained was 94.3%, and the character of the copper continued to be excellent, as may be seen from cathode 15.

INFLUENCE OF IRON

At the conclusion of the previous experiment no further additions of arsenic were made to the electrolyte, inasmuch as a content of 1.86% was already in liberal excess of that commonly met with in practice. In subsequent experiments, therefore, iron only was added to the electrolyte. This was introduced in the form of iron filings, which at once dissolved to the ferrous salt, replacing copper in solution. The electrolyte used in the following experiments consequently contained not only arsenic, from the previous experiments, but also the gradually increasing amounts of iron which were added from time to time. The final iron content in the electrolyte was about 1%, which amount is above that ordinarily obtaining in practice.

In the first experiment 0.43% of Fe was present. The deposit appears to become somewhat more crystalline in appearance as the percentage of iron increased in the electrolyte. The current efficiency, however, continues excellent, as may be seen from the records on this and succeeding experiments.

With pure copper electrodes, acidulated copper-sulphate electrolyte, arsenic about 1¾%, and 0.85% of Fe, the efficiency obtained was 93.8%, and the physical structure of the copper was perhaps a trifle more crystalline than in the previous experiment. This may be seen from cathode 17.

In a repeat experiment the total percentage of iron in the electrolyte remained the same. Hydrogen peroxide was added, however, in such an amount as to oxidize about two-thirds of the total iron content. The current was then passed through the electrolyte under the ordinary conditions which had previously obtained. The duration of the experiment was 24 hr., at the end of which period the deposited copper was washed and weighed in the usual manner and the solution analyzed. This analysis showed that all of the iron present in the electrolyte had been completely reduced to the ferrous condition. The current efficiency remained practically unaffected (93%), however, notwithstanding the fact that the experimental errors were greatly magnified as a result of the short time of the electrolysis.

BLISTER COPPER ANODES

This experiment was made with the substitution of commercial blister copper anodes for those of the pure wire bar copper which had hitherto been used.

New starting sheets were hung in the electrolyte in order to minimize the chance of short-circuit and consequent error. All metal contacts were carefully cleaned, which resulted in the much lower tank drop which is recorded in the table. In addition an extra effort was made to keep all of the contacts uniform so that all of the cathodes should have a uniform current density. The direct result of this latter precaution was a much improved appearance of the deposited copper. The current efficiency continued normal at an average of about 93.5 per cent.

SUMMARY

A summary of the results obtained in the foregoing experiments shows:

(1) The average standard or normal current efficiency obtained under ideal conditions of purity of the electrolyte is about 95%, as recorded by the ampere-hour meter used.

(2) *In toto* 14 experiments were made which yielded the results shown in Table 1.

(3) In these 14 experiments the purity of the electrolyte was purposely vitiated by adding: (a) Glue and salt in a measure proportional to the quantities used in practice, *i.e.*, 12 to 14 lb. per day per 170,000 cu.ft. of electrolyte; (b) arsenic in increasing quantities up to a maximum content of between 1.5% and 2% in the electrolyte; (c) iron up to a maximum content of about 1% in the electrolyte; (d) hydrogen peroxide to the already foul electrolyte for the purpose of oxidizing the iron content from the ferrous to the ferric condition.

(4) In all of these experiments the resulting current efficiency did not vary from the average normal efficiency by more than plus or minus 2%, which is well within the limits of experimental error.

(5) Changes in the impressed voltage resulted in the main from impaired metallic contacts and temperature changes.

(6) Changes in the specific gravity of the electrolyte resulted not only from the addition of impurities to the

solution, but also by virtue of the unavoidable concentra- of the electrolyte from time to time.

(7) Iron is always present in the electrolyte in the reduced or ferrous condition. If it is oxidized by outside agencies, it is very quickly reduced again during the electrolysis and remains in such condition.

Selling Mining Property

By C. Lorimer Colburn[*]

It is my belief that never before in the history of mining has there been such a good opportunity for the sale of mining property. A large number of mines are changing hands, and more mines could be sold if it were not for the lack of salesmanship on the part of the owner.

The market is filled with *bona fide* purchasers. The wildcatter is almost extinct. The watchful eye of Uncle Sam and the cutting criticism of the press have ruined his game. The prospective buyer now is the successful operator, who is looking for a mine to work, not a project to float.

Purchasers of mining property may be divided into several classes: (1) Large exploration and ore-purchasing companies; (2) successful mining companies whose orebodies are fully determined; (3) manufacturers who need certain ores for raw material; (4) mining men who have made money and want to make more; (5) promoters who have a satisfied group of clients; (6) individuals and associations who have devised special processes.

Each class has its own needs and wants. The careful mine salesman will consider these wants before he offers his property for sale.

Big Business

The first class constitutes those groups of large capitalists who are organized for big business. They are looking for large properties, they have millions of dollars to spend in mining and marketing their products, and to interest them one must show an almost unlimited possibility of ore that can be mined economically on a large scale. They will prospect and prove a territory, provided the territory shows unusual signs of successful development. Men handling millions cannot afford to consider hundred-dollar enterprises.

Mining Companies and Manufacturers

The second class constitutes mining companies that have made money for their stockholders and are thoroughly organized. They have prudently put a percentage of their earnings into development work. In order to supplement their fast disappearing orebodies, they are in the market for new mines. They are, of course, prejudiced in their choice and prefer a mine similar to the one they are working. If they are mining gold, they are looking for gold mines. If they are dredging, they are looking for new dredging ground. If they are mining zinc, they have their organization ready to handle zinc mines.

Manufacturing concerns are in mining only to insure to themselves an ore that they, as manufacturers, need. They are not in the mining but in the manufacturing business. There are chemical works that need ores in the manufacture of chemicals, and there are electrical concerns that need mica in the manufacture of electrical instruments.

Mining Men

The fourth class consists of those individuals who have made money in mining through their own efforts. They have bought a property, then developed and sold it, or they may have been fortunate in leasing. These men are open for any kind of a mining venture, but of course prefer a property similar to the one in which they made their money.

Promoters

There are men who have had the mining and business training and have the acquaintance necessary to make them first-class promoters. These make up the fifth class. Many of them have already been successful in mining. Some have been interested in kindred branches of business. Most of these men are willing and ready to promote a promising prospect or mine. They must first be convinced that the venture has a good chance to succeed, and the price and terms must be reasonable. Very often such men have funds of their own to invest and call on their friends for additional help. They must treat their friends fairly, or soon they will be without friends. The day of selling mining stocks with flamboyant advertisements and misleading literature is past.

Inventors

Today is a great day for new processes. The inventors and backers of these processes often have to secure a special ore to prove and develop their methods. They are therefore often in the market for a mine capable of producing such an ore. They make up the sixth class.

Selling Is Legitimate

There are many people who have mines for sale and are prompted by the most honest and upright motives. There is a notion in the mind of the general public that a man wishes to sell a mine only when he finds out that there is nothing in it. This notion is unfair. A man is just as honest in selling a mine, if he thinks he can make a profit by so doing, as a real estate man is in selling a farm. In both cases an honest man will set forth the facts concerning the property and endeavor to interest those who can use it to a profit. The great majority of properties now on the market are raw prospects. Some, of course, are more promising than others. Some are the lost hopes of defunct mining companies. There are partly developed and fully developed mines for sale. Some of these properties are salable and in demand. Others can be made salable. The reason that so many are begging for a purchaser is because the person at the head is either a poor salesman, is poorly informed regarding those who can use his mine to advantage, or is financially unable to place the property in a salable condition.

A grocer who wishes to sell butter makes his butter attractive. He puts it up in pound or quarter-pound packages to suit the customer. The wise man who has a house for sale paints it and puts it in good repair, so as to make it attractive, before he puts it on the market.

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[*] Allen & Colburn, mining engineers, Ideal Bldg., Denver, Colo.

[Note—This article was put in type before the outbreak of the present war, with its consequent upsetting of business conditions.—Editor.]

The piano salesman arranges the payments on the piano to the satisfaction of his customer. He must be prepared to give extended credit. In all cases the wise salesman is striving, first, to get the attention of his customer; second, to make him want to purchase; and third, to make him purchase at a price so that a profit can be made on the transaction. Anybody can give a valuable article away, but it takes a good salesman to sell it at a profit. To sell a mine for a fair price takes time and hard work. The man who undertakes such a task should recognize the stupendous problem and put forth his best effort. He should first thoroughly familiarize himself with the property. Then he should study his prospective purchaser and attempt to make the property attractive to him. He must also arrange the price and terms so that it is possible for the prospective purchaser to take the property. Then if he can make the purchaser want the property a sale can be made.

Requisites for a Sale

Three things are necessary to interest a purchaser:

(1) Facts must be presented, not theory. The prospective purchaser demands such facts as amount of development work, equipment, ore blocked out, evidence of additional ore, kind of ore, nature of deposit, topography and location. A little theory might be necessary, but it should occupy only a secondary place. A person should not be compelled to read an extended discussion in order to get at the simple facts. Once a man had a large copper property for sale. He offered it to a mining company that was in the market for a copper property. He claimed that a large body of ore was exposed. He did not know the facts himself, but presented an engineer's report to give the information. This report was 76 pages long, but nowhere did it give a brief and clear estimate of tonnage or tell the character of the ore; consequently, the deal failed. A few facts, simply stated, might have sold the property.

(2) Facts must be given in a clear and attractive manner. A great deal is gained if the first impression is good. If one attempts to interest a large company the reports, maps and other information must attract favorable attention in competition with other reports that have also been submitted. Although the mine may be a desirable purchase, unless the salesman, armed with his information, can attract attention the property may be rejected.

(3) The property must be in such a condition that the facts can be easily verified. No reliable purchaser will take a property on mere hearsay evidence. He must go and see for himself. He is liable to become suspicious if the drifts are impassable and the important workings are under water.

The owner of a mining property can either wait until some live mining man recognizes the value of his property, or, if he has a property of real merit, he can go out and seek a purchaser. To do this he must spend some money, the amount of which will depend on the property he is trying to sell. The average owner is not capable of selling a mine; he should employ a good mine salesman. But he himself should prepare the property for sale and supply the necessary information. It is hardly necessary or wise to prepare elaborate reports and maps, but a little money spent on obtaining fresh, clear information is essential. A gravel bed is worth little if mere rumor reports it as containing gold, but it is worth a great deal if 10 drill holes have been sunk to bedrock and show the bedrock to be 20 ft. deep with gravel running 40c. per cu.yd. in gold. If the owner has not the money to finance the sale he can often, by putting in good form all the facts he has at his command, interest a friend to finance the sale for him.

Price and Terms

The proper valuation of mining property calls for the highest skill of the mining engineer. In a developed mine the orebodies can be measured and their value determined with a fair degree of certainty. In a partly developed mine the engineer is aided in his guess at the probability of future orebodies by a careful study and analysis of the ore already exposed. In a prospect the value is almost entirely imaginary and therefore is susceptible of wide variations. A prospector who locates a claim begins at once to count the millions that his claim will produce. Day after day his dream of a great fortune increases until he finds ore; then the value of his property has been so magnified that he places a prohibitive price on it. Often he spends the rest of his natural life rudely working his property, suffering all the privations of poverty and doggedly insisting on his original demands. This man would act with much more wisdom if he would allow a good promoter to take over his property on long-term payments with little or no cash. He should demand references from the promoter and lay more stress on his honesty and ability than upon a short term of payment. It is of great importance that the first promoter make a success of developing the property, and he should be given every assistance. The best mine is hardly ever sold for cash. The payments usually extend over several years, with a royalty on all ore extracted, to apply on the purchase price. In some cases when a company needs a particular parcel of mining property and can get a favorable price, a cash deal is made. These cases are comparatively few.

If the agent for the sale of mining property knows the property, knows the vital facts concerning the property, knows how to present them, knows that the mine will stand examination so that his statement can be verified, and knows that he can give a reasonable price and good terms, and also provided that his property has real merit, he should have no trouble in making a sale.

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Mineral Production of Chile

The mineral production of Chile for the year 1912 has been given in the "Boletin de la Sociedad Nacional de Mineria," and was as follows, the items being arranged in order of descending values: Nitrates, 2,585,580 metric tons; copper, 41,647; coal, 1,334,407; borates, 43,356; iodine, 458 tons; silver, 39,467,693 grams; guano, 18,266 tons; gold, 1,100,594 grams; salt, 17,045 tons; sulphur, 4431; iron, 6451; perchlorate, 87; lead, 4½; potash salts, one ton.

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Minerals of California, is the title of Bull. No. 67, issued by the State Mining Bureau and available for distribution July 1. The manuscript was prepared by A. S. Eakle, Ph.D., professor of mineralogy in the University of California. Each chemical group of minerals constitutes a chapter in the book. One chapter is devoted to distribution of minerals by counties. Information is systematically given for each variety, as follows: Chemical composition, crystal form, occurrence, cleavage, fracture, color, streak, luster, hardness, specific gravity, and a description of places in California where it is found, including in most cases individual deposits as well as town and county. There is also an alphabetical index of minerals.

Salt Lake Meeting, A. I. M. E.

Special Correspondence

The Salt Lake meeting of the American Institute of Mining Engineers opened most successfully on Aug. 10. By Wednesday, 320 members had registered with more coming. After registration on Monday morning at the headquarters, Hotel Utah, an organ recital was given at the Tabernacle in the afternoon, followed by a trip around the city by auto. The first technical session was held Monday evening in the ball room of the Hotel Utah, opening with an address of welcome by D. C. Jackling, and a response by B. B. Thayer, president, R. C. Gemmel presiding.

Mr. Jackling's address included a review of Utah's mining industry, and praise for the institute in the advancement of mining and metallurgy. Papers were then read by Laist and Aldrich, Laist and Frick, Austin, Holt, Croasdale, Laist and Wiggin, Bacorn, Goodale, Bancroft, Alling, Butler and McCaskey. The ladies were meanwhile entertained at an informal reception.

On Tuesday morning a special train was run to the Bingham mines, to see the Utah Copper Co.'s steam-shovel operations and mills, and to the Garfield smelting plant. A talk was given by Manager Gemmel on blasting, drilling and other operating costs, and the usual blasts were set off at noon. Luncheon was served on the train during the ride to Magna.

The U. S. Bureau of Mines' mine-rescue car was included in the Magna trip, and a demonstration was given of first-examination and pulmotor work. There were 285 members on this excursion. The technical session in the evening was presided over by William Wraith and papers were read by Howard, Anderson, Addicks, Newhouse, Norton, Hulst, Palmer, Lewis, and Alexander. A smoker was given at the University Club after the session.

On Wednesday a special train, carrying 106 members, was run to the Murray plant of the American Smelting & Refining Co., thence to U. S. Smelting Co.'s smelters and zinc plant at Midvale, after which lunch was taken on the train *en route* to Tooele. A luncheon was given at the Country Club for the ladies meanwhile. At the technical session Wednesday evening, C. W. Whitley presided. Papers and discussion by Lyon and Arentz, Divine, Wentworth, Bretherton, Bardwell, Demond, Jones, Lyon and Keeney, Kuzell and Wigton, Howard, Kuchs, and Lewis were read.

Thursday morning a Utah branch of the A. I. M. E. was organized, R. C. Gemmel presiding, 40 local engineers present. Bylaws were adopted, and the organization will be perfected in October. An excursion to Park City, participated in by 111 members, visited the Silver King mine, and Mines Operating Co.'s mill. Sidney J. Jennings presided over the technical session on Thursday. Papers by Joralemon, Van Horn, Allen, Ward, Dorr, Clevenger, Hodgson, Bedford and Hague, Livermore, Wise and Strache, Allen, Chance, Raymond and Crowfoot were read. In the discussion T. C. Hoyt, of the Forestry Service, answered a series of questions by Winchell, regarding the Government's attitude toward mining. This ended the business meeting, the remainder of Thursday being devoted to a lunch at the Alta Club, and an excursion to Saltair.

On Friday, 105 members went on an excursion to Provo Cañon, Vivian Park, and the Olmstead power plant. Friday evening a closing banquet was held in the Hotel Utah, W. L. Saunders acting as toastmaster. Addresses were made by Thayer, Stoughton, Governor Spry, of Utah, and Allison. President Thayer stated that the meeting was the most successful, most representative and largest in attendance of any meeting in the Institute's history.

Lake Superior Mining Institute

An announcement of the nineteenth annual meeting of the Lake Superior Mining Institute, was made in the Journal, July 4, 1914. It will convene on Monday, Aug. 31, at Ishpeming, Mich. The first-aid contest and rescue exhibition will be held at Union Park, Ishpeming, at 10 o'clock of that day, after which lunch will be served at the Wawonowin Golf Club. During the afternoon, the party will visit the mines in automobiles, and will also inspect points of interest at Marquette. Dinner will be served at the Lake Shore Engine Works, Marquette, and will be followed by an entertainment at the opera house in the evening. By making arrangements with certain of those in charge of affairs, members desiring to go underground in the mines of the district can do so.

On Tuesday, Sept. 1, a special train will carry the members to St. Ignace, Mich., whence the steamer, City of Detroit II, will convey them to Detroit, arriving there Wednesday forenoon, Sept. 2. While in Detroit, the Institute will visit the Solvay Process Co., Detroit Iron & Steel Works, Detroit Copper & Brass Rolling Mills, some of the automobile factories and other industries. Sept. 3 is the day scheduled for adjournment. While on the boat, enroute to Detroit, meetings will be held, at which the following papers will be read:

"Use of Electricity at the Penn and Republic Mines." By William Kelly and F. H. Armstrong, Vulcan, Mich.

"Methods of Stocking Ore on the Marquette Range." By Lucien Eaton, Ishpeming, Mich.

"General Outline of Mining Methods Used in the Copper Queen Mine, Bisbee, Ariz." By Joseph Park Hodgson, Bisbee, Ariz.

"The Sinking of a Vertical Shaft at the Palms Mine of the Newport Mining Co., at Bessemer, Mich." By Frank Blackwell, Ironwood, Mich.

"Mining Methods on the Marquette Range" Report by Committee.

"Steel Stocking Trestle at No. 3 Shaft, Negaunee Mine." By S. R. Elliott, Negaunee, Mich.

"Ventilation in the Iron Mines of the Lake Superior District." By Edwin Higgins, Pittsburgh, Penn.

"Follow-Up System and Method of Recording Injuries in Compliance with the Workmen's Compensation Law." By Herbert J. Fisher, Iron River, Mich.

"Hydro-Electric Plant of the Cleveland-Cliffs Iron Co." By F. C. Stanford, Ishpeming, Mich.

"Biographical Notices." By Committee.

"Brief History of Marquette Ore Docks By D. H Merritt

"A Trip to Lake Superior." By Robert Kelly in 1853.

Nevada Consolidated Copper Co.

Report of the Nevada Consolidated Copper Co. for the second quarter of 1914 shows a production of 1,880,043 lb. of copper in April, 4,959,589 lb. in May, and 4,483,175 lb. in June, a total of 11,322,807 lb.; 831,589 dry tons of Nevada Consolidated ore, averaging 1.38% copper, were milled, and 55,879 dry tons of Giroux ore

Cost per pound of copper produced, including Steptoe plant depreciation, and all charges except ore extinguishment, was 10.73c. Earnings are based on a basis of 14.09c. per lb. Copper on hand and in transit, sold and unsold, at the end of the quarter was 23,276,016 lb.

Low production, high costs and decreased profits for the quarter can be attributed almost entirely to the necessity of mining a large tonnage of 1.1% ore, with resulting lower copper recovery per ton. The price of copper also contributed to lower earnings.

Deficit for the quarter was $134,978 after payment of the 19th quarterly dividend. In addition, $139,482 was set aside for Steptoe plant depreciation, $79,856 for ore extinguishment, and $9900 for depreciation of Nevada Consolidated equipment, a net charge to undivided profits of $364,216.

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Chuquicamata and the War

Chuquicamata and the European war seem remote enough at first thought. But when it is recalled that some of the Chuquicamata equipment was "made in Germany," the practical cessation of transportation out of that country means indefinite delay for any material that has not been shipped. Most of the important material has already left Germany, and steps have been taken to re-order in the United States such other equipment as will be required for the initial operation. The Chile Exploration Co. is redoubling its efforts toward bringing this great enterprise to fruition and the officials of the company have great hopes of starting copper production in March, 1915, as originally planned.

Much of the work at Chuquicamata is already completed, or nearly so, and the determining factors now in the inception of copper production are the dechlorinating plant at Chuquicamata and the power plant at Tocopilla on the coast.

It is impracticable to state exactly the condition of all the work or to enumerate all the equipment now at the plant sites, as this is continually being augmented. However, as a result of a visit at New York offices of the company, the following general review of construction progress is presented:

The completed and nearly completed departments are: Ore bins, railroad tracks and assembly yards, machine shop, carpenter shop, warehouse, acid plant, laboratory, offices, store, native quarters and dwellings.

The leaching vats are about 75% finished, and the loading and unloading bridges are on the ground. The solution sumps are about 40% done; all the 16-in. and many of the other sizes of lead-lined pipe have been shipped, as well as all the large acid pumps made by the Henry R. Worthington company in this country. The substation at Chuquicamata is under way and is about half finished.

The completion of the dechlorinating plant on time will not be hindred by the fact that none of the 22 dechlorinating drums has been shipped from Germany. These steel drums are 30 ft. long and weigh about 30 tons each; they are lined with brick and "mastic" and have to be shipped assembled. Steps have already been taken to re-order these in America. The first of the Kelly filter presses for this department has been shipped.

The electrolytic tank house is under roof and the first of the 510 concrete tanks is building; the cranes are installed and are operating. About 55,000 insoluble magnetite anodes—over one-half of the ultimate requirements—have been shipped. The steam shovels, cars and other mine equipment are practically all on the ground and there is little chance of delay in the mining operation if only power be delivered. Most of the pipe for the water supply is on the ground and some of the trestles for the water line have been erected.

The crucial factor in the beginning of operations at Chuquicamata is the completion of the power-house units. Two of the four 10,000-kv.a. generators have been shipped by the Siemens-Schuckertwerke, of Germany, which has the contract for the power plant at Tocopilla. One of these generators is now due at the Chilean coast, the second should also arrive soon. Three of these generators are of sufficient size for a 10,000-ton operation and two would enable a start at two-thirds the contemplated initial capacity. All boilers, switchboard fittings and most of the smaller equipment for the first half of the power plant have been shipped. One of the 100,000-volt transformers has been sent forward, and the smaller 5000-volt transformers required for the first half of the power plant have been re-ordered in the United States. All of the 86-mile transmission line has been shipped, erection of towers has begun and some of the wires have been strung. Construction work at the power plant, which was stopped by the contractors at the outbreak of the European war, has since been resumed. At the various operations connected with Chuquicamata, about 2000 men are now reported to be at work, and with favorable delivery of materials at present en route, the officials expect to be able to start operations next March at about half capacity. Consulting Engineer Pope Yeatman sailed this week for Chile, to make an inspection and to expedite work in any departments that may require special attention.

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Refining Practice at Colburn-Ajax Mill

In the JOURNAL of July 25 was published an article under the caption of "Refining Practice at Colburn-Ajax Mill," by R. H. Shaw. We have been informed reliably that the process described in that article was subsequently discarded as a failure. We have no doubt that Mr. Shaw wrote the article in entirely good faith, and believed the process that he described to be a success at the time when he wrote the article. This was in January last. The delay in publishing the article was our own fault, which statement relieves Mr. Shaw from any imputation of contributing an article about what he knew to be a failure.

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Mineral Output of New York

The mineral production of New York in 1913 was as follows, the figures being supplied by David H. Newland, Assistant State Geologist: Cement, portland and natural, 5,340,757 bbl.; petroleum, 916,873; salt, 10,819,521 bbl.; crude clay, 6291 tons; emery, 611; feldspar and quartz, 25,680; garnet, 4665; gypsum, 532,884; metallic paint, 7950; slate pigment, 2200; talc, 75,071 tons; graphite, 1125; iron ore, 1,217,899 long tons; pyrite, 54,903 long tons; mineral waters, 9,448,348 gal. Other mineral substances, including granite, limestone, marble, sandstone, trap, apatite, natural gas, diatomaceous earth, marl and mica, etc., to the value of $12,016,232 were also produced.

The Baghouse in Lead Smelting

SYNOPSIS—A brief history of bag filtration and its initial application in silver-lead smelting at the Globe Smelling & Refining Co., Denver, Colo. Discussion of filtering media and general baghouse practice.

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In the early part of the last century textile fabric was used for the filtration of products of combustion. Lampblack was obtained by passing smoke through a series of canvas bags; natural draft was used to draw and force the smoke through the bags. About 1850 bag filtration was used for collecting zinc oxide. About 1876 it was introduced for collecting the fume from lead-ore hearth smelting in Missouri. Shortly afterward it was used, first at Portland, Me., and later at Cañon City, Colo., for the collection and production of zinc-lead pigment in treating mixed zinc-lead sulphides.

In 1890, the Globe Smelting & Refining Co., at Denver, Colo., installed a baghouse containing 1458 bags for the recovery of fume from silver-lead blast furnaces; this installation was too small to handle all of the gases and was increased to approximately 2300 bags. In 1900 the number of bags was again increased, making a total of approximately 2800. The usual difficulties incident to new installations were encountered, but they were gradually overcome and the baghouse became accepted as standard practice for this class of smelting. As all of the baghouses built since have followed the general lines of the Globe installation, a short description may be of interest.

The Globe Baghouse

The building is 149 ft. 8 in. long by 67 ft. 4 in. wide and 40 ft. 2 in. high from the basement floor to the eaves of the roof, having brick walls 26 in. thick from the foundation up to the thimble floor, from there an 18-in. wall for 16 ft., and a 13-in. wall from this point to the top, a distance of 14 ft. 2 in. Additional stiffening is given to the walls above the basement by pilasters placed every 16 ft. The end-wall construction is similar to that of the side walls with the exception of the spacing of the pilasters, which is somewhat greater. The roof is made of corrugated iron laid on 1-in. boards and supported by a timber framework spaced 16 ft. apart resting on the basement partition walls. On top is a louver running the length of the building to allow the gas to escape.

The basement is 10 ft. high and divided into compartments by brick walls 13 in. thick spaced 8 ft. apart, made tight to prevent the gases from interfering with the cleaning out of the flume in any one compartment while the others are in operation. These walls also carry the thimble floor above, which is made of No. 10-gage sheet-iron plates riveted together as nearly gas tight as possible, so that all gas entering the basement will be forced through the bags above. On the thimble floor are fastened the thimbles, which are 17 in. in diameter and 10 in. high, made of No. 14-gage sheet iron, with a head at the top to attach the bag and a flange at the bottom for riveting to the floor plate. They are spaced on 2-ft. 1-in. centers.

To these thimbles one end of the bag, which is 31 ft. long, is fastened by means of a soft-iron or copper wire; the other end is hung by means of a similar wire fastened to the bag and then given several turns around a 2x12-in. plank overhead, which runs parallel with and directly over each row of thimbles. These planks are carried on cross-timbers resting on the framework, which supports the roof. The bags usually begin to deteriorate around the thimbles. As this takes place the lower end of the bag is cut off and the hanging wire at the top, which has been left sufficiently long for this purpose, is lengthened out; in this way the bag may still be used, although slightly decreased in filtering area.

The gas is drawn from the furnaces through the flue by means of a fan and discharged into a flue passing along the side of the baghouse. Short connecting flues 24 in. in diameter, equipped with gas-tight dampers, lead the gas from the main flue into each separate compartment in the basement. The thimble floor being gas-tight, the fumes are forced up into the bags, the gas filtering through the fabric and passing out through the louver on top of the roof. The fume retained in the bags is dislodged, at regular intervals, by shaking, and deposited in the basement, and is removed through the basement doors after first shutting off the gas from that compartment.

Filtering Media

The ideal filtering material is a thin layer of absorbent cotton, but, owing to the difficulty of cleaning and recovering the fume without destroying the material for filtering purposes, it is impractical. The bags used are either cotton or woolen, and while various other substances have been experimented with, they have not been successful; either on account of excessive cost, or, lacking in nap, the material would act as a screen and fail to abstract the solid particles from the gases. About 20 years ago the writer treated woolen cloth with titanium chloride. This treated material filtered as well as untreated cloth and resisted the corrosive effect of sulphuric acid to a point where the condensed acid fully saturated the bag. The material of the saturated bag then either clogged up and no amount of shaking would dislodge the fume and all filtering ceased, or, if the gases were low in fume and high in acid, the nap of the cloth would fold up on the strands and the fumes would pass through without filtering.

Cotton bags do not offer as great a resistance to the corrosive action of acid and will not stand as high temperatures as woolen. It is difficult to determine from the analysis of the gas which material should be used, as the acid contents and temperatures of the gases, particularly from an oxidizing furnace, are liable to vary greatly. It is better to use woolen bags whenever there is doubt. As woolen bags cost from three to four times as much as cotton, they must last correspondingly longer.

Free Sulphuric Acid Must Be Avoided

The writer recalls seeing all the bags in a building destroyed within 30 min. This happened with gases from a converter working on lead-bearing copper mattes and occurred on the finishing blow to blister, when the lead content of the converter charge was low—under 2%. The

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Note—Excerpts from a paper read by H. H. Alexander before the Salt Lake meeting of the American Institute of Mining Engineers, August, 1914.

converter delivered the gases into a brick flue, the opening of which made a snug joint with the converter snout. The temperature in the brick flue back of the converter ranged from 800 to 1300° F., and at the discharge end of this brick flue the temperature ranged between 400 and 700° F. In this range, giving the proper temperature, from 800 to 1200° F. for conversion, by contact, of sulphur dioxide to sulphur trioxide, the amount of sulphur trioxide formed was in excess of the lead oxide carried by the gases; the surplus acid rapidly destroyed the bags. This was overcome by enlarging the opening in the flue, also an opening with a damper was made in the side of the flue close to the point where the converter discharged into it; the fan was speeded up, thus diluting and cooling the gases. A recording thermometer was placed in the flue 25 ft. from the converter, and 600° F. was the maximum reading permitted on this thermometer. The dilution of the gas was also regulated by analyses, never allowing the sulphur dioxide content of the gases to get over 4%. It had formerly run as high as 9% on the finishing blow. After these precautions were taken a set of cotton bags lasted over a year.

The same action may occur on concentrating and cupeling furnaces where the only sulphur present comes from the fuel. With the temperature of the flue as noted above, the conversion of sulphur dioxide into sulphur trioxide proceeds rapidly and destroys the bags. Fortunately, in a majority of these cases there is sufficient lead oxide in the gases to combine with the sulphur trioxide formed, rendering it harmless.

Another cause for the corrosion of bags is the presence of selenium. The selenium being volatilized and passing off with the gases as an oxide, upon coming into contact with the sulphur dioxide converts the latter into sulphur trioxide with the production of selenium, and unless there are sufficient bases to combine with the sulphur trioxide produced the bags are attacked.

Specifications for Filtering Cloth

Exhaustive tests were made to determine the critical temperature of cotton and woolen bags. The test pieces were cut to 3x4 in. and were pulled, always against the warp, in an Olsen testing machine. Other pieces were placed in a Freas electric oven, which was kept at the proper temperature for the desired period of time, at the expiration of which they were removed and broken in the Olsen machine. . . . Each plant has its favorite brand of cloth, which is required to have a definite number of strands; in cotton cloth these vary from 30x30 to 48x48, depending upon the character of the fume to be filtered; with woolen cloth, owing to the longer nap, a coarser weave may be used, and the number of strands is usually in the twenties. The woolen cloth should contain the natural grease, but, as the manufacturers object to this, the wool is usually scoured and manufactured into cloth and the grease added. After numerous working tests, checked by the laboratory, the following specifications were formulated for a satisfactory woolen cloth:

> The weight is to average 12 oz. per yard and the tensile strength is to be not less than 21.5 lb. per lineal inch. The test pieces are to be square, 3½ in. on a side, and the pull is to be against the warp. The fabric is to contain not less than 85% wool fiber, estimated by taking the difference between 100 per cent. and the sum of grease, dirt, moisture, burrs, and cotton fiber, and to be practically free from vegetable matter of all kinds. The weave is to be 22 ends by 20 picks per inch.

Yarn is used for sewing woolen material. Linen thread should be used for cotton bags, usually No. 40 Barbour's Irish Linen, with a double-lap seam, and lock stitch is specified.

There is a diversity of opinion as to the necessity of ventilation around the bags, but the consensus of opinion is that good ventilation lengthens the life of a bag. Some plants have gone to the extent of drawing the gases from around the bags with a fan and discharging them into a stack. An iron stack 4 ft. 6 in. in diameter and 68 ft. above the roof has proved satisfactory. This stack takes care of 15,000 cu.ft. of gas per minute and maintains a draft of about 0.05 in. of water. The temperature of the gases entering this stack varies from 110 to 130° F. Diffusion stacks after the Wislicenus type were tried for converter gases. They worked nicely, but the rain beating through the openings caused rapid deterioration and they were abandoned.

The number of bags in a compartment which can be closed off from the main current varies greatly. The original Globe baghouse contained 81 bags. Some smelting works have as many as a thousand bags in a compartment. As most baghouses are run continuously, one or two compartments are usually cut out for cleaning, shaking, etc., and it is therefore better that a unit be of such size as not to have too large a percentage of the filtering area cut out when one or more compartments are closed.

The filtering area or bag surface necessary to handle a given amount of gas is entirely dependent upon conditions, and what is ample in one case may be insufficient in another. The area necessary is not only dependent upon the volume of gases, but upon the amount of solids per cubic foot, the stronger or weaker adhesion of the fume to the filtering material, and the number of times the bags are shaken in 24 hr. Few smelters accurately measure the volume of gases being handled, but use the manufacturer's rating of the fan at the different speeds. As this depends upon character, resistance, temperature, etc., of the flue to the fan, and the same variable factors on the discharge end of the fan, the rated amount is not always delivered. Comparing performances of baghouses with fan rating, one baghouse could be cited in which each bag is filtering 130 cu.ft. of gas per minute and recovering 5 lb. of fume per bag per day, with bags shaken once in 24 hr., and another in which each bag filters 70 cu.ft. of gas per minute and recovers 27 lb. of fume per day, with bags shaken eight times during that period.

Shaking the Bags

In dislodging the adhering fume from the bags, hand shaking, when done properly, gives the best results, but it is a slow and disagreeable task and is being replaced by various mechanical shakers. This mechanical shaking is accomplished by striking the inflated bag lengthwise; quickly jerking the deflated bag up and down; swinging back and forth, or a combination of the two motions. Another method is to reverse the flow of the gas through the bags by means of an individual fan or by a second connection between each compartment and the suction side of the main fan. The best results were obtained with an arrangement having a combination of the up-and-down and the back-and-forth motions. The bags in each row are hung from a 2-in. pipe, which in turn s supported from above by hangers spaced about 8 ft. part and 21 in. long. The ends of the pipe pass through ast-iron spools placed in the walls, with holes in them ufficiently large to allow for the up-and-down motion aused by the swinging around the 21-in. radius. On the nds of this pipe are placed collars, one on each side f the cast-iron spool, and set for 8-in. stroke. A lever is astened to one end of the pipe, which, when pulled uickly back and forth, gives the bags an up-and-down s well as a back-and-forth motion, and on coming up harp against the collars, also produces a sudden jar which assists in dislodging the fume from the bags. This device when handled properly will lower the pressure in the bags to 0.15 in. of water. Good hand shaking will lower the pressure to 0.10 in. or slightly less.

It is important that the bags are so hung that when inlated they will stand straight; otherwise, upon shaking, he fume will collect around the thimble top, distorting the bottom of the bag and thus obstructing the flow of the gases into the bag, at the same time putting an unlue strain upon the bag at this point.

Fume from blast furnaces carries enough sulphides and finely divided carbon to burn. The burned material, after moistening thoroughly, can be handled safely. Sluicing the fume from the compartment promises to be the quickest and most sanitary method, but filter pressing and the large amount of moisture left in the cake are objectionable. In any case, cleanliness should be demanded from all employees and no scattering of fume should be permitted around a baghouse.

Bag filtration, with its high percentage recovery of fume, diffusion of gases, and simplicity of operation, is very satisfactory, and the baghouse has well proved its worth to the lead smelter. Credit for its introduction into this branch of metallurgy is due Dennis Sheedy, manager, and Dr. M. W. Iles, superintendent, of the Globe Smelting & Refining Company.

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Daly West

The 1913 report of the Daly West Mining Co., Park City, Utah, shows a production of 60,788 dry tons of ore. Of this 1555 tons were shipping ore and 59,233 tons were treated in the mill. The mill was in operation 319 shifts of eight hours each, thus treating 23.75 tons per hour. The mill produced 8332 dry tons of lead concentrates, 1598 dry tons of zinc concentrates, thus concentrating six tons of crude ore into a ton of concentrate. The crude ore had an assay value of 5% lead, 7.7 oz. of silver and 4.3% zinc; while the lead concentrates assayed 34.54% lead, 40.01 oz. silver; and the zinc concentrates, 4.83% lead, 19.27 oz. silver and 35.37% zinc. The mill made a figured saving of 79.55% of the silver and 99.6% of the lead. Total receipts for the year amounted to $407,224 and operating expenditures, $434,296 making a loss of $27,072. Cash reserves were depleted $86,220 by the operating loss, payment of $27,000 in dividends, increasing property holdings $18,537, increasing inventories $13,275 and a charge of $336 to impound account. Cash on hand at the end of the period amounted to $23,648. There were 6446 ft. of development work done. The total cost of mining based on 60,788 tons was $5.28 made up of: Exploring, 78c.; development, $1.65; stoping, $1.88; tramming, 17c.; engineering, 2c.; hoisting, 29c.; general mine expense, 35c.; transportation, 5c.; tunnel rental, 8c.; sampling and assaying, 1c. Milling cost, $1.46 per ton for 59,233 tons as follows: Sorting, 5c.; crushing, 28c.; jigs and tables, 29c.; tailing plant, 20c.; electric plant, 4c.; building and fixtures, 5c.; water system, 4c.; sampling and assaying, 2c.; transportation, 13c.; tunnel rent, 8c.; general mill expense, 18c. General expenses, taxes, insurance, legal and office expenses amounted to 39c. per ton milled. These charges do not include deductions and smelting charges on the ores.

The company lost its main mill and hoist by fire on Dec. 28, 1913. It is expected to have a new plant ready for operation by Sept. 1, 1914. The Daly West has received $15,464,890 from the smelters for its product since its incorporation and has paid $6,606,000 in dividends. It is believed that the advantages the company will derive from a new and uptodate concentrating plant will be ample in a few years to turn the present fire loss into a gain.

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Calumet & Hecla Contract Mining*

The contract system has been in force in the Copper Country probably ever since mining there began, drifting and sinking being paid for by the linear foot and stoping by the cubic fathom; the latter curious custom was introduced from Cornwall. The measurements to determine the number of cubic fathoms stoped were made by the mining captain, and on the conglomerate lode of the Calumet & Hecla, since the foot and hanging walls were fairly uniform, it was not difficult to obtain an accurate measurement. The amygdaloids, however, were difficult to measure with accuracy, and fault began to be found with the fathom system as these lodes were more opened up. A great deal of averaging of dimensions was necessary, and the men complained that they did not get fair measurements from the captain. Especially was this true in measuring up to the end of an irregular stope. The custom was therefore gradually done away with, in some of the mines quite a while ago, in others within the last two years.

At present, on the amygdaloid lodes of the Calumet & Hecla mines, measurement is made by the ton. The railroad cars into which the rock is delivered after being broken are weighed, and this weight is divided by the number of underground tram cars, corresponding to the weighed quantity of ore, so that, after a little experience, it is not difficult to obtain the average weight of a tram-car full of ore. This is probably a relatively accurate way of measuring.

Under the fathom system, the miner's supplies were usually charged up to him, although not always. It was thought the men would be more economical in their use of explosives and would lose less steel if they had to pay for it. Under the present system, supplies are not charged. At present, the only charges against the miner's pay are an assignment of his wages or a garnishee from a creditor. Collections for groceries or clothing or similar supplies are not made in that way. In case of a dispute between the mining captain doing the measurement and the miner under contract, the case can be carried to the captain next in authority, and frequently is so, the captain acting as arbitrator.

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*From a report of the hearings before the Congressional Committee investigating the recent strike in the Copper Country. Testimony given by Mr. MacNaughton.

In case a man quits his contract at the end of a month, or at any other time, and notifies the management, extra trammers are put in in order to clean out his stope and thus make possible an exact measurement of the contract. If the miner quits without notice and leaves the company's service entirely, he is asked to wait for a settlement until the broken material can be removed and measured; if he is unwilling to do this, he is taken to the stope and a measurement made which is usually satisfactory both to the man and the mining captain, settlement being made on that basis. If the man merely quits his contract and stays with the company, the broken material is trammed out in the regular course of affairs and kept track of, and the miner is paid when the tramming is completed.

Men called "stemmers" have been maintained by the company to take the place of contract miners who might be kept from work or remained home. These substitutes in some of the company mines were paid at straight rates on company account and this charged up to the contractor, and in other mines it was arranged that they should participate in the contract for the shifts put in. These general-utility men would put in about two-thirds of their time substituting for contractors. When not so substituting, they were employed in other ways in the mine.

The contracts originally were let for a period of three months. The reason for this was that a man taking a new contract might have to cut out the bottom of the stope and did not have a chance to make a fair wage the first month; therefore did not want to be paid only what he had earned. He was given an advance on the first month, therefore, which was deducted from the subsequent months' earnings. The effect of this long contract was to average up conditions, good, bad and indifferent, throughout the stope. This fact that the contractor did not receive so much on his second and third months' work as he thought he had earned, led to a good deal of complaint. He would draw so much as an advance after the first month as to leave little on the remaining months. This was particularly true when he worked slowly. For that reason, the three months' contract was gradually eliminated and one for two months was given; and the tendency lately has been to reduce this to one month. The men now get quicker settlements and know better where they stand.

There was complaint made to the committee by the men that a successful contractor would often be cut down when his contract came to be continued: that is, a man who had earned a good deal on a contract would not be allowed to do the same again. Mr. MacNaughton stated emphatically that this was not the policy of the company, and that if it occurred, it was to be charged against individual mine captains who acted without the authority of the management. In fact, the policy of the company was to encourage high earnings and industry on the part of the men, since the man making a large tonnage was more economical to the company. There is only room for a certain amount of stoping and a certain number of men in a mine. Since the overhead or fixed charges remain constant, it is obviously economical to have each of these men produce as large a tonnage as possible. It was admitted that there might be cases where a captain in fixing the price for a contract made it too high or too low and readjusted this when it came time for renewal.

In the amygdaloid mines especially, there is in force a bonus system on stoping work. It has there been ascertained by experience what an average miner or pair of miners will be able to get out in a certain length of time. The base for two men using a one-man drill is 600 to 900 tons per month. If, for any reason not their own fault, the men fail to get this tonnage, they are still paid their rate of \$3.25 a day. If, however, they fail to get this tonnage on account of loafing or for some other reason attributable to themselves, the mining captain is privileged to reduce their pay to \$3 a day. This is the only discretionary power he has in the matter, and this is subject to review by his immediate superior. If, however, the men get over their 900 tons, they are paid at so much a ton, and this amount is added to their day's pay of \$3.25. It is common experience for men to get 1400, 1500 and 1600 tons a month. If the bonus pay in this case were 10c. per ton, which is a common figure, each of the men would then make \$30 apiece over his day's wages. In a normal 24-day month at \$3.25 a day, each would make \$78, and the bonus on the difference between 600 tons and the 1500 which they might get, would bring their total earnings up to \$108 each. If the contractor loafed habitually for some time, it would be indicated to him that he had better look somewhere else for a job.

Even before the bonus system was in force, the terms of the contract were not rigidly adhered to. It was common practice then, as it was put, "to make up a pay" for a man who, because of hard conditions, failed to make a fair wage under the terms of his contract. At that time, contracts were frequently padded up to \$2.75 and \$3 per day.

Power to Lease Company's Property

By A. L. H. Street

Recognizing that control of a mining corporation's affairs is vested in its board of directors, the Arizona Supreme Court has just handed down a decision in the case of Franklin vs. Havalena Mining Co., 141 *Pacific Reporter*, 727, holding that a lease of such a company's property made by the president, secretary and general manager without authority from the directors is invalid. And the court goes further by saying that even a majority of the stockholders could not validly ratify a lease and sale of the property at much less than its actual value to the prejudice of minority stockholders.

New Basis of Mine Accident-Rate Computation in Quebec

The 1913 report on mining operations of the Department of Colonization, Mines and Fisheries of the Province of Quebec lists the fatal and nonfatal accidents occurring during the year, and states the figures are now so collected that the rates are calculable to the 300-day basis. This is the basis of calculation recommended and largely followed by the U. S. Bureau of Mines.

On this basis the death rate for the year in mines, clay pits and quarries was 1.86 per 1000 men employed. In the mines proper, asbestos, copper, graphite, mica, etc., the rate was 3.19 per 1000 employed.

Details of Practical Mining

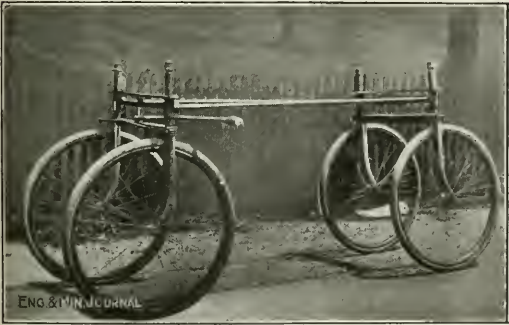
One-Man Hand Ambulance

By A. H. Sawyer*

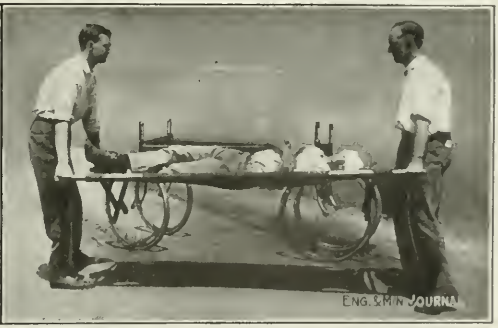
At the Raimund mine of the Republic Iron & Steel Co., in the Birmingham district, Ala., an ambulance particularly adapted to quick service, has been recently put into use.

The accompanying photographs show the construction and operation of the ambulance. It consists of four ordinary 28-in. bicycle wheels and front forks, rigidly fastened together with a 1-in. pipe frame, the front wheels being provided with a steering lever. It has a 59½in. wheel base, 22½-in. tread, is 36 in. high and weighs only 91 lb. A canvas stretcher of the common type is set on top of the ambulance frame, the hand-holes on the sides easily slipping over the extended posts on the frame and thus preventing any movement of the stretcher after it has been once placed in position.

When a man is injured in the mine, he is placed on a stretcher, which is then suspended in the 10-ton ore skip in a horizontal position by light chains hung from the front and rear of the skip. On reaching the surface the stretcher is lifted out of the skip and set on the ambulance, which one man easily steers and pushes to the emergency hospital.



The Frame of the Ambulance



Lifting a Patient in Stretcher to Ambulance Frame

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Shrinkage Stoping at Bisbee†

Up to this time, only one place in the Copper Queen mine has been found where, it seemed practicable, to develop a shrinkage stope. This is on the 1100 level of the Lowell mine, upon an orebody approximately 100 ft. long and about 50 ft. wide.

In order to use the shrinkage system successfully, the surrounding character of the walls must first be ascertained, and it must be demonstrated beyond a doubt that they are strong enough to permit the removal of the ore after the stope has been carried to the top of the orebody or to the level above. This work is in progress at present in the Lowell mine and promises to show a material reduction in cost, as compared to square setting in the same character of ground. Practically no timber is necessary, and as the ore is kept close to the back, the men work under relatively safe conditions. Care must always be taken that the men bar down and make safe the backs before commencing drilling operations. One disadvantage in the shrinkage system is that should bars of waste occur in the orebody, the waste must necessarily be mined and there is a danger of its becoming mixed with the

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Two Rand Automatic Electric-Hoist Controllers

Two controlling devices for electric mine hoists have been attracting attention on the Rand. One, the Philip's, is designed to sound a warning when the shaft conveyance becomes subject to dangerous conditions. The other, the Lindberg, actually shuts off power and applies the brakes when an overwind becomes imminent.

The Philip's would appear to be a rather elementary device, such as is applied to even the simplest hoists in this country. A small control switch, of the rotating-drum pattern, is installed on or under the engineer's platform and worked direct from his control lever. Mounted upon the indicator spindle at the back of the dial, is an insulated disk carrying a contact piece, which engages with two spring contact-fingers fixed in any predetermined position to give a warning signal when required. The signal usually used is an electric "hooter," in order that it may be clearly distinguishable from the ordinary bell signals. The apparatus can be worked from any low-voltage system available, such as signal batteries or lighting circuit.

When the skip or cage is in the danger zone, which may be taken as extending from a point a few feet below the collar of the shaft up to the dump, the brass contact on the insulated disk is making contact with the two fingers mentioned. When the engineer's lever is not in the neutral position, but is in such a position as would move the skip or cage upwards, the circuit is completed and the warning signal sounded. The warning is thus given:

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*Mining engineer, 412 American Trust Building, Birmingham, Ala.

†From A. I. M. E. "Bulletin," August, 1914.

(1) When the hoist is standing with the conveyance at the surface or in the dump if the engineer merely moves his lever in the wrong direction, so as to hoist when he should lower.

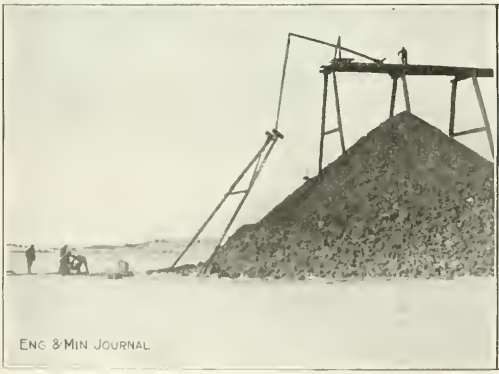
(2) When the engineer brings his vehicle up past a pre-determined point below the collar of the shaft, without shutting power off.

The Lindberg device automatically shuts the power off and applies the brakes if the conveyance is brought up to a pre-determined point, either above the collar of the shaft when hoisting men or above the dumping point when hoisting ore. To make the device work for either men or ore, a hand controller has to be moved by the engineer according to the signals given from below.

The Lindberg device will not give any warning to the engineer if he should put his lever in the wrong direction until the skip has actually moved, when power is cut off and the brakes applied.

The operation of the apparatus is as follows: Plungers are fixed at given points on the headframe and are electrically connected in series with the main switch. The brakes of the hoist are held in the off position by magnets all controlled by the same main switch. If the wheel of the shaft conveyance strikes any of these plungers it opens the auxiliary circuit holding the main switch in position, breaks the main current and operates the brakes so that the skip or cage comes to a standstill.

The device is electrically controlled by a three-way switch on the engineer's platform marked "Ore," "Men" and "Off." When the switch is in the "Ore" position the plungers for the dumping position of the skip are automatically thrown forward in order that engagement may take place with the skip wheel in the event of the skip's going up too far. In this position the plungers for the "Men" position are depressed so that no engagement with the wheels can take place. When the switch is in the "Men" position the reverse takes place.



Raising the Bent

The Bent in Place

The "Men" plungers are placed about 3 ft. above the ordinary level at which men enter and leave the cage, so that should the driver inadvertently start his engine in the wrong direction or attempt to go too high, the engine is brought to a standstill before any damage can be done.

The "Off" position is used when an overwind has taken place; it cuts out the electrical connections on the headframe, allows the main switch to be replaced, and permits the skip to be lowered to its normal position. When in this position a bell is continuously rung, warning the driver that neither device is in action.

As the apparatus is permanently fixed in such a manner that it is impossible for the skip to pass without operating it, it is not affected in any way by the slipping of ropes or by faulty indicators.

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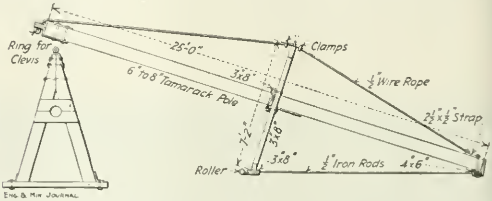
Raising Trestle without Gin Pole

By R. B. Wallace*

The apparatus here shown was devised to facilitate the erection of a stockpile trestle, by eliminating the operations of moving a gin pole, changing guys, etc., which consume much time. It consists of a sound tamarack pole 6 or 8 in. in diameter, supported by an A-frame at the center and trussed by a ½-in. wire rope attached to both ends and passing over the top of the frame. The base of the frame and the cross-piece at the lower end of the pole are connected by two ½-in. rods. A roller made of wood with both ends incased in pipe is attached to the base of the frame and in front of it, so that by raising up the lower end of the pole, the whole apparatus can be



Movable Trussed Pole for Raising Trestle Bents easily rolled out to the end of a trestle. With the lower end of the pole lashed to the rails or to a stringer, it is ready for use in hauling up a bent.

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*Mining engineer, Republic, Mich.

After the bent is hauled up, it is held by guy lines while the stringers are raised and fastened in place. Then the frame is rolled out to the new end of the trestle, and is made fast, ready for the next bent. The photographs show the frame in use at the Republic mine where the rock-pile trestle is being extended into the lake in the winter time. An electric winch is used for power.

*

Double Skip-Changing Carriage

By William Hambley[*] and Albert E. Hall[†]

One of the most frequent time losses in hoisting, is that due to changing skips for one reason or another, often for repairs to the skip in use. The operation of changing a heavy skip without any device other than a cradle to span the top of the shaft is slow and uneconomical. A time-saving device for this operation is shown in the accompanying drawings. It is a carriage designed to hold two skips, the dimensions given being subject to alteration as the case demands.

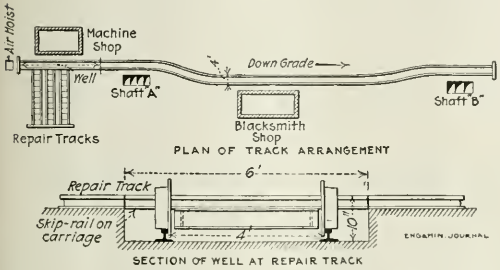

Fig. 1. Plan of Surface Arrangements and Repair Well

In the installation considered, there are two shafts connected by a track, which also runs to the blacksmith shop, the machine shop and the repair yard, Fig. 1. The skip carriage is designed to run on this track, as is also a car to carry drill steel from the blacksmith shop to the shafts. A small, stationary engine, operated by air, pulls the vehicles by means of a light cable. There are two points requiring care in laying the track: First, it must be placed far enough back from the shaft to allow the nose of the skip to clear the timbers supporting the shaft guard-rails; the nose of the skip will, of course, project some distance over the skip carriage if the shaft is inclined. Second, the track at the shaft should be laid flush with the ground to avoid the danger of anyone's tripping on it and plunging down the shaft. The carriage itself, Fig. 2, is made as low as possible, so that the center of gravity will be low, thus reducing the tendency for the carriage to tip up as a skip is loaded on it or taken off.

A skip in good condition is always kept on the carriage. When it is necessary to change skips, the carriage is run to the shaft, the skip is hoisted a short distance above the surface and the spanning rails thrown across the shaft. The skip is lowered and run on the empty half of the carriage. The carriage is then advanced a few feet, the new skip run off and connected to the rope. This operation takes but a short time and is much easier than the old method, requiring eight or ten men with bars. When the skips have been changed, the carriage is run to the repair yard, the old skip unloaded and a new one put on ready for another emergency.

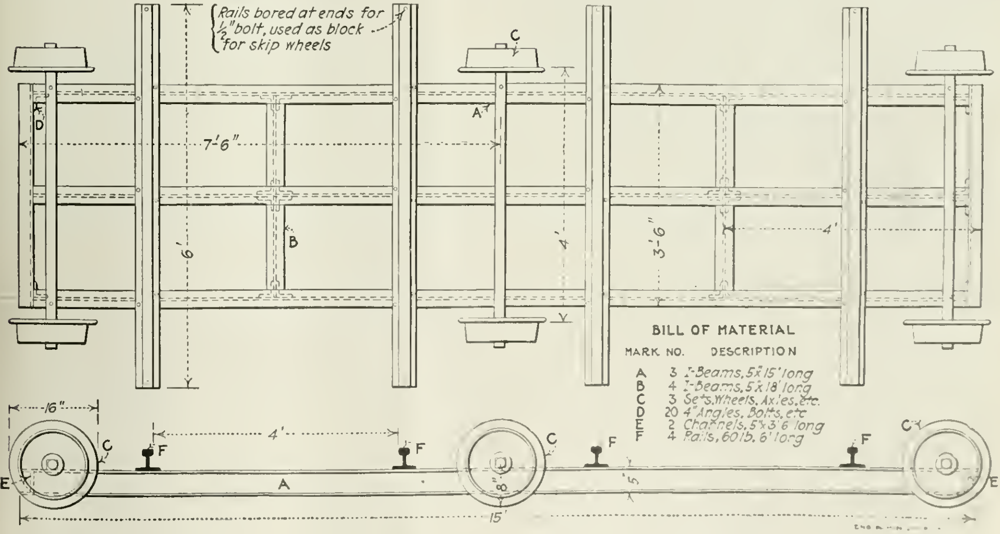
Rails bored at ends for ½" bolt, used as block for skip wheels
C
A
D
7'-6"
B
6'
4'
3'-6"
4'
BILL OF MATERIAL
MARK NO. DESCRIPTION
A 3 I-Beams, 5"x15' long
B 4 I-Beams, 5"x18' long
C 3 Sets Wheels, Axles, etc.
D 20 4" Angles, Bolts, etc.
E 2 Channels, 5"x3'6 long
F 4 Rails, 60 lb. 6' long
16"
4'
C
F
E
A
8"
5"
15'
ENG.&MIN.JOURNAL

Fig. 2. Design of the Double Carriage

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[*] Superintendent, No. 2 Mine, Canadian Copper Co.

[†] Mining engineer, Creighton Mine, Canadian Copper Co., Creighton Mine, Ont., Can.

Safety Devices for Electric Hoists

The Penn Iron Mining Co., of Vulcan, Mich., operates a series of electric hoists at its various shafts. An ingenious system of safety devices has been worked out and is described in the February *Bulletin* of the A. I. M. E., as well as in the Report of the First Coöperative Safety Congress held in Milwaukee, Sept. 30, 1912. The devices prevent overwinds, excessive hoisting speeds and dropping of the shaft vehicle on the bottom.

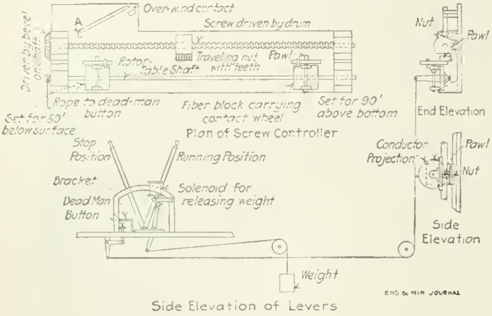

Fig. 1. The Distance Limit Devices

The hoists are equipped with Lane friction clutches thrown in by oil-operated cylinders and released by weights. The band brake is similarly operated. If the oil pressure be lost, the clutch releases and the brake sets automatically. The oil is kept under air pressure by a pump in the basement, and is admitted to the brake cylinders or released by means of a three-way valve. The hand lever operating this valve is connected differentially to the brake lever, so that the brake follows the operator's hand. The use of oil under pressure, as against air or steam, results in a smooth action of the clutch and brake.

By referring to Fig. 1, it will be seen that a weight is kept suspended by a catch engaging the end of a lever and connected to a vertical rod through a solenoid. If the solenoid becomes live and pulls the rod up, the catch is lifted, the weight released and the brake and clutch levers pulled into the stop position. The safety devices then consist of making electrical contacts so as to send current through the solenoid. Contacts are made: (1) To prevent an overwind under all conditions; (2) and (3) to stop at a point 50 ft. below the surface and 90 ft. above the bottom, unless the engineer purposely throws the mechanism out of action and keeps it so; (4) to stop when a certain speed is attained in all cases. The first three contacts are made by the device shown in Fig. 1, the last by that of Fig. 2.

The device for stopping the hoist in the various positions consists of a horizontal screw driven by a bevel gear from the drum shaft. A heavy nut travels on this screw, its position corresponding to the position of the shaft conveyance. Thus, when it reaches the point *A*, the conveyance having reached the surface, the lever is thrown to make the overwind contact, the current sent through the solenoid, the bar and catch lifted, the weight released, the levers thrown to the stop position and the hoist stopped.

The nut is cut away on one side and equipped with teeth as shown. Two contact wheels carried by fiber blocks are set on a shaft alongside the screw at points corresponding to positions of the shaft conveyance 50 ft. below surface and 90 ft. above bottom. The teeth of the nut, on pasing either of these points, catch a pawl extending downward from the lower part of the wheel and revolve the wheel slightly, so that a projection on its periphery makes contact with a stationary conductor and actuates the solenoid. The pawl of one wheel is beveled in one direction, that of the other in the opposite, so that in hoisting, the pawl on the 90-ft.-point wheel is not caught and similarly in lowering that on the 50-ft.-point wheel.

The fiber blocks carrying the contact wheels are mounted on a shaft, which can be rotated by a rope to the engineer's platform. A "dead man" button in the platform depresses a bell crank and pulls the rope as shown. The engineer's foot must be on the button to keep the stops out of action and is customarily so when he knows that everything is all right. If he should die suddenly or lose control on account of any other disability, the safety devices automatically come into action. A bracket over the button prevents its being held down by the engineers pulling on it, should he faint or have a fit or die.

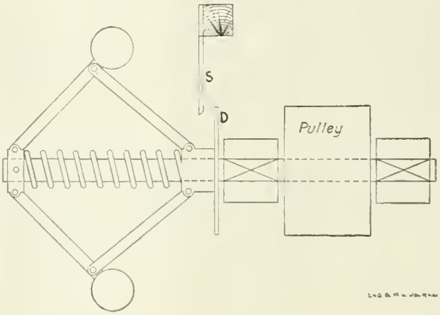

Fig. 2. The Speed Controller

The speed control is shown in Fig. 2. It consists of a simple fly-ball governor driven by a belt. When the speed passes a predetermined point, the points *D* and *S* make contact and actuate the solenoid.

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Primary Battery Electric Mine Lamp

In an abstract by the *Mining Journal* of the compendium of mining practice in 1913, issued by the Prussian Minister for Commerce and Industry, a nonstorage-battery mine lamp is described. It is known as the Mann type and showed up well in some trials at the Hildesheim potash mine.

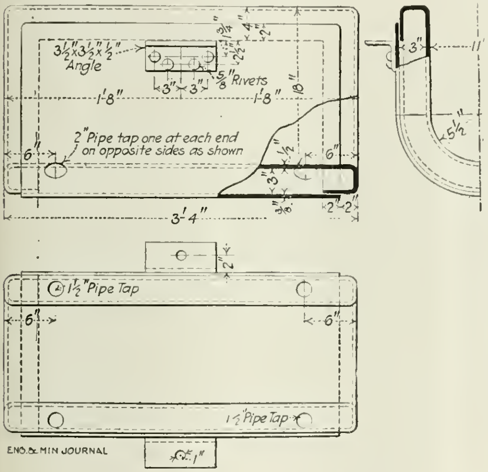
One great advantage of this lamp is that it can be filled in a few minutes, and is ready for use practically at any time.

This would apparently make it especially suitable for rescue work. Its light is distinguished by uniformity and steadiness. The element is a Bunsen element of zinc and carbon. The electrolyte consists of bichromate of sodium with a small quantity of sulphate of mercury. The weight of the lamp is considerably less than that of the usual storage-battery types.

Details of Milling and Smelting

The Trough Furnace Spout

When water-jacketed spouts first came in vogue, they were made with a sloping bottom to trap the blast, following the construction of the old cast-iron water-cooled spouts used in Montana and Utah. The sloping water-jacketed spout has now been superseded to a great extent by the water-jacketed trough spout, particularly in the Southwestern smelting plants. The accompanying drawings show the trough spout used on the new furnace of the Detroit Copper Mining Co., at Morenci, Ariz. The inside plate is of ½-in. steel and the outside plate is ⅜ in. thick. There are pipe taps at each end on top of the spout and two washout connections on the bottom. These spouts have the advantage that either end may be fitted against the furnace breast and are much simpler to manufacture. No nose piece is used with these spouts. The blast is trapped by making a clay dam at the end of the spout, and in emergency the dam may be torn away and the furnace connection freed much more readily than with the old spout which involved the tapping out of the furnace in case the blast was off for any considerable length of time.



Trough Spout Used at Morenci, Ariz.

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Leaching Copper Products at the Steptoe Works*

A small copper-leaching annex is in operation at the Steptoe metallurgical plant, to treat dust from the roasting-furnace dust-chambers, together with siliceous oxidized ore. This leaching plant was designed to obviate smelting low-grade siliceous flue dust, which blankets the reverberatory charges.

The flue dust carries about 2.56% water-soluble copper and 0.44% water-insoluble copper, with 19.94% free sulphuric acid. Sufficient acid can be obtained by mixing this material with water to provide a lixiviant for a local siliceous ore which carries 3.47% total and 3.23% acid-soluble copper. The copper is probably present as silicates.

The piles of flue dust are hydraulicked and the stream allowed to settle in tanks or behind dams. The clear solution is then drawn off to a wooden leaching tank fitted with a filter bottom, 40 ft. in diameter by 10 ft. deep, filled with ¼-in. ore to a depth of 7 feet. If the filtrate from this ore-leaching tank contains much free acid it is pumped back and passed through the ore bed a second time. Otherwise it goes through a filter of the ore and thence over iron scrap. About 85% the acid is utilized in leaching the ore, and about 2 lb. of scrap iron is consumed per pound of copper recovered. The total cost is about 8c. per lb. of copper.

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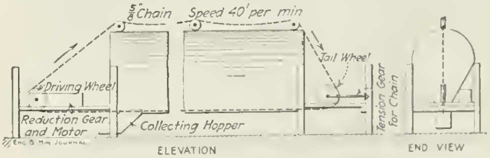
Collecting Flue Dust with Chain Conveyor

Erle Huntley, general manager of the Hampden Cloncurry Copper Mines, Ltd., described before the Institution of Mining and Metallurgy the method used for collecting flue dust at the copper-smelting works in North Queensland. The use of chain conveyors for delivering flue dust from the bottom of balloon flues has long been practiced at small smelting works, but the acompanying illustration of the Hampden Cloncurry arrangement may interest some readers. The gases from the company's smelting works in North Queensland pass through a preliminary collecting flue, 9 ft. high and 7 ft. wide, and a main settling flue, 27 ft. high and 18 ft. wide, where the increased area reduces the speed of the furnace gases to about 4 ft. per sec. No baffle-plates are used, as with this slow speed practically all the dust settles to the bottom of the flue, along which a ⅝-in. endless chain is drawn by means of a sprocket wheel operated by an electric motor. The chain is moved at a rate of about 10 ft. per min, but is only used for about six hours per day, or two hours per shift, delivering about 12 tons of the dust, daily, into a collecting hopper. The dust is run through a pug-mill, together with fine kaolinized ore and about 20% of water, and while still wet is returned to the blast furnaces. Practically all the dust is used up in this way, notwithstanding that a fairly high blast, 30 to 40 oz., is maintained.



Dust Flue with Chain Conveyor

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*Abstract of a paper by W. L. Austin, presented at the Salt Lake meeting of the A. I. M. E.

Excessive wear on the chain or flue bottom is avoided by having the tension side of the chain on the bottom. This prevents the full weight of the chain from bearing on the flue bottom. During 15 months' operation only one chain has been replaced, while the flue bottom showed no sign of wear. The return or slack side of the chain is run over small guide wheels outside and above the flue, and returns to a loose pulley at the other end. This return pulley runs in a guide connected to the frame of the flue by tension screws, so that by moving the loose pulley backwards and forwards, the correct tension can be kept on the chain. A continual stream of flue dust is delivered to the collecting hopper during the time that the chain is in operation, and, of course, dust could be delivered at a faster rate if the speed of the chain were increased.

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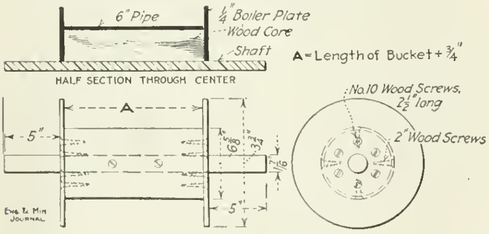
Elevator Guide Idler

By T. Swift*

A cheap, flanged idler for light duty, such as guiding bucket-elevator belts may be constructed as is shown in the accompanying sketch. Standard pipe, in this case 6-in. diameter, is filled with well dried wood and is bored for a tight-fitting shaft; 1¼-in. boiler plate being cut to form the flanges as deep as may be needed. These are fastened to the wood-filled pipe with good-sized wood-screws. It is also well to fasten the wood firmly inside the pipe with wood-screws, as is shown, to prevent the pipe from turning on the wood in case of shrinkage.



Guide Idler Made of Pipe with Wood Filling

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Emergency Crusher Drive

Due to the sudden failure of one of the crushers at the McKinley-Darragh mill at Cobalt, Ontario, a stock machine had to be ordered and installed in the shortest possible time. A 13x24-in. Buchanan Blake crusher was ordered by telegraph, and since this had no loose pulley, some means of driving it had to be devised. There was no time to order a clutch, which would have been costly besides, and no room for a countershaft. The difficulty was surmounted by adding a loose pulley on a short independent shaft in line with the crusher shaft, and belting the motor directly to it. After getting the motor up to speed, the power was applied to the crusher pulley by shifting the motor sidewise on a set of I-beam rails, using a handwheel operating a pinion which engaged a rack on the under side of the motor base. The device was simple and cheap, and works satisfactorily.

Cooling Furnace Gases before Filtration

The cooling of furnace gases is an important factor in the operation of the baghouse system of filtration. Many efforts have been made to produce filtering fabrics which would withstand both heat and acidity, such as the use of asbestos, chemically treating cotton and wool, etc. These efforts are to some extent misdirected, says L. D. Anderson, in the July bulletin of the American Institute of Mining Engineers. Effectual filtering of gases cannot be accomplished until the gases are cooled sufficiently to get the fumes into a condition more nearly approximating what is considerel solid matter, nor can the gases be so cold that condensation of moisture occurs to destroy the filtering fabrics. Any attempt to filter hot gases will be disappointing, resulting in visible clouds of smoke as the gases passing through the bag meet the outer air, become cooled, and precipitate the fumes which escape the bags in a fine state of division. As long as the gases are hot, the minute particles of fume seem to repel each other and exist in a sort of smoky cloud. Cooled, however, they tend to coalesce and thereby reach a state wherein they are easily retained in the meshes of the bag.

Three methods of cooling are commonly in use: by dilution with external air, by passing through thin metal flues, and by spraying with water. The first method has only a limited application, lest the quantity of gas handled become excessive. The second method is probably the most extensively used. The rate of heat transmission through sheet-steel plates about ⅛ in. thick under smelting conditions appears to be about 0.02 to 0.04 B.t.u. per minute per square foot of cooling surface per degree Fahrenheit difference between interior and exterior temperatures, depending upon cleanliness of the flues, convection by winds, shading from direct rays of the sun, etc. In computing the required area of a flue for cooling, it is not sufficient to assume the mean interior temperature as the arithmetical mean of the initial and final temperatures, for the drop in temperature proceeds more slowly as the gases become cooler. If t_1 be the initial temperature of the interior gases, t_2 the final temperature and t_x the temperature of the external air, the mean temperature difference θm between inside and outside will be

$$\theta m = \frac{t_1 - t_2}{\log \frac{t_x - t_2}{t_x - t_1}}$$

In the use of sheet-metal flues it has been found by experiment that the cooling within certain limits, is proportional to the square root of the velocity. For this reason it is advisable to keep the velocity high in such flues, which also tends to avoid too heavy a deposition of the heat-insulating dust.

Cooling by water sprays has been used to some extent and will undoubtedly be extended now that efficient atomizing nozzles are obtainable. Care must be used, however, that too much water be not used and the saturation point of the gases be not too closely approached, as any dampness of bags is fatal to their life. It is an interesting fact that by full utilization of the latent heat of evaporation gases can be cooled by warm water below the temperature of the water itself.

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*Mineville, N. Y.

Company Reports

Alaska Treadwell

The 1913 report of the Alaska Treadwell Gold Mining Co., Douglas Island, Alaska, shows a net operating profit for the year of $1,223,438 from 886,057 tons of ore, yielding an average of $2.6617, or a total of $2,358,423, and miscellaneous profits of $62,592. This profit is exclusive of depreciation of property and plant charged off, amounting to $400,207. Dividends amounting to $1,000,000 were paid. The following table gives details of costs under the main headings of expenses:

	Per ton milled
Mining	$0.8271
Milling	0 2476
Sulphuret expense	0.0880
Offices	0.0207
Legal expense	0.0053
Taxes	0.0098
Bullion charges	0.0113
Total operating charges	$1.2098
Construction	0.0435
Sundry losses, boarding houses, etc	0.0982
Total	$1.3515
Operating profit per ton ore	1.3808
Total	$2.7323
Less miscellaneous profits	0.0706
Actual yield per ton ore	$2.6617

Depreciation of about 45c. per ton of ore is not included in these charges.

Development work totaled 5980 ft. and 707,477 tons of ore came from stopes. The average cost of development work was $13.799 per ft.; stoping per ton of ore stoped, 63.8c.; tramming per ton of ore trammed, 11.5c.; hoisting per ton of ore hoisted, 9.9c., and pumping per ton of ore milled, 10c. The total mining costs consisted of: Labor, 41.2c.; supplies, 24.1c.; subsidiary accounts, 17.4c.; total, 82.7c. per ton milled. The central shaft was sunk 330 ft. through waste, giving it a total depth of 2271 ft. Ore reserves are estimated to contain 6,093,308 tons, averaging $2.67 per ton, of this amount 1,114,549 tons are broken in stopes.

In the 240-stamp mill, 1 lb. of chrome steel in the shoes crushed 2.92 tons of ore, and in the 300-stamp mill 2.72 tons. In the 250-stamp mill, 1 lb. of iron in the dies crushed 5.14 tons of ore, and in the 300-stamp mill 4.75 tons. There were 3815 samples taken from the mines and 5928 from the mills. This is equivalent to 1 sample at the mine for every 232 tons of ore, 1 sample at the mills for every 149 tons of ore, or a total of 1 sample at the mines and mills for every 91 tons of ore treated. The average number of men employed per day during the year was 719, and the average wage was $3.51 per day. According to this, about 1230 tons are mined and milled per year per man employed.

Mention is made in the report of the efficiency of the fire department of the company. At 2:55 a.m., on the morning of Oct. 11, a fire was discovered in the headframe and crusher house at the No. 2 shaft. On account of No. 2 being an up-cast shaft, the entire building was in flames in a few seconds. Within two minutes after the alarm the department had two streams of water playing on the fire from the stationary giants and within 10 min. the contents of 11 streams of water through 2½-in. hose under 200 lb. pressure were brought to bear on the fire. The framing sheds and compressor building, which form a part of the headframe, were saved.

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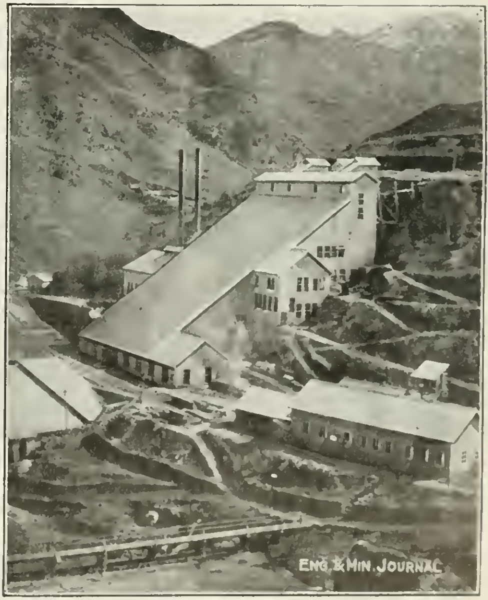
Seoul Mining Co.

The table given herewith is a four-year record of the Seoul Mining Co., Hwang-Hai Province, Chosen. The company was incorporated in Connecticut in 1908 and has an authorized capital of 20,000 shares of $25 each. The company owns a lease on the Suan concession which it secured from the Korean syndicate for the payment of a 20% stock interest in the company and an 8% royalty based on the actual profits derived from the concession, which embraces an area of about 260 sq.mi. Within this area the company has the right to stake as many mineral claims as it pleases until the end of Jan., 1916. After this date all areas retained by the company are subject to an annual tax of about 30c. per acre. There is also an additional tax in the form of a 1% royalty on the gross value of the output. The concession includes a granite-limestone contact roughly in the shape of an oval 8x6 miles or about 20 miles of contact. The Suan mine is situated on this contact, at Holkol, formerly a small Korean village but now a place of considerable importance owing to the opening of the mines.



Seoul Mining Co.'s Reduction Works

The mine is at the head of a narrow gorge about one mile from the main valley. It is entered by means of an adit level which is about 200 ft. below the highest workings, an incline shaft has also been sunk from this adit to a depth of about 400 ft. and levels opened at intervals of 100 ft. The greater part of the gold is recovered by amalgamation, and the remaining contents by concentration. The concentrates are shipped to England for treatment.

POSITION OF COMPANY AT END OF YEAR

	1910	1911	1912	1913
Mining and milling:				
Ore treated, tons......	33,500	70,229	74,489	71,535
Gross recovery from ore	368,405	551,470	620,055	671,879
Mineral yield per ton.	10.98	7.85	8.25	9.39
Operating costs per ton	4.58	3.01	3.52	4.12
Operating profit per ton	6.40	4.84	4.73	5.27
Ore reserves, tons....	190,100	211,400	421,310	633,338
Ore reserves, value...	$3,353,400	$3,499,000	$6,082,530	$7,642,296
Number of stamps operated	20	40	40	40
Financial record:				
Net profits	$122,082	$242,581	$287,088	$289,595
Dividends	100,000	200,000	200,000	215,000
Depreciation written off	......	20,000	20,000	20,000
Cash on hand and in bank	67,156	104,507	79,701	307,168
Sundry creditors	30,317	68,395	58,475	53,641
Sundry debtors	1,545	4,619	37,259	1,294
Concentrates in transit	27,159	41,688	70,312	44,503
Supplies on hand.....	31,603	41,310	66,288	79,937
Royalty on land taxes	20,871	29,892	31,102	36,077
U. S. corporation tax..	1,079	2,191	2,578	2,440
Mines and plant, book value	400,000	380,000	360,000	340,000
Issued stock	400,000	400,000	400,000	500,000

The following are items of mining and milling costs taken from the annual report for 1912:

	Per ton		Per ton
Mining:		General expenses:	
Maintenance of mine employees	$0.08	Management and office	$0.16
Mining supplies......	0.65	President and secretary	0.09
Mining assays........	0.02	Agency expense......	0.09
Mining payrolls......	0.93	Prepaid insurance....	0.02
Total mining costs.	$1.68	Freight and transportation	0.02
Ore transportation to mill	0.04	Messengers and police	0.04
Milling:		Live stock..........	0.03
Maintenance of mill ployees	0.03	Surveying	0.03
Mill fuel and supplies	0.43	Hospital	0.10
Mill assays..........	0.02	Unclassified expense..	0.01
Mill payrolls........	0.26	General repairs......	0.01
Total milling costs.	$0.74	Other expenses.......	0.16
Concentrate expense....	0.31	Total mining and milling	$3.52

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Alaska Gold Mines

The 1913 report of the Alaska Gold Mines Co., Juneau, Alaska, shows that it now owns $3,267,500 par value of Alaska Gastineau Mining Co. bonds out of a total issue of $3,500,000 and $11,299,845 par value of its stock out of a total issue of $12,000,000. This is the operating company of the Alaska Gold Mines Co. The Alaska Gold Mines Co. has a capitalization of 750,000 shares of $10 each, all of which is issued. The balance sheet shows $1,710,750 cash on hand at the end of 1913. Development and construction were continued throughout the year. The Sheep Creek tunnel was advanced 6431 ft. during the year. At the time the report was written, Apr. 1, 1914, this tunnel had been driven its full length of 10,000 ft. and connected with the bottom of the Perseverance shaft. The average rate of advance during 1913 was 536 ft. per month, but in some months over 600 ft. was driven. The height of the vein measured on its dip above the Sheep Creek tunnel and for the length of the zone developed on the No. 10 level is nearly 2000 ft., and the length of the zone so developed is about 5000 ft. The thickness of the main vein used for estimating tonnages is 70 ft. A solid block of ore with these dimensions would contain more than 50,000,000 tons. It is not claimed that an orebody of this size has been fully developed, but it is claimed that underground work, sampling, drilling, etc., indicates a uniformly increased thickness of commercially valuable orebodies as compared with that used in previous estimates. A new orebody has also been opened to the north of the main Perseverance vein on No. 5 level. At the time of writing the report this development had extended for several hundred feet and showing a thickness well over 100 ft. No. 2 vein developed by the Alexander tunnel has been prospected for a length of over 600 ft.; its thickness is over 100 ft. and several hundred tons taken from across the full width and put through the test mill gave a gross value of about $1.60 per ton. Parts of the vein on No. 5 level average about $3 per ton and on No. 10 level, well in excess of $2 per ton. Total development work totaled 22,137 ft. for the year. A new compressor plant including two 3000-cu.ft. electrically driven compressors was started. One of these compressors has been installed. All other surface improvements of consequence required at the mine have been completed.

The Salmon Creek water power contemplates a continuous year-round production of 6000 electric horsepower. In order to get the maximum benefit from the total amount of water available it is necessary to build two power plants. A concrete dam 165 ft. high and 700 ft. long is being constructed which will make a reservoir for storage of flood waters in summer to be used during water shortage in winter. One of these plants is located about a mile from this dam and operated under a 600-ft. head. The water discharged from this plant, together with other drainage water collected from a lower area, is conveyed through a flume for about 10,000 ft. and is to be used under a 500-ft. head at the second plant which will be situated on the shore of Gastineau Channel. Preparations are also being made to install a 2000-hp. plant on Granite Creek.

Construction on the 6000-ton mill is under way. Practically all grading has been completed. The concrete foundations for the crushing plant have been completed. Steel for this plant is on the ground and shipments of steel for the concentrating plant have begun. The railroad from the mine to the mill is nearing completion and living quarters for men, wharves, roads, storehouses, shops, etc., have been completed.

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Tonopah Extension Mining Co.

The report of the Tonopah Extension Mining Co., Tonopah, Nev., for the year ended March 31, 1914, shows that 58,022 dry tons of ore were mined and milled, the average content being 14.86 oz. silver and 0.156 oz. gold per ton. The average price received for silver was $0.59041 per oz., and for gold, $20.6718.

Receipts from sale of bullion were $615,780; marketing costs, $11,013; mining cost, $335,585, and milling cost, $172,873, leaving an excess of $96,279. Adding to this the miscellaneous income amounting to $1560 gives a total of $97,839. After setting aside $17,440 as depreciation reserve, the net realization is $80,399.

Gross value of the ore milled was $12.008 per ton. Costs were, for mining, $5.784; milling, $2.979; metal losses in milling, $1.395; marketing, $0.19; total, $10.318. This leaves a per ton profit of $1.660. Development amounted to a total of 16,091 ft. in drifts, crosscuts, winzes, raises and shaft.

Operations of the Marysville Dredging Co.

By W. H. Wright*

SYNOPSIS—A review of the work of a California dredging company digging deep gravel. Its later dredges have the winchroom over the well-hole, giving the winchman a view of the bucket line, hopper and stacker; the buckets have corners more rounded than in earlier dredges, as it was found that the high corners typical of the early California practice were not required in the Marigold field.

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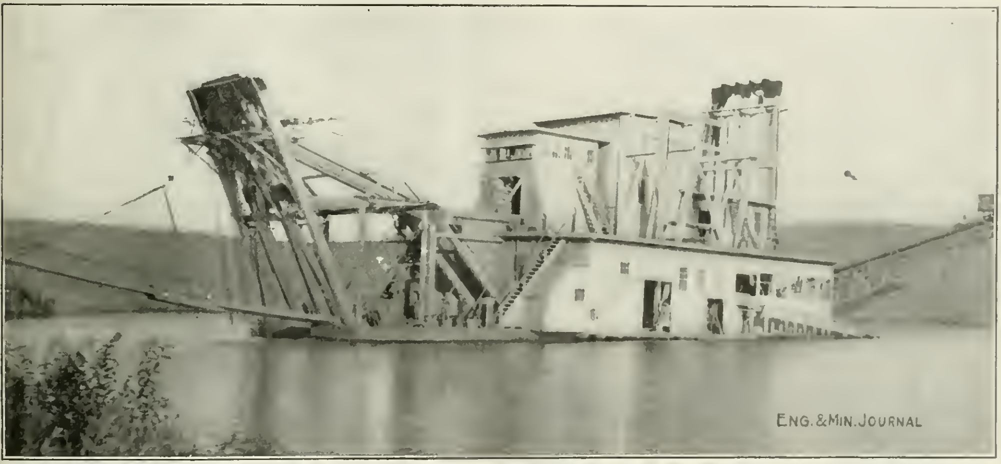
The Marysville Dredging Co.'s property adjoins that of the Yuba Consolidated Gold Fields in Yuba River basin, Calif., and up to June 1, 1914, the company had dredged an area of 207 acres of gravel, averaging 62 ft. deep. This represents a total of 20,705,520 cu.yd. of gravel dug in about nine years with two dredges. An area of 1092 acres remains to be dredged. Four dredges have been installed and operated. Two were dismantled, and two 9-cu.ft. bucket-elevator dredges are now operating.



Marigold Dredge No. 3, Marysville Dredging Co.
The bucket line is almost down to its limit of 65 ft.

Sacramento men first became interested in this ground, which has since been known as the Marigold field. Under the direction of Robert E. Cranston, considerable prospecting was done. The results induced the organization by San Francisco men of the Marysville Gold Dredging Co. This company in 1905 installed two 7.5-cu.ft. dredges. These were of the close-connected, single-lift, California type, and were built by the Marion Steam Shovel Co., of Marion, Ohio.

In 1906 the Marysville Gold Dredging Co. sold its interests to the Marysville Dredging Co., of which Bulkeley Wells is president and managing director. This company has operated steadily since that time. In 1909, dredge No. 3, an 8.5-cu.ft. boat, was constructed, and in 1911, No. 4, a duplicate of No. 3, was finished. No. 1 and No. 2 had been dredging in conformity with the plans made for the government settling basin, and it was not always possible to operate in the most profitable manner. Both dredges were worn out on this work, and being of too small capacity for low-grade gravel, it was decided to dismantle them. No. 2 dredge was shut down on Feb. 1, 1910. No. 1 dredge, which had been giving better results than No. 2, was not shut down until Aug. 2, 1911, some time after No. 4 had been completed.

Changes in Later Dredges

No. 3 and No. 4 dredges were designed and built by the Marysville Dredging Co. under the supervision of Robert E. Cranston. A number of improvements were introduced, and besides increasing the capacity of the buckets from 7.5 cu.ft. to 8.5 cu.ft., the boats were built much stronger than No. 1 and No. 2. About the time these new boats were in operation, T. D. Harris, of Telluride, Colo., became superintendent of operations. Mr. Harris has made a careful study of the field and of the mechanical operations of the boats. He has introduced a number of improvements, the chief feature of which has been in the type of bucket, which has not only been increased to 9 cu.ft. capacity, but the three-piece type of bucket has been entirely discarded and the two-piece type substituted. The corners of the buckets are more rounded and the projections on the corners, which were typical of most of the early dredge buckets in California, are no longer a part of the bucket design. There are some fields in California which require the extra digging strength of a high-cornered bucket. But in the Marigold field the high corner is not essential to the efficiency of the bucket.

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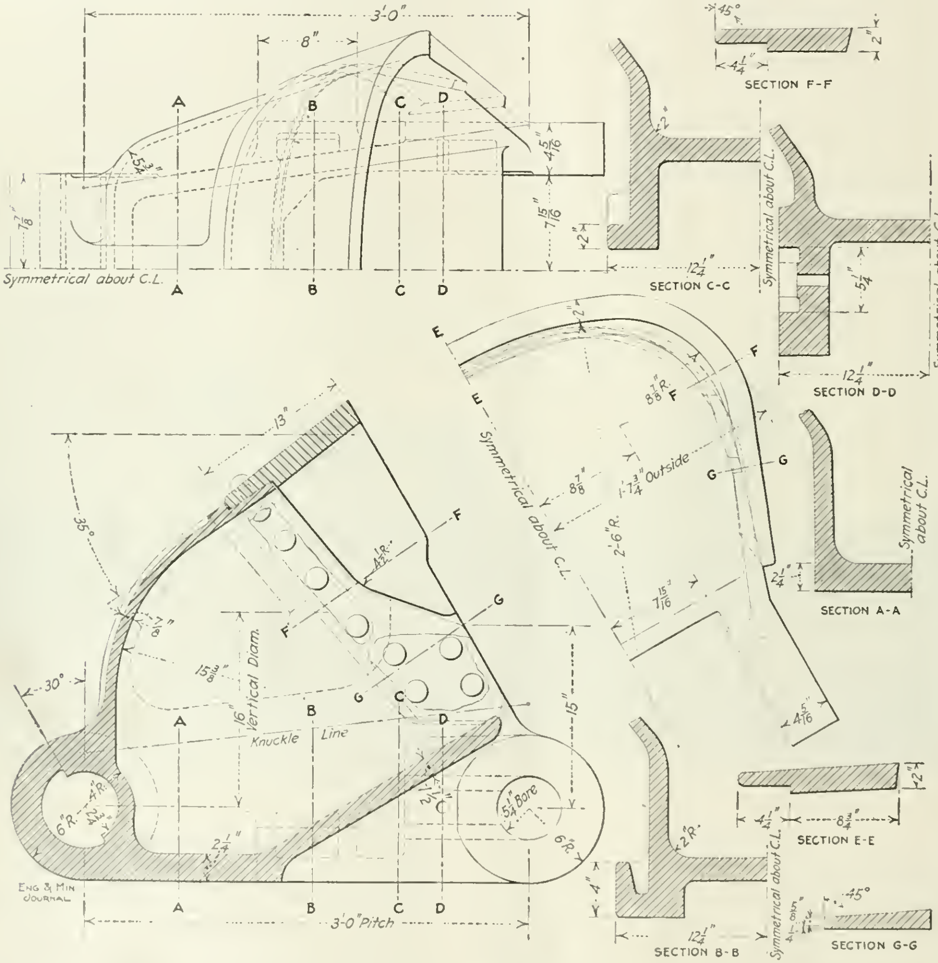
*Mining engineer, 325 Clunie Building, San Francisco.

In the construction of these dredges, the designers departed from the customary style in placing the winchroom over the well-hole instead of on the side. This has much in its favor. The winchman has an unobstructed view of the bucket line and digging ladder, the upper tumbler and hopper, both spuds, stacker and conveyor belt and both bow swinging lines. One objection to this arrangement is that it does not permit the winchman much of a view of the main winch. This objection does not bear much weight as the deckman, or oilers look after the proper winding of the lines, while it is a great advantage for the winchman to be able to see when the stacker belt is stalled or the hopper is blocked.

An electro-magnet clutch is used on the bucket drive and on the main winch. It possesses the advantage of simplicity of operation, is positive, and will always slip at the same pull. The grip of the clutch is regulated by the amount of current passing through the coil. This once adjusted it cannot easily be changed without the knowledge of the dredgemaster.

As the dredges are alike in design and construction, the following description applies to both. The dredges can dig to a depth of 65 ft. below water line and to a height of 10 ft. above water line.



Dredge-Bucket Details, Marysville Dredging Co.

Details of Construction

The dimensions of the hull are as follows: Total displacement, 6 ft. 2 in.; length of hull, 115 ft.; width, 50 ft.; overhang on each side, 4 ft.; depth, 8 ft. 6 in.; length of well, 63 ft.; freeboard, 2 ft. 4 in.; thickness of side planking, 6 in.; thickness of bottom planking, 4 in.; height of bow gantry above deck, 37 ft.; height of main gantry, 22 ft.; height of stern gantry, 58 ft.; total amount of lumber in hull, housings, gantrys, decks, etc., 400,000 ft. b.m. The lumber used was Douglas fir.

The digging ladder is of the plate-girder type; weight, 94,000 lb.; length between centers, 115 ft.; extension beyond bow, 38 ft. The stacker ladder is of the lattice-girder type; length, 139 ft.; weight, 24,000 lb.; width, 4 ft. 4 in.; width of conveyor belt, 32 in.; power on drive, 35 horsepower.

The buckets are of 9 cu.ft. capacity, cast in two pieces of manganese steel. The bucket line is close connected; number of buckets in line, 84; weight of each bucket complete, 2268 lb.; size of bucket pins, 5¼ by 24⅞ in. The ladder rollers are of chrome steel and are 14 in. diameter, 17 being used.

The upper tumbler is six sided; size of shaft, 17 in.; span between bearings, 9 ft. $3\frac{3}{16}$ in.; weight of tumbler, shaft and plates complete, 21,310 lb. The lower tumbler is six sided, has a 12-in. shaft; weight, including shaft and plates, 12,758 pounds.

The ladder-hoist drums are 3 ft. 6 in. diameter. The maximum winding speed is 100 ft. per min. The lines are 1⅛-in. wire rope and travel over 42-in. sheaves. The main winch is driven by a 25-hp. motor. The maximum side-swing speed at the end of the digging ladder is 38 ft. per min.; the minimum being 11 ft. per min. The spuds are hoisted at the rate of 9 ft. 6 in. per min. The bucket drive is driven by a 200-hp. motor, giving a maximum speed of 3 r.p.m. to the tumbler shaft. The bull-wheels have a pitch diameter of 143.55 in., 10-in. face and weigh 10,200 lb. each. The spuds are of steel, center-web construction, having a cross section of 24x36⅞ in. They are 61 ft. long and weigh 36,000 lb. each.

The revolving screen is 36 ft. 3 in. long, 6 ft. diameter, driven by a 50-hp. motor at 8 r.p.m.; holes in screen plates, ½ in. diameter; grade, 2 in. per ft. Total area of gold-saving tables is 2400 sq.ft.; the grade is 1⅜ in. per ft. The riffles are constructed of $1\frac{1}{4}$x$1\frac{1}{4}$x$\frac{5}{16}$-in. angle iron. The water for washing the gravel is furnished by a 10-in., 68-ft. head, high-pressure pump and also by a 12-in., 25-ft. head, low-pressure pump; both are centrifugal pumps made by Abner Doble Co., of San Francisco. The capacity of the pumps is 3200 gal. and 3800 gal., respectively; the high-pressure pump is driven by a 100-hp. motor and the low-pressure pump by a 35-hp. motor. A 2-in., 100-ft. head pump, driven by a 10-hp. motor, is used for priming the larger pumps and for fire protection.

The accompanying drawing shows one of the new 9-cu.ft. buckets used by the Marysville Dredging Co., which is typical of the later design in the California type of bucket.

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Wolverine Copper Mining Co.

Report of the operations of the Wolverine Copper Mining Co., Michigan, for the year ended June 30, 1914, shows a production of 3,435,459 lb. of copper. Price received was 14.09c. per lb., a total of $484,061. All operating expenses were $388,708, leaving a gross profit of $95,353. Construction expense was $3433, and strike expense $10,844, leaving net profit of $81,075.

Rock hoisted was 188,117 tons; stamped, 182,127 tons; yield of the rock was 18.86 lb. per ton, and the cost per ton of ore milled, $1.92. Cost of refined copper at the mine was 9.85c. per lb., while with smelting, marketing and all costs, including strike expense, the cost was 11.72c. per lb. Drifting and shaft sinking amounted to 625 ft. Production at present is approximately 400 tons of mineral per month, yielding 71% copper.

Economical Ore Transportation

Mining in India seems to be generally governed by conditions, which make primitive and laborious methods of operation cheaper than modern machines and processes. At the Kolar Gold Fields, Mysore, ore transportation by bullocks is cheaper than by the use of the aërial cableway. A cable system was installed to supplant natives and bullocks, but after a thorough trial was retired from service since it cost more than the former method.

ORE TRANSPORTATION IN INDIA

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Flotation in Southeast Missouri

The flotation process has been adopted by the St. Joseph Lead Co. for the recovery of lead in the slimes from its mills in southeastern Missouri. The dry slimes carry about 3% lead and contain water in the proportion of about 40:1. The water ratio is reduced in thickening tanks to about 4:1 and the thickened product is then treated in the flotation apparatus. The flotation plant at the Bonne Terre mill was estimated, in the company's annual report, to cost $16,100, that at the Leadwood mill $22,000, and at the Doe Run mill, about $14,200. The Leadwood flotation plant began operation in March of this year and the other two were placed in commission in May. The process used is the same as that developed by H. A. Guess at Flat River, Mo., where it is in operation at the mill of the Federal Lead Co. The total extraction has been increased about 7 per cent.

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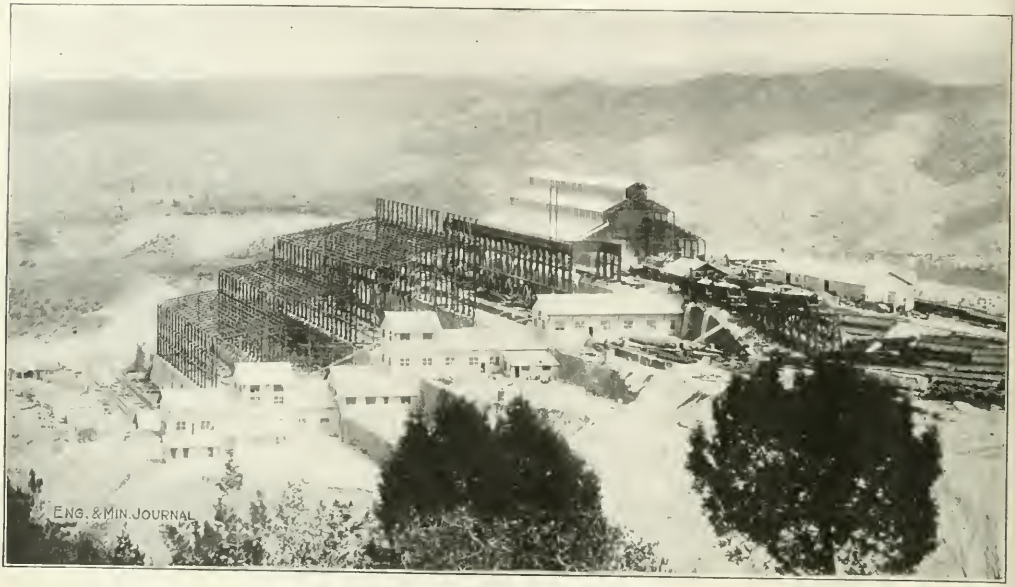
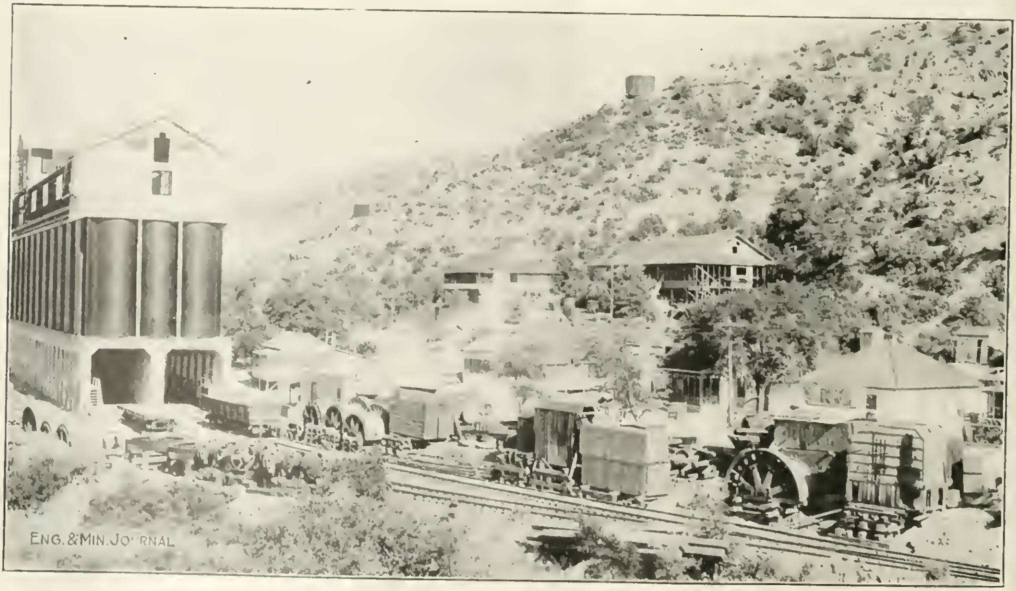
The Calumet & Hecla Tailings Dredge

In an article by a Houghton correspondent in the JOURNAL of July 18, describing the plans of the Calumet & Hecla to dredge and leach its accumulation of mill tailings, it was stated that the accompanying photograph showed the suction pipe leading to "the large Morris centrifugal pump on the dredge." Our correspondent in Houghton inadvertently fell into error, as we have learned. This dredge is being built by the Bucyrus Co. of South Milwaukee, Wis., as was stated, and that company is furnishing the entire dredge, including the pump, from its own designs. This dredge is designed to dig to a depth of 100 ft., which is considerably beyond anything that has ever been attempted before.

Inspiration Consolidated Mill



Test Mill, 7500-Ton Concentrator and Shops
The test mill has a capacity of 600 tons daily and in it are tried out various machines and processes under working conditions



Machinery in Storage and End of 30,000-Ton Bins
Flotation will be a step in the concentration of Inspiration ore

Correspondence and Discussion

Heating a Powder House by Electricity

I was interested in E. P. Kennedy's description of a combined electric and hot-water heating device for a primer house, published in the Journal of Aug. 15. The same arrangement could, of course, be applied to a thawer. I cannot agree with Mr. Kennedy, however, that from the point of view of safety it is above criticism. In this case apparently the powder is not kept near the radiators, but in the case of a thawer, it probably would be and it is well recognized that electric circuits near explosives constitute a distinct hazard. If the scheme were to be applied to a thawing house, I should recommend that the bayonet heater be installed 10 ft. or more from the point where the powder is stored and that no combustible material be allowed between the heater and the powder, at least over a space of several feet. The hot water could be conveyed to the thawing point in well jacketed pipes.

Robert Olds.

New York, Aug. 18, 1914.

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Ore Treatment at the Argo Mill

In the Journal of Aug. 1, the criticism of Jackson A. Pearce, on my article on the Argo mill in the issue of July 4, is not in keeping with facts. I made no claim that the use of ammonium salts or the electric cell were new to the metallurgical fraternity. That Mr. Pearce is operating the mill without these features, using others to get the same effect, is quite possible, but it does not at all detract from the fact that the ammonium salts and electric cell gave the results I submitted in my article.

In regard to Mr. Pearce's statement that during the period between Apr. 1, 1913 (starting of mill operations) to Nov. 1, the plant did not pay expenses, which is true, he either did not know conditions or did not give them consideration. In April, 1913, the directors of the company saw fit to start the plant in an uncompleted condition, with $10,000 in construction debts hanging over it and less than $400 in cash in the bank with which to pay these and start purchasing custom ores at the rate of several thousand dollars per month. The company furnished no more money for months. We were unable to pay the shipper for his ore until we had milled it and sold our products, which was in from three to four weeks. The consequence was that we received only the very low grades and unsatisfactory ores, and part of the time no ore. Furthermore, with no money for necessary equipment we did not get a completed plant until in November.

I am sure that mill operators will appreciate that adding the above conditions to the ordinary troubles of starting a new plant, it was a wonder that we operated at all, much less paid expenses. I state again, due to a knowledge from personal observation, and the word of metallurgists familiar with conditions and employees of the plant, that there have been no radical changes in the plant as turned over to the new management in November, 1913, unless they have occurred within the last 90 days.

Mr. Pearce should truthfully have stated that the shutdown in November, 1913, which lasted nearly 60 days, was because there was hardly a ton of ore in the bins, the shippers having refused to supply ore until the company furnished funds for cash settlements.

The present management should be willing to give those who preceded them the credit for having knocked off the rough edges of the proposition even if we did not have the chance to enjoy a working capital and add the refinements.

Arthur H. Roller.

Denver, Colo., Aug. 12, 1914.

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Single-Track Cable-Way in Sardinia

The Journal of Nov. 29, 1913, contained an article describing an aërial cableway in Sardinia, on which the buckets passed each other on a single line. I remembered that my friend, A. Monticolo, an Italian engineer, had erected a similar line at Massa Carrara, which he has described in *l'Industria Chimica Mineraria e Metallurgica,* Vol. 1, No. 4, and which he patented in Italy on Dec. 12, 1895, pat. 442/40168. This line ran for eight years until the increasing demand on it necessitated a double line.

Herbert K. Scott.

London, July 28, 1914.

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What Is a Prospector?

Misther Editor,

I obsarve that ye've gotten the goat av a rayspictable prospector in Coloraldo, *y parece que él se ha puesto lentes rojos.*

If he'd only kape his shirt on like me old frind Dick on Sunset Peak, he might see that ye're only thryin' to hilp us silf-ilicted Jay-sons nail the grubstake fleece down to the sluice-box av common sinse, so that whin the long delayed flood av prosperity washes agin the gravel banks av Hopes Deferred we kin ketch the foine gold av wisdom along wid the coarse lumps that any fool cud pick up wid his toes. I'm a strong belaver raysonable timperance, but I've noticed that too much grape juice makes the bow'ls wake.

Bill McGinty.

Ong root,
Burro & Shanks' Mare Limited.
El Paso to Kelvin, Arizona, Aug. 8, 1914.

Editorials

Copper Quotations

We are so used to attacks upon our recording of the copper market by a certain Chicago paper that a resumption of them is never a surprise to us. We know, moreover, that any reply is futile, insofar as that paper is concerned, inasmuch as it will disregard simple facts or twist them maliciously, and after a while will go over the same ground again. However, for the benefit of our readers, we will give attention to its last scurrilous tirade, supplementing our remarks of Oct. 25, 1913, and Nov. 29, 1913.

The burden of this tirade is that because there is a difference between its quotations of the copper market and ours, we are wrong and low for some malign purpose. Of course, it would occur to a logical mind that the Chicago paper first ought to establish that it is right and not too high. We must confess that we have never thought it important to examine its quotations in recent years, but we recollect that some years previous there was a charge against it that it copied our figures, making trifling alterations, and a recent examination excited our suspicion that it made similar use of some daily paper. In fact, its quotations for the week ending Aug. 5, 1914, were specifically credited to a daily paper, although this was a week during which there was no market, as we said on the authority of six agencies which sell about all the electrolytic copper that there is in this country, and since then the paper in question has suspended its own quotations, following our initial action.

Now, the fact that we base our record of the market chiefly upon the sales reported by the producers, smelters or agencies, whichever term one may please, is something that we freely admit. We say it every week. Also, that the editor of the Journal calls upon producers, smelters and agencies in order to learn of their business, is something that we have repeatedly told our readers. Inasmuch as we request them to give us their information, we cannot expect them to come to see us, so naturally we have to go to see them. The summary that we report is, of course, our own judgment of the data obtained from all quarters. In reporting the market, we accept information from whatever quarters are reliable, both sellers and buyers, and such as are regularly consulted are willing to show documentary evidence of transactions whenever requested. We confess that we do not know of any other way of reporting the market.

However, the proof of the pudding is in the eating. We have said time and again that we do not pay any attention to the small business of jobbers and dealers, or to the operations of minor speculators, who not infrequently have to pay a premium; or to the New York Metal Exchange, where no business worth mentioning is done and where the big interests are not even represented; or to the scrappy and commonly inaccurate notes of reporters for daily newspapers, etc.; but we aim to summarize what the producers get in merchandizing the whole of their output; in other words, what is the commodity price of copper. In 1913, eleven companies officially reported that they had sold 658,533,402 lb. of copper for an aggregate sum which averaged 15.222c. per lb. Our quotational average was 15.269c. In 1912, the same companies officially reported the sale of 552,155,308 lb., averaging 15.841c. per lb. Our quotational average was 16.341c. Manifestly, those producers who sold on quotational averages got all there was. And similarly in previous years.

Our inability to quote the market on any day is often vexatious to some persons—whether subscribers, readers or what, we do not always know—but it is a fact that the editor of the Journal, who has other duties than market reporting to perform, cannot, except for incidental attention, devote more than one day to this, at which time the day-to-day transactions of the previous week are reviewed; and, moreover, if he could, the producers, etc., would refuse out of fear of indicating their operations to competitors. In recording what is old history there is no such objection, except with regard to the last day, and we have had some complaint about that. This may lead us to discontinue the advance communication of quotations at 4 p.m., Wednesday, the time when we go to press, which we have done heretofore at the request of subscribers, wholly as a matter of courtesy to them and at a good deal of trouble to ourselves.

Now, it is necessary that there be quotations for the conduction of business. Everybody found that out a few days ago, if they did not previously know it, when quotations for silver and copper were suspended and business stopped. The quotations of the Journal have come to be used as a basis of settlement for the reason that they have been recognized to be accurate and disinterested. As to the nature of all the contracts that are based upon them, we do not know. Often are we surprised to learn of some new way of their use, both as basis of buying and of selling.

This use of quotations is, of course, entirely optional. Large producers do not have to base their contracts upon them if they do not want to. The largest sales of copper on quotations are those of big companies, who periodically enter into contracts with the buyers. If they choose, they can sell on commission or can have their copper refined on toll and handed back to them to sell themselves. Some people like to sell their output right along at the average price; others like to speculate in the hope that they may sell when the price is high, which sometimes they do and sometimes they do not. In the long run, however, things seem to turn out about the same, probably because of the law of general average. The great bulk of all of our copper is produced by a relatively few mines. The copper in the ores of small miners is of trifling quantity. It comes in such small lots that it would be inconvenient to smelt it on toll or settle for it in any other way than on some recognized quotations. In so settling, the small miner is doing simply what is done by many big miners who are amply able to satisfy themselves respecting the reliability of what they are using. Smelters who take in ores on quotations often sell their own products on the same quotations.

It is high time to call a halt upon these reckless charges that smelters are dishonest, just because they are smelters, and this fomenting of suspicion, which is done out of ignorance and maliciousness. The smelters conduct their business upon principles that are just as honest as the principles of miners, and of most people. During recent years, they have effected great economies in their methods and the derivative advantage thereof has gone to a large extent to the producers of ore, who have progressively got more and more for the same grade of ore. In the trying days of late, when our whole commercial and financial structure has been shaken to the foundations, the smelters have shown their patriotism in working for the common weal just as have the bankers, brokers, statesmen, and even editors. It developed suddenly that there was no market for either silver or copper, our biggest customer—Europe—having been suddenly cut off. There being no market, properly speaking, there could be no quotations, and settlements for metal and ores could not be made, of course to the disaster of many producers. We have been criticized for suspending our quotations for copper. A few days after the first shock, there were some purchases of copper at about the last prices, and anybody who needs copper today can get all he needs, but while the buyer is free to buy, the seller is not free to sell, and in that condition there is no market, as we consider it, or as persons who see broadly consider it. If smelters had had to take in copper and silver, they would have had to sell it, and in trying to sell it with the principal customers gone, what would have happened to prices may be left to the imagination. The situation was precisely analogous to the situation in the securities market which led to the summary closure of the stock exchange. There were those who objected to that, eager to profit from the misfortunes of others, but a continuance of the stock market would not have been to the interest of owners of securities or to the public welfare; and a continuance of the copper market would not have been to the interest of either the miners or smelters of copper.

In this juncture the smelters came generously to the assistance of the miners, with whom they had contracts for metals and ores. By agreement with the Mint, which took 1,175,000 oz. of silver at 52c., they undertook to take in all silver to be settled for up to the close of business on Aug. 11 at the same price, although the quantity was far in excess of what the Mint was taking off their hands, and they have to carry it through the uncertainties of these evil days. And furthermore, the smelters volunteered to their consignors of ore, etc., to take in copper and silver under their contracts until further notice, advancing 10c. per lb. on copper and 25c. per oz. on silver, and to make final adjustment of the difference when there should again be an open market for those metals. We do not know what could have been more square or more generous in their assistance in a trying situation. But the same spirit has animated most men since the calamity fell upon us.

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The Salt Lake Meeting

The Salt Lake meeting of the American Institute of Mining Engineers, which was held last week, was from all accounts a highly successful meeting, being in all respects a successful emulation of the red-letter meeting at Butte last year. Salt Lake City is a great mining center and was an eminently suitable place for the holding of such a meeting, having a great variety of mining and metallurgical enterprises with which to interest professional visitors. Indeed, there is scarcely any other mining center in the United States where there are operations of such great magnitude and such diverse character.

The technical papers presented at the Salt Lake meeting were of a high order of merit, and will add greatly to the important file of technical records that the Institute is accumulating in its transactions. The excellent attendance at its meetings, the constant flow of technical literature that is coming into its office, and the steady increase in membership, are evidences of the esteem in which the rejuvenated Institute is now held among mining men.

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The Situation in Spelter

The war has so upset the commercial conditions of the world, that statistics of so recent date as the mid-year are about as valuable as statistics unearthed in Babylon. However, there is a certain interest in the last mid-yearly statement of the production of spelter as reported a few days ago by the U. S. Geological Survey.

A few weeks ago, we reported the guesses of four large smelting interests respecting the unsold stock of spelter on hand, these guesses ranging from 40,000 to 60,000 tons, and ourselves made the guess of 50,000. It appears from the government statistics that the stock was actually about 64,000 tons, being an increase of upward of 23,000 tons since Jan. 1, 1914, and being the largest stock ever known in the history of zinc in this country. The production of spelter from domestic ore was 171,196 tons, which was an increase of about 5500 tons over the previous six months, and was, in fact, the largest domestic production of spelter ever reported in any single semester. Can there any longer be doubt as to why spelter was persistently pressed for sale during the first part of 1914, and why the generally prevailing price was low?

The Government report reckons an "apparent consumption" of about 149,000 tons, or about 17,000 tons more than in the previous semester. Bearing in mind the well known stagnation in industry during the last six months, this figure as indicative of consumption is, of course, ridiculous. Deliveries may have been such, the explanation being that manufacturers were laying in stocks at low prices, but not using them up. Also, deliveries may have been made to other quarters than the manufacturing.

The statistical position in Europe at the mid-year was about as bad, the stock over there being unofficially reported as about 100,000 short tons; yet in spite of the adverse statistical position, both in Europe and America, we have witnessed here a rise of about 1c. per lb. in the value of spelter since the end of July. The explanation of this is that Great Britain's supply of spelter has been cut off by the war on the Continent, wherefore, that country may look only to the United States for what she needs. The large European stock of spelter was understood to be held chiefly on the Continent, relatively little being in Great Britain. In 1913, Great Britain consumed about 194,000 metric tons of spelter, but produced only about 69,000. Consequently, her probable requirements from the United States will be large, and our producing interests seeing a prospect of the rapid diminution of their stocks, have become stiffer and stiffer in the price at which they are willing to sell. Export sales at high figures have already been made to Europe. Thus, the war has unexpectedly lifted the American zinc smelters out of a very awkward predicament.

On the other hand the zinc miners of Broken Hill, in Australia, have been put in a bad fix, the European market for their ore having been entirely cut off. Efforts are now being made to sell the Australian ore to zinc smelters in this country, but no arrangements have yet been made.

Manufacturers' Mines

Mr. Colburn, in this issue, sets forth some optimistic and common-sense ideas upon the selling of mining properties. He seems to take little stock in the gloomy tales that are circulated regarding stagnation in the industry. The facts in the case seem difficult to ascertain, and the answer to the question whether mining is thriving or languishing depends largely on one's point of view. But nobody can take issue with Mr. Colburn's brief instructions on how to sell a mine; they are admirably to the point. Selling a mine is a business in itself and requires special aptitude and training. The art of salesmanship is one not widely diffused. To sell goods is about the most difficult thing in the world; the salesman for a machinery house gets three times the salary of the designer or the plant superintendent. With this fact in mind, the profits that the successful mine promoter makes do not seem so outrageous.

Mr. Colburn's classification of possible purchasers is interesting. He makes up a group of manufacturers who are seeking raw material and cites certain examples. We suppose that his residence in Denver may account for his failure to include the most prominent example in this class, namely, the iron and steel companies. It is a feature in our mining industry rarely commented upon that the steel and iron business is conducted in reverse order from most other mining. Here the furnace is the thing and the mine is an accessory. The manufacturing plant producing pig iron and finished product buys iron ores and iron mines to furnish it with raw material. A gold-silver miner or a lead-silver miner, or a copper miner, after proving his property—or before—builds him a treatment plant, a mill or smelting works, or both. Here the mine is the thing and the works are dependent on it.

We believe that at one time the General Electric decided to get its raw materials direct and attempted to find and make a copper mine. The result was a flat failure. But conditions somewhat similar to those of the iron industry exist also in the aluminum and to a less extent in the zinc industry. The reason for these radical differences in business methods and organizations is probably to a large extent inherent in the nature of things. For iron, aluminum and zinc production, questions of fuel, markets and power are paramount. Broadly speaking, too, the metallurgy of these metals adds more to their value than the metallurgy of copper, gold, silver or lead. But on top of this, the difference is undoubtedly due largely to the fact that things got started that way.

This subservience of iron mine to iron furnace works out unfortunately for the iron-mine employee. From his point of view, iron mining is the most uncertain, erratic and unsatisfactory in the whole field of mining industry. Just now the country is passing through a period of business depression and no line of business suffers more than the iron and steel trades. This bad effect is reflected back with double force on the mines. Shipments from Lake Superior are little more than half what they were at this time a year ago. Many properties have shut down, and in many others the force has been cut in half. No other metal mining is thus adversely affected by business depression to the same extent, except it be that carried on in the Joplin district. With the copper mines, it is quite different; no considerable property had closed down or even reduced its force, until the European disaster forced a radical curtailment; and on gold mining, the state of the market has no effect at all, except that a depression is actually beneficent in reducing costs.

The facts of the case are that gold mining, popularly conceived of as the greatest gamble in the world, represents stability itself in comparison with iron mining. For steady-going reliability, there is nothing to equal a big, low-grade, producing gold mine. On Thursday, July 30, when industrial, railway and copper stocks were tumbling 10 and 20 points, Homestake, on the New York exchange, made a small but real advance.

We have had no reports of great distress among the Lake miners because of the curtailment of production, nor of reduction in the salaried forces. But these features are likely to develop. The mine ordered by its furnace master to curtail production and cut expenses cannot be expected to keep its surveyors and superintendents employed. It seems not unlikely that a great many young engineers from the iron ranges may be added to the still greater number now up from Mexico who are looking for some profitable employment in mining or out of it.

Secretary Lane on the Mining Industry

The Secretary of the Interior, in an interview this week, extended a word of cheer to the American mining industry in its present troubled condition. The substance of his talk was that we have in this country about all the mineral resources that we need, and where we have not heretofore been making use of them, we ought to get busy and do so. Thus, we ought to obtain potash from California, we ought to make nitrate of lime at Niagara Falls, and we ought to develop our known resources of manganese ore, antimony ore, and numerous other minor mineral substances.

Remote is it from our intention or wish to be a carping critic in these days of adversity, when it is needful that everybody coöperate for the common welfare. However, it may be pointed out that many of the things that Secretary Lane suggests require a great deal of money and a great deal of time for their development. Thus, it would trouble the most optimistic promoter to begin the production of nitrate of lime at Niagara Falls within any brief time. Also, the utilization of some of our resources, which Secretary Lane mentions, was abandoned in the past for the reason of being unprofitable. There is an antimony smelting works right on the water front of New York's harbor, which has been idle for many years through inability to obtain ore supply on terms permitting it to be operated profitably. However, the high prices now prevailing for antimony may alter that condition.

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American Potash Not Yet a Reality

No important quantity of potash salts will be available this year from the American Trona Corporation's operation in California. The experimental unit at Searles Lake is nearing completion and should be ready for full operation in September or October.

As the process is a new one, the usual adjustments will have to be made before the building of the commercial plant will be undertaken, so that regular production on an important scale cannot be expected for another year at least.

In the experimental plant some of the first precipitations have already been tried and sodium carbonate, chloride and sulphate have been separated, though some features have required perfecting for commercial-scale production. Potassium chloride, being the most soluble, is the last salt to be recovered. In view of the improbability of getting any potash salts from Germany this year, prices have risen abruptly and the American Trona Corporation may subordinate its production of other salts for the present and recover only potassium chloride. If this policy be adopted, the potassium-chloride output of the experimental unit would much exceed the daily capacity of five tons, the estimated potassium-chloride production when the other salts were being separated.

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Copper

While the prices of some metals are soaring and those of other metals are at least holding their own, the position of copper is unknown, not even the most experienced participants in its business venturing to offer any positive prophecy respecting its prospects. A few months ago we were congratulating ourselves that while iron, spelter and other metals might be suffering from the domestic depression in business, copper was secure for the reason that it had an international market. That very condition proved to be its weakness. It may help to form ideas by reviewing some of the statistics for 1913.

In that year our refineries delivered 348,068 metric tons for domestic consumption and 394,201 for export. The Government report of exports is, however, 420,200 tons, of which Germany and Holland took 220,500 tons and Austria 15,700 tons. Germany reports imports of only 197,353 tons from the United States. The discrepancy between the producers' and the government figures need not here be explained. It is evident that Germany has been our largest customer.

Germany, however, did not keep all the copper she took in. Besides copper bars, etc., she imported 17,913 tons of copper manufactures, but exported 78,957 tons, an export surplus of 61,000 tons, which was largely in the form of brass, sheets, wire and cables.

So long as the war lasts we cannot expect to sell any wire bars, cakes or ingots to Germany. Probably she laid in a comfortable supply when she made her large purchases last spring. We may, however, expect to sell copper to Great Britain, France, Italy and Canada when commerce is resumed and the cessation of Germany's large exports of copper manufactures must leave a void to be filled by somebody, perhaps to some extent by American manufacturers.

In the meanwhile, American production has been curtailed from *nil* to 100% in the case of individual mines. Perhaps the curtailment in the aggregate is about 50%, reducing production to about the estimated domestic requirement, although for the moment there is not even any of that worth mentioning. Soon, no doubt, there will be, however. But there was a large supply of crude copper at the refineries and in transit thereto which, of course, could not be curtailed and has swollen the unsold stock, although, of course, copper is still leaving the refineries on old contracts, some going even to Great Britain.

We have but little information respecting copper production in other parts of the world. Some producers in South America have been obliged to suspend owing to inability to dispose of their product either through the disruption of international exchange or inability to secure transportation, or otherwise. From Spain and Portugal, we have had no news. The whole situation is very complex.

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The bearing of the war upon the export trade of the United States is shown by the following values of our exports of crude commodities in the last fiscal year: Cotton, $630,000,000; breadstuffs, $166,000,000; provisions, including livestock, $153,000,000; copper, $150,000,000; petroleum products, $141,000,000; tobacco, $55,000,000; fruits, $33,000,000; hides and leather, $22,700,000; phosphate rock and fertilizers, $11,800,000.

BY THE WAY

An interesting political, but nonpartisan, movement is that of the National Voters' League, of Washington, D. C., which is a development of the "follow-up" system. Its activities consist largely in printing an easily followed chart, showing the votes on all important bills, together with a discussion of the most noteworthy matters. It is interesting to note the tribute in its Bulletin No. 3, to Congressman MacDonald, of Michigan, lately in the mining eye by reason of the strike investigation.

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The "Cousin Jack" stands high with Mr. MacNaughton, manager of the Calumet & Hecla. Testifying before the Congressional Committee investigating the recent strike of copper miners in Michigan, Mr. MacNaughton explained why so many of his bosses were Cornishmen. The Cornishman, he said, inherited mining from generations of ancestors. Furthermore, when he came to this country, aside from being a good miner, he spoke English and had thus an advantage over a great many of the other foreigners, such as the Austrians, the Italians and the Finns, who were handicapped by reason of their inability to speak and understand English readily for some time after arriving. Aside from that, the natural ability of the Cornishman as a miner, he assumed, worked to his benefit, with the result that the charge to the effect that the majority of underground bosses and captains were Cornish probably was right.

PERSONALS

Roscoe H. Channing sailed for Genoa last week to bring home his family, who are at Lucerne, Switzerland.

Frederick P. Burrall sailed from New York for Cartagena, Colombia, Aug. 12, on professional business.

J. C. Hoffman is the newly appointed manager for the Arizona Southwestern Copper Co., in place of Lawrence Hoffman, resigned.

L. G. Huntley, formerly of the Associated Geological Engineers, has left for Colombia, South America, for examination of oil properties.

Anton and Karl Eilers, with their families, were at Munich when the war began. Since then their friends have had no word from them.

Lloyd B. Smith, of the Associated Geological Engineers, sailed Aug. 12 for Colombia, where he will be engaged in the examination of oil territory for a couple of months.

Sir George Paish, the eminent financial writer, has resigned as editor of the London "Statist," to become financial adviser to the Chancellor of the Exchequer, in London.

At a meeting of the board of directors of the Vinton Colliery Co., held at Vintondale, Penn., on July 28, Clarence M. Schwerin was elected president of the company and Warren Delano, chairman of the executive committee.

T. H. Edwards has been appointed superintendent of the steel department of the Wheeling Steel & Iron Co., Wheeling, W. Va. He was formerly superintendent of the bessemer department of the Colorado Fuel & Iron Co., Pueblo.

William B. Thompson, head of the Stock Exchange house of Thompson, Towle & Co., and the prime spirit in the Inspiration Copper Co., was elected a member of the board of directors of the New York bank of the Federal Reserve system.

D. M. Riordan sailed upon six hours' notice on the U. S. cruiser "Tennessee" as one of the commissioners representing the government in the distribution of aid to the Americans stranded in Europe. Mr. Riordan made a great record in rendering help at the time of the San Francisco earthquake, and Washington was quick to avail itself of his services in the present emergency.

R. N. Dickman, of Chicago, has completed examination of the plant and properties of the Birmingham Ore Milling Co., of Birmingham, Ala., and sailed Aug. 16 from Seattle for a two months' trip to Alaska to examine tin and copper properties north of Nome. While continuing his own office at 1010 Mallers Bldg., Chicago, Mr. Dickman can be reached through any of the offices of Robert W. Hunt & Co., with whom he is connected as consulting mining engineer.

A. L. Queneau has been at Jemeppe, on the Meuse in Belgium, during the last year, engaged in some experimental work in zinc smelting. The editor of the "Journal" received a personal letter from him, dated Aug. 3, which will be of interest to all his friends, and surely Mr. Queneau will not mind the communication of some of his news. After telling about his experimental work and rejoicing over some promising results lately obtained, he continues: "But, alas! I have now to start to rejoin my old regiment, Germany having declared war on France, and everyone and everything must be abandoned. I leave Mrs. Queneau with the children here, as it is probable that Belgium will maintain her territory free from the invasion of Germany. Belgium has now some 250,000 men in the field, a force sufficient to make Germany think twice before violating her neutrality. M. de Sincay has promised to look after my family during the war." M. de Sincay is the director-general of the Vieille Montagne company. How little did Mr. Queneau foresee what was shortly going to happen in Belgium!

OBITUARY

B. C. Wolfram, manager of the West Dome mine at Porcupine, was found dead in his room at a hotel at North Bay, Ont., July 30. It is believed that he committed suicide, though no reason for such action is known. He had been in the Cobalt camp for seven years as prospector and manager for Morgan R. Cartwright in the Temiskaming and other mines. He was unmarried.

Harry J. Hubbard died on the U. S. battleship "California," off Mazatlan, Mexico, July 31, after an operation for appendicitis. He had just reached Mazatlan from Bosario, Sinaloa, where he was superintendent of the Minas del Tajo. He was 32 years old, was born at Vermilion, S. D., and went to Texas when a boy, his parents settling at Marfa. He graduated from the New Mexico School of Mines at Socorro. He was for several years at Divisadero, Salvador, returning to Texas three years ago. Soon after, he accepted the position at the Minas del Tajo, which he held until his death. He leaves a widow and two young sons.

Jacob Langeloth died at his country residence at Riverside, Conn., Aug. 14, aged 62 years. He was born in Mannheim, Germany, and came to the United States about 30 years ago. He was one of the best known men in the metal trade in New York and was for many years a leader in the trade. He was long president of the American Metal Co., retiring a few years ago and becoming chairman of the board. Mr. Langeloth was vice-president of the Balbach Smelting Co., and a director in the Corn Exchange Bank, the General Development Co., Metallurgical Co. of America, Mexican Bank of Commerce and Industry, Miami Copper Co. and Wetherill Separating Co. He was a member of the New York Chamber of Commerce, the Downtown Association, the New York Yacht Club, the New York Zoölogical Society, the Metropolitan Museum of Art, the American Institute of Mechanical Engineers and the Deutscher Verein. We hope to publish a fuller obituary in our next issue.

SOCIETIES

American Chemical Society—The general meeting appointed to be held at Montreal, Sept. 14-18, has been indefinitely postponed. In consequence of the war, it was impossible to carry out the program arranged for the meeting. As it will be difficult or impossible to arrange for a meeting later in the fall, it is probable that the next meeting of the society will be held in New Orleans, early in next April.

Teknik Club—This club, organized a few years ago as the immediate successor of the Western Association of Technical Chemists & Metallurgists, has issued its program for the season of 1914-15. This club meets monthly at the Shirley Hotel, Denver, for an informal dinner, after which two members present technical or popular papers that are freely discussed by all members. The program follows: Oct. 13, addresses by M. S. MacCarthy and R. W. Gordon; Nov. 10, W. G. Swart and S. C. Lind; Dec. 8, C. F. Whittemore and J. C. Morgan; Jan. 12, R. K. Allen and J. B. Ekeley; Feb. 9, Walter E. Burlingame and A. R. Schroeder; March 9, John A. Davis and E. J. Dittus; April 13, G. W. Stiles, Jr. and R. S. Hiltner; May 11, J. C. Roberts and H. P. MacGregor. Guests are always welcome at these dinners.

Iron Country M. C. M. Club—This club is composed of the graduates and former students of the Michigan College of Mines who are located in the Michigan and Wisconsin iron ranges. It has at present 65 members, with local branches on the Marquette, Menominee and Gogebic ranges, the range branches meeting three times a year and the entire club once a year. The members in the Iron River Stambaugh District hold a dinner once a month. E. S. Dickinson is president; E. L. Laing, secretary, both of Iron River, Mich. F. C. Roberts, of Crystal Falls, Mich., is treasurer. W. B. Pattison, Negaunee, Mich., is secretary on the Marquette range. The positions held by members of this club vary from shift boss and mine captain to general superintendent. The third annual meeting will be held in Iron County, Mich., Aug. 22. It will include visits to Crystal Falls and the principal mines of the Iron River and Stambaugh districts, ending with the annual dinner at Iron River.

INDUSTRIAL NEWS

The John Simmons Co., manufacturers of the Baldwin Carbide Lamp, has issued for the use of engineers using Baldwin lamps a table of natural sines and cosines, on heavy celluloid of a size that can be conveniently carried in the note book.

The Westinghouse Electric & Manufacturing Co. reports the following recent orders from the metal-mining industry: An aggregate of 2713 hp. of electric motors, four storage-battery locomotives, two motor-generator sets, 1403 kv.-a. of transformers, one lighting arrester, one switchboard transformer, and one three-phase induction regulator.

Editorial Correspondence

SAN FRANCISCO—Aug. 12

Forest Fires in Siskiyou County during the latter part of July and the first of August destroyed a large amount of timber. One fire started five miles from Sissons near Black Butte, and burned over an area of 5000 acres. Most of this was cut-over ground. From 500 to 1000 men were employed fighting fire at a cost of $35,000. Another fire started from the Shasta County side of the line in heavy and valuable timber, burning over an area of 600 acres. At the head of Bogus Creek, near Yreka, 100 acres of timber were destroyed. Cut-over land at Hilt, amounting to 100 acres was burned. Two fires in the Salmon River district started in heavy timber, but were controlled without large damage. There were several fires during this period in Sissons, Dunsmuir, Yreka and Hornbrook, some of which resulted from the forest fires. It is stated on good authority that most of the forest fires were incendiary. The Forest Reserve men were active in fighting these fires and were assisted by volunteers in every instance.

Yukon Gold Co. Has Increased Its Holdings, the Guggenheim interests having added to the dredging land owned by the company and operated by its subsidiary, the Pacific Gold Dredging Co., by the recent purchase of 300 acres on Yuba River lying north of the holdings of the Yuba Consolidated Gold Fields at Hammonton. The ground has been sufficiently prospected to satisfy the purchasers to the extent of making the first payment on the purchase price. No time has been definitely set for the installation of a dredge on the new holdings, owing to the installation now in progress of a dredge on Butte Creek, near Chico. It is probable that the Yuba River installation will await the completion and commission of the Butte Creek dredge. Whether the money depression resulting from the European war will cause further delay is not at present known, though it is probable the work will proceed as speedily as convenience will permit That the Pacific Gold Dredging Co. will also operate this new holding is quite probable, as it is the subsidiary that operates all of the Guggenheim dredging interests in California. The other operations are at Oroville, Chico and Auburn.

Mountain Copper Co. Smeltery has closed and the extraction of ore at the Iron Mountain mines in Shasta County has been discontinued. Construction of the new concentrator has temporarily ceased, but will probably be resumed before resumption of work at the mines. The reason for the closing down of the copper mines and smeltery at Martinez is that copper is absolutely unsaleable. The directors in London cabled to Manager Ketts on Aug. 4 that owing to financial conditions in London caused by the war it is desirable to discontinue the mining and smelting of copper until there is some settled market for the production. Ketts immediately proceeded to the closing down of the smeltery and after putting the mine in order discontinued the extraction of ore. There were 350 men at work in the mines and 150 at the smeltery, all of whom are now out of employment. Mountain Copper Co., Ltd., is entirely financed in London and the operation of mines and smeltery is wholly dependent upon London capital in the absence of a market for copper. The company will allow married men to retain the cottages at the mine free of rent, and will extend credit to them at the company store if necessary, and will make a reduction in prices of goods to the actual cost to the company.

The Mammoth Copper Co. announced on Aug. 11 that instead of closing down the entire plant, two of the three furnaces will be kept in operation. The same number of men will be employed as has been necessary in the operation of three furnaces. The work will be divided so that each man will be able to work five or five and one-half days. This plan was the result of a visit to Kennett of Frederick Lyon, managing director. Mr. Lyon, with Manager Metcalf, took up the matter with the smelter workmen. There were 350 employees present at the conference. They were invited to suggest an improvement upon the plan offered, but no suggestions were made. Robert E. Henley, superintendent of the mines, made a similar proposition to the 400 men employed. There will be no Sunday work at the mines. The order to suspend all development work has been modified and development at the Stowell mine will continue with 60 men employed. There will be no reduction in wages and no increase in working hours, and no men will be laid off during the period this plan is enforced. Men who are contemplating vacations are asked to do so, as early as possible, and they are assured that they may return to their work at any time without prejudice. Heads of families who go on a vacation will not be charged rent for company houses, occupied by their families during their absence.

BUTTE—Aug. 17

The Industrial Commission in Butte, appointed by President Wilson to secure information in all parts of the country upon the underlying causes of unrest in the labor world and to make recommendations for action by Congress, has been in session from Aug. 6 to 8. The commission consisted of Prof. John R. Commons of Wisconsin University, Austin B. Garretson, president of the order of railroad conductors, James O'Connell, third vice-president and John B. Lennon, treasurer of the American Federation of Labor. Prominent mining men, laboring men, and men active in political and official life of state, county and city were summoned before this board to give their views on the mining, industrial, political, civic and moral conditions of Butte in particular and of the state in general. The statements of the men called before the board did not reveal the existence of conditions which are not fully known to everybody throughout the country and which have been freely discussed by the press and magazines. C. F. Kelley, vice-president of the Anaconda Copper Mining Co., was among the first to be called before the board. He outlined the history of the Anaconda company, the extent of its operations, of its holdings, salaries of its officers and employees, expenditures and earnings, methods of mining and dealing with labor organization, regulations and means employed in and about the mines for safety, sanitation, etc. All this has time and again been made public by the company in official and semi-official reports and by accounts of innumerable visitors from all parts of the world to the mines, shops and reduction works of the company, where they are always welcomed and courteously shown about by the company's employees. John Gillie, general manager for the Anaconda company, E. P. Mathewson, general manager of the Washoe works and managers and superintendents of other Butte companies who were called before the board, all corroborated Mr. Kelley's statements regarding conditions in Butte mines and had nothing to say beyond the facts already known to the general public, through the company's policy of issuing monthly, quarterly and yearly reports in which all the phases of mining and the company's relations to labor organizations are freely and impartially discussed. During the sitting of the commission the miners' view of the labor situation was also discussed and the officers of labor organizations were given opportunity to present their views. Among those called before the board were Dan. D. Sullivan, Butte's street superintendent and former president of the Miners' Union, Daniel Shovlin of the new Butte Mine Workers' Union, W Daly and others. They gave testimony regarding the company's dealings with the labor unions, the methods in vogue of hiring and discharging men, they also expressed opinions as to the causes that brought about dissatisfaction with the old and the organization of the new union, all of which had been discussed at the meeting of the labor organizations and reported in detail by the daily papers. Governor Stewart of Montana, testified regarding the state; means for maintaining order, for protecting property and enforcing the law. He favors arbitration between capital and labor by a Federal board of arbitration rather than a state board. Says that laboring men in Montana are law abiding and that recent disorders in Butte were due to outside influences. Various physicians discussed the methods of taking care of diseased and injured miners in private hospitals and other institutions. Tuberculosis, its causes and treatment were gone into in detail. The only startling incident of the session was a broad attack by the former city attorney, Maury, on the state, and county courts, judges, jury and lawyers who, he says, were all dependant on the good graces of the mining companies and that therefore no justice could be obtained in

Montana courts in damage or other suits against said companies. These charges were all refuted by L. O. Evans, chief counsel for the Anaconda company who reviewed individual cases and recited facts to show that the statements of Maury were wholly unwarranted. Altogether the inquiries of the commission brought to light nothing that was new to the general public nor anything that would point to the necessity of Congressional interference. The companies are fully able to deal intelligently with the difficult problems incident to the great industry of mining. The fact that for a period extending over many years no serious troubles arose between the companies and their employees, goes to show that the great majority of miners are satisfied with the conditions existing in Butte mines as well as with the constant efforts of the companies to render work in and about mines and smelters as comfortable and safe and healthful as natural conditions permit. The closing session of the commission was marked by an eloquent address by Mr. Kelley in which he replied to some of the statements that had been made against the Anaconda company. In the address he set forth the following facts: "I deny that the Anaconda company has ever, directly or indirectly, attempted to assert any dominion over the Butte Miners' Union in its internal affairs. We are in competition with the copper producers all over the world. We are in competition with the copper that comes from the labor of the Mexican peon who gets from 50 to 75 centavos per day. We are in competition with the Peruvian, the Spanish and the Japanese miner. With a greatly added expenditure in the production of copper, it would cease to be produced here at all. A shorter work-day would mean an increased cost of production that could not be maintained. Out of every dollar taken out of these mines, more than 50c. goes directly to the man in the mine and at the smelter. If the grog shops upon this hill were shut up, the accident record would be closed. The man who comes up to the collar of the shaft with a half dozen drinks under his belt and goes underground is the one who, many times, falls into the chute, loses his hold upon a lever or misses a loose piece of ground over his head. The high rate of wages among the local crafts downtown is one of the factors that has made living very high."

CALUMET—Aug. 15

All Small Mines are Closed and the Lake Superior copper district of Michigan is facing a serious condition. These smaller properties are closing down indefinitely and the producing properties are curtailing. This condition coming right upon the heels of the strike will, if it continues for any length of time, cause considerable hardships upon some of the people. The Tamarack Mining Co. has discontinued all work with the exception of pumping and the Hancock has also shut down affecting 200 men. The Copper Range, starting with today has put all work in half time, closing down entirely until Sept. 1, when the full force will work until Sept. 15, when another shut down will be effective. A reduction in wages of 10% has also been announced at this property. The Calumet & Hecla Mining Co. has curtailed slightly on its underground force but is maintaining production at present. Some of the shops have gone on half time owing to the stoppage of all construction work. It is not likely that any further reduction will be made at the present, for the management of the several properties are hoping that developments will be such that they can continue with the present forces. The Wolverine and Mohawk companies have not made any announcement as to what course they will pursue, and the Quincy is operating full force. About 1000 men have been affected up to the present time.

MARQUETTE—Aug. 15

Further Curtailment Among the Ore Producing Properties have been made. These have been offset by accessions to the region's output elsewhere. Yet with the close of the shipping season still more than three months distant the fact that any slackening at all has taken place is regarded with significance. It is taken to indicate that the decision of the men in touch with the market is that convalescence from the present unhealthy condition will be slow. On the Gogebic range, the Windsor shaft of the Cary mine has been shut down for an indefinite period. Approximately 100 men are affected. The stockpile at the Windsor is filled almost to overflowing, only one cargo of this ore having been sent out to date this year. The Cary mine proper is shipping steadily. The property is a Wisconsin possession of Pickands, Mather & Co., of Cleveland. On the Menominee range, the Florence Iron Co. has put its Ernst mine on half-time. The property is at Commonwealth, Wis., and of late has been wrought on a small scale, employing only 40 or 50 men. Hereafter it will be operated but three days a week; 40,000 tons of ore now in stock will, however, be sent out. At its nearby Florence mine, which has been idle most of the year, the company has placed its central shops on half-time. In the Iron River field, in Michigan, the Florence interests have laid off one shift of men at the Bates property and hereafter will operate the mine only in the daytime. Under orders from President Clergue, at Montreal, the Millie at Iron Mountain, Menominee range, has been added to the idle list. As only development work was in progress a force of but a score of men was concerned. The order to suspend came unexpectedly. The lease to the Millie expires within a few years and it has been the belief that operations soon would be prosecuted vigorously. The trammers at the Republic Iron & Steel Co.'s Traders mine at Iron Mountain recently walked out. An 8-hr. day was demanded. The move was ill-advised. Those of the men who refused to return were discharged. Operations were retarded only a day or two. A full force was recruited from among the idle labor of the district. Some ore has gone forward lately from Oglebay, Norton & Co.'s Bristol mine, last year the largest shipper from the Crystal Falls district of the Menominee. An order for 19,000 tons has been filled from stock. While not idle, the Bristol is not producing at present. The stockpile is a big one. Shipments are being made from M. A. Hanna & Co.'s Ravenna mine, but these are small also. Operations at Crystal Falls have been at low ebb throughout the season. The principal producer is Corrigan, McKinney & Co., of Cleveland, and most of this big firm's Menominee range mines are closed.

FLAT RIVER, MO.—Aug. 12

The Labor Contract signed for a year with the miners has expired, but no trouble is anticipated this year, as the different companies have posted notices that they are willing to continue the present high scale of wages that were the result of compromising last summer's strike. Although notices were sent to the Hungarians and other Balkan states laborers from the home government to return to take part in the present war, few have thus far left the mining camps and most of them seem disposed to remain at work, even if transportation to Europe could be secured. All the mills in the disseminated lead belt have adopted the flotation process for reworking the tailings from the slime tables. The Federal Lead Co. was the pioneer in working out and developing the details of the process and about two-thirds of the lead in the slime tailings is now recovered as a 50% lead product, at a good profit.

TORONTO—Aug. 15

Extensive Forest Fires, owing to the dry season, have done considerable damage to mining properties in the Porcupine and Elk Lake areas. The buildings of the Little Pet and Foley mines, South Porcupine, were burned, and at Elk Lake the plants of the Otisse and Fleur-de-Lis were destroyed, and some losses sustained by the North American and Mapes-Johnston companies.

Many Miners at Cobalt Have Enlisted for service in the Canadian contingent that will shortly leave for the seat of war. The Ontario government has granted an extension of time for the performance of assessment work on claims held by volunteers. A general extension of three months on all assessment work on account of the prevailing financial stringency is being asked for, and will in all probability be granted.

The Effects of the War are severely felt by the iron and steel industry, and many plants both in basic and secondary lines are being closed down, or are greatly curtailing production. The Dominion Steel Corporation of Sydney, N. S., has closed down its openhearth furnaces and two blast furnaces, as it cannot fill orders for shipment by water. The Nova Scotia Steel & Coal Co. will limit its iron ore mining operations at Wabana, Newfoundland, shutting down a portion of its plant there, and has closed its openhearth and blast furnaces at Sydney Mines, N. S.

Toronto Mining Exchange was recently granted a charter by the Ontario government and one has been applied for by the Toronto Oil Exchange, just organized. A strong protest is made by brokers and financiers on the ground that the similarity of names to that of the Toronto Stock Exchange may lead to confusion. It is felt also that the creation of new exchanges at a time of financial stress is a mistake. It is understood that the new Mining Exchange will not be allowed to operate unless it selects another name, and the issue of the Oil Exchange charter has been held up indefinitely.

The Mining News

ALASKA

SNOWSTORM—This group of claims in the Port Wells district has been bonded by F. S. Sinnicks, of Boston, who plans to put a force at work on the property at once.

RAMSAY-RUTHERFORD—This company has the foundations under way for a five-stamp mill on its property near Valdez, and expects to begin operations in a short time.

GRANBY CONSOLIDATED—This company is making some very extensive improvements on its property, 5½ miles from Valdez. A tramway is being built to the dock on Solomon Gulch, where ore bins having a capacity of 3000 tons of ore are being erected.

ELLAMAR—This company is planning some new work on its property on Virgin Bay. Some fine ore has recently been encountered. A tramway has been installed and will be ready for operation within a few weeks, greatly increasing the output of the mine.

ARIZONA

Cochise County

COPPER QUEEN (Bisbee)—Practically all operations in the Czar and Holbrook shafts were suspended Aug. 14, when officials issued an order dismissing 400 men. This was the second reduction since the European war began, the first consisting of 500 men. The reduction means a curtailment of approximately 85% in ore from the local mines to the smelter at Douglas.

Mohave County

TENNESSEE (Chloride)—Large amounts of ore are being shipped to Needles from the 900 level. Sinking is to be resumed.

GOLDEN GEM (Cerbat)—Water has been taken out of the Golden Gem as far as the 350-ft. level. Timbering below the 300 is in bad shape.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—New rolls and a dry concentrator have been ordered. Recent experiments with a dry concentrator gave high recovery.

Pinal County

CHRISTMAS (Christmas)—Sjoidan & Grosjean have taken a lease on parts of the old Christmas mine and have a small force at work taking out high-grade copper ores.

KELVIN-SULTANA (Kelvin)—Work in mine has been suspended temporarily. Pumps are kept running on day shift. Work on new concentrator is going on uninterruptedly, a large force being employed. Lessees working in the carbonate zone in No. 3 mine are taking out large quantities of good ore.

Yavapai County

MIRABLE (Prescott)—A cyanide plant is to be built soon.

UNION (Chaparal)—Development work continues and large reserves have been broken in the stopes. Milling began Aug. 10.

SANTA MARIA (Prescott)—This company has leased the Big Stick mill and is treating a large tonnage from the Thorne group.

SWASTIKA—This company, which has been developing the old Silver Prince mine, near the Peck, has begun to ship ore to Noodles. The ore is loaded at Peck siding.

NELSON (Crown King)—A new orebody has been opened up on a vein parallel to one which has been under development some months. The new ore assays 10% copper and is reported to be 20 ft. wide. It carries no other metals.

MONTEZUMA (Crown King)—A new orebody has been opened up in the lower tunnel at a point 420 ft. from the portal. It is 4 ft. wide and is regarded as the continuation of the shoot in the upper tunnel. Pack trains are bringing the ore to Crown King for shipment to the Needles smelter.

CALIFORNIA

Calaveras County

MELONES (Melones)—A miner fell 1200 ft. to the bottom of an open shoot on Carson Hill, July 29. The accident resulted from barring down a large rock when the man slipped and fell.

Eldorado County

BIG CANYON (Placerville)—Mine has been unwatered to the bottom of the shaft. Crosscutting and drifting will be started to determine the extent at the 600- and 700-ft. levels.

MT. PLEASANT (Grizzly Flats)—Large amount of ore has been developed, which is reported to assay from $1 to $10 per ton. The installation of a cyanide plant is contemplated.

JUNIPER MINING CO.—Brush fire destroyed the mill, rock crusher and other buildings of the Griffith mine in July. The mine was idle, but in early days was a profitable producer.

PLACERVILLE GOLD MINING CO. (Placerville)—It is reported that development of Pacific mine has been abandoned on account of effects of the European war. The operating company is controlled by the Alexander Baring interests in London.

Modoc County

HESS (Alturas)—Mill has been started. Abundance of water has been secured for all purposes. Mine is developed to the 300-ft. level.

Placer County

HERMAN (Westville)—Electric power is being installed. Pole line is being extended from Towle to Westville. This will aid in the reopening of the small mines.

SPANISH (Forest Hill)—Property is bonded to Brown, De Cou & Co., of San Diego. Road building and repair is in progress. A mill for prospecting work will be installed. Mine will be developed by tunnel.

CRANDALL (Auburn)—Mine is being cleaned up and air compressor and drills ordered. Mine is equipped with a five-stamp mill. Property has been idle for several months, owing to the death of the former superintendent.

PLACER COUNTY PROPERTIES CO. (Iowa Hill)—It is reported that the asbestos plants owned by the company have been sold to London men, and that the closing of the deal awaits the arrival of Martinez Thompson and Charles Page.

Shasta County

GOLINSKY (Redding)—It is reported that George Bayha, representing German investors, reported from New York that the recent negotiation for sale of the copper mine had been declared off on account of the European war.

MAMMOTH (Kennett)—June output of copper approximated 1,725,000 lb. July output probably about the same. Recent improvements to baghouse have increased the efficiency. An additional bank of cooling pipes has been installed. The working force at the Spread Eagle mine is increased and development is progressing at the Stowell, Summit and other properties. At main Mammoth, a large amount of work is in progress. There are 1000 men on the payroll at smelter and mines. The number of miners employed at development of recently acquired properties is likely to be reduced since the closing of the copper market. The springs at the mine camp have gradually failed with the draining into the mined-out stopes. A new supply of water has been found at the head of Little Backbone Creek. Right-of-way was purchased of the Summit Mining Co., over whose land a 4-in. pipe had been laid a distance of 1½ miles. The Mammoth has also bought right-of-way for a tramline, crossing Summit ground to convey ore from the Sutro mine, one of the Mammoth holdings which is now producing. The ore is transferred from the tramline to the electric railway.

Sierra County

ANDY FITZ MINING & MILLING CO. (Fruitvale)—Company has concluded financial arrangements for resuming underground development and constructing a new surface plant, which has been long in contemplation.

GOLD KING (Alleghany)—A strike has been made in this mine on Kanaka Creek, of typical arsenical sulphides yielding $67.50 per lb. gold. This property was located 35 years ago and worked until the payshoot was lost. Recent prospecting again uncovered the vein, which measures 2 to 4 ft. in width and is considered a south extension of the Kate Hardy mine.

Tuolumne County

BLACK OAK (Soulsbyville)—An electric pump was installed at 1700-ft. level. Another electric pump will be placed on the 1000-ft. level. Ledge in north drift 1700-ft. level is making good showing.

DUTCH (Jamestown)—A miner was killed Aug. 2 by falling down a shaft from the 1000-ft. level to the 1670-ft. level. He had just made ready to begin work and was turning on the air with a wrench. The wrench slipped and he lost his footing.

COLORADO

Clear Creek County

NEW ERA (Idaho Springs)—The mill is being remodeled and will be ready for operation within 30 days.

PIONEER (Empire)—This property is being developed by lessees, who are driving a crosscut with machine drills.

CALUMET-CORBIN MINING CO. (Idaho Springs)—This company, often spoken of as the New Era Mining Co., is remodeling its mill at Freeland.

ONEIDA (Idaho Springs)—Development and equipment of the Oneida and Stag properties have been resumed. A 50-ton cyanide mill is under construction. The mill will be built by Hendrie & Bolthoff, of Denver.

GOLD FISSURE (Empire)—The dump is being worked by lessees. The material is passed over a concentrating table which is operated by a gasoline engine. A car of concentrates has been shipped to the smelter.

STANLEY (Idaho Springs)—Lessees have decided to unwater the property to the third level and do extensive development in this level, and also in the road adit. The compressor plant, hoist and pumps are in operation.

Montrose County

CARNOTITE MINING IS AT STANDSTILL owing [illegible] talled market resulting from European war.

Ouray County

LEGAL TENDER MINES EXPLORATION CO. [illegible] Company is advertising for bids on contract to [illegible] ent adit until it reaches known ore-bearing [illegible] tance of probably 100 ft.

Park County

HILL TOP (Fairplay)—Water prevents work through No. 1 winze, one of the best portions of mine, but steady shipments of lead-silver ore have been maintained from other workings.

San Juan County

BROOKLYN (Silverton)—Mine is being cleaned out preparatory to new development. This mine formerly produced ore running well in lead, copper, silver and gold.

LACKAWANNA (Silverton)—This property on Kendall Mountain was recently purchased by the Wagner brothers, who own and operate the Alta mine in San Miguel County. The new owners contemplate considerable development work in the near future.

San Miguel County

COLORADO MINING & POWER CO. (Telluride)—Company intends to erect a 25-ton amalgamation and concentration mill.

JUNTA (Telluride)—Aerial tramway on Mayflower property has been purchased and is to be moved up on Ballard Mountain to form an extension to present Junta tram. It will extend 3700 ft. up mountain from Jim Crow terminal.

Summit County

REILING PLACER (Breckenridge)—Experiment is being tried of saving and shipping non-amalgamable gold.

BOLIVAR (Montezuma)—Concrete running well in zinc is being made from low-grade ore in new mill and is hauled to Keystone for railroad shipment.

FRENCH GULCH DREDGING CO. (Breckenridge)—Boat is working in 40-ft. gravel and cutting 400 ft. across streambed. Cleanup for second half of July amounted to $17,520.

MEKKA (Breckenridge)—Ben Hall's lease of the bench placer portion of property on slope of Nigger Hill is operating two giants and has averaged a recovery of $100 in gold per day for three weeks.

TONOPAH PLACERS (Breckenridge)—Boats are said to be doing well. Operations are occasionally interrupted by electrical storm disturbances in the power-lines. July's output is said to be the greatest monthly production thus far.

IDAHO

Coeur d'Alene District

FLOTATION IN THE COEUR D'ALENE MILLS is being satisfactorily tried out. The Callow system is the one generally favored. At the Hunter mine at Mullan two Callow machines have been in operation for some time, one a rougher and the other a cleaner. The savings on Hunter ore by ordinary concentration have been from 50 to 60%, while with the same ore the Callow flotation is said to make a recovery of practically 90%, and with only 6% silica. At the first experiment, an attempt was made to treat only the tailings but it soon developed that better results could be obtained by treating the ordinary feed, and the two machines in operation have taken the place of seven vanners. They are now handling 35 tons per 24 hr., and can handle up to 50 tons. The ore is first reduced to 80 mesh, after which it is passed through a mixer, where a small percentage of creosote and pine oil are mixed thoroughly with the ore. From the mixer the ore passes to the roughing machine, and then directly to the cleaning machine, after which it is ready for shipment. The machines are so constructed as to leave several small air compartments in the bottom, into which air is forced at 8 lb. pressure, and comes into the water-and-oil mixture through a coarse blanket in the bottom of the machine, causing a bubbling agitation, which forces the mineral in the feed to the top, where it rolls over the side into ore troughs. The process uses ¼ lb. of oil per ton of ore. The Hunter company plans the installation of at least four machines. At the Federal company's Morning mine, operations are nearing completion for the installation of 18 machines. An addition is being placed on the west end of the Morning mill, which is 48x70 ft., and a large Dorr thickener plant is being built in a new building 50 ft. square. The plant will be of 350 tons daily capacity.

FEDERAL (Mullan)—Between Mullan and Mace, company recently completed an important piece of work in the development of the ore zone by finishing the raise from the No. 5 level of the Morning mine to the Star mine, which was recently taken under bond by the Federal from Finch & Campbell interests of Spokane. The Federal company has been developing the Star for some time with a crew of 20 or 30 men, drifting from the west end Morning mine workings on No. 5 level. Nothing of importance was found in the drift, and as a last resort, the company determined to connect with the old Star workings, with the result that the oreshoot developed in the Star ground was encountered near the top of the raise, where it shows a width of 14 ft. of good milling ore. The raise is 435 ft. from the Morning to the Star workings. Where encountered, the oreshoot shows a rake away from the drift development on No. 5 level, and it will be some time before the ore is found on that level. The present development is important, as it means almost the certain purchase of the Star group by the Federal under the option and increased life for the Morning mine. By the addition of the Star group, the Morning mine will become one of the greatest lead-silver properties in the Coeur d'Alene district, with practically an unlimited ore reserve from which to draw. The successful development of the Star also means that more persistent efforts will be made to develop the belt farther west to the Frisco mine, all of which chain of ground, with the single exception of the Ivanhoe ground, the Federal company holds under option.

NATIONAL COPPER MINING CO. (Wallace)—Stockholders' meeting has been called for Aug. 22, to ratify a decision of the directors to increase the capitalization of the company from $2,000,000 to $2,500,000. Proposed increase is for the purpose of providing funds or stock for the purchase of the Nellie claim, on which the bulk of the present National orebody has been developed, and which is owned by individuals, most of whom are stockholders in the National company. Reports have been in circulation that the National mill was closed some time ago because of a lack of ore to feed the mill. This was not the case. The National mine has plenty of ore developed and ready for stoping to last the mill an indefinite period, but the trouble has been that most of the stopes opened have been on the Nellie claim, which did not belong to the National company, but to individual stockholders, who purchased their interests in the claim before the orebody was found in the National lower tunnel. The National company had a verbal agreement with some of the owners regarding a deal for the property, with the result that development work was completed and milling operations started, but when it came to signing an agreement for the ground one of the owners, who controls ¼ interest, refused to agree to the terms offered, but agreed to allow the company to develop the ground in question and pay for it according to the grade of ore found therein, before any milling operations were attempted. This has been the work in progress since the mill was closed several months ago ,and a deal for the property seems to be definitely arranged. The mine wôrk was one year behind the mill, and so far as the company is concerned, the closing of the plant for a few months has been a benefit. When operations are resumed, it will be possible to continue mining and milling at full capacity for an indefinite period of time. The company has recently started working west, driving a drift on the vein, and so far as this work has progressed it shows fully as important an orebody as that developed in the east drift.

MINNESOTA

Cuyuna Range

FERROMANGANESE AND SPIEGEL are the principal topics being discussed on the Cuyuna range, due to the advance in price because of the closing off of the European supply. Of the various Cuyuna properties said to contain manganese, only the Cuyuna-Mille Lacs is in shape to take advantage of the sudden advance in price. About 150 tons daily are being hoisted from this shaft, and the company has some ore stocked. Management has announced that the working force there is being greatly increased and production would be rushed. A recent statement given out from the company's office says that the Duluth-Brainerd Iron Co.'s crosscut on the 150, and only, level is in ore analyzing 44.74% manganese, 0.089% phosphorus and 3.97% silica. However, the total width of ore thus far encountered averages but 20% manganese. The company is still in the development stage. Another so called manganese property is that of the Iron Mountain Mining Co., 1½ miles northwest of Cuyuna-Mille Lacs. It was recently announced that this property had been turned over to a new organization, and the deal was stated to include a cash advance royalty payment of $50,000. The property has a three-compartment shaft and a small shaft, but both have been boarded up for some time. In connection with this property, it might be added that one of the officials of the company recently appeared before the Crow Wing County board of equalization and opposed a valuation, for taxation purposes, of $25,000 on this property, stating that he believed $5000 was a fair value. Several other properties on the north range contain considerable tonnages of manganiferous iron ore, but only those adjacent to the Cuyuna-Mille Lacs property give promise of being of value for the manganese content. Of these properties, none has been opened as yet. The Cuyuna-Mille Lacs ore runs from 8% to 23% in manganese, and no considerable tonnage of 40% manganese ore is claimed for the property. The manganiferous iron-ore deposits to the northward from this property suffer from high silica and high phosphorous content, making them undesirable from a metallurgical standpoint, at least so far as present furnace practice goes. Along these lines, the Dell Development Co. is at present erecting in Duluth a furnace designed to reduce the Cuyuna range low-iron high-manganese ores, with the idea of enriching the manganese product. The furnace is an adaptation of the Jones step process of former days.

CUYUNA RANGE RAILROAD CONSTRUCTION—At Cedar Lake, the Soo Line and Northern Pacific are being connected by a spur, McCullough & Cheney doing the construction work. At the Croft mine, north of Crosby, the Northern Pacific will handle the tonnage but will do so over Soo Line tracks.

BRAINERD CUYUNA (Brainerd)—After two unsuccessful attempts to sink a lath shaft, this company announces that a timber drop shaft will now be sunk. Shaft will be similar to the one at the Wilcox mine, east of Brainerd, and will be put down under the supervision of the same engineer, D. C. Peacock.

Mesabi Range

ON THE MESABI RANGE the Quinn and Harrison mines, west of Nashwauk, are now employing upwards of 200 men, making daily shipments. La Rue is shipping but 700 tons per shift from the concentrating plant and has 50 men working at Chisholm, actual stripping operations have been inaugurated for the Great Northern Ore interests at the Leonard mine. Johnson & Hoy, St. Paul, Minn., are doing the work, it being their first stripping contract on the range. A spur is now building to the Dunwoody mine at Chisholm and machinery is arriving. Work will start in the near future. Thus far Mesabi range operators report no loss of labor due to the European war, the majority of the foreign-born, employees preferring to retain their jobs. At Virginia, the Duluth, Missabe & Northern Ry. has a large force working on the spur to new Prindle mine. Geo. A. St. Clair, a well known operator, has started work on two shafts in the district east of the Spring mine, as the result of extensive exploratory work there some months ago.

HAWKINS (Nashwauk)—Work was resumed on Aug. 11, giving employment to 115 men. Two shovels are working, one in ore and one in overburden.

DUNCAN (Chisholm)—This newly opened property of the Oliver Iron Mining Co. has just started to ship. Depth of shaft 210 ft., being 25 ft. below the orebody. Estimated to contain 7,000,000 tons.

HILL ANNEX (Marble)—Preparations are under way for inauguration of stripping operations; 33 carloads of supplies, machinery, etc., are now on siding, and camp construction is well under way. Steam shovels will be at work within two weeks.

PITT IRON MINING CO. (Mountain Iron)—The company has won its contention against the village for lower taxes, which will result in a net reduction of $40,000 in the tax levy for the ensuing year, of which amount practically all would have been paid by iron mines within the village limits. The current year's per capita tax was $80.

Vermilion Range

SOUDAN (Tower)—No. 1 crusher is now completed and ready for operation; No. 2 crusher was scheduled to be ready by Aug. 20.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT CO. (Butte)—At a meeting of stockholders, officers were authorized to issue $3,000,000 worth of convertible bonds. These bonds were to have been sold to a London syndicate and the money used in construction of proposed road from Divide to Jackson in Beaverhead County. The road was primarily planned to connect the company's Elkhorn mines at head of Wise River with Butte. War conditions make sale impossible and will delay matters indefinitely in respect to company's operations.

Broadwater County

OHIO-KEATING GOLD MINING CO. (Radersburg)—Aug. 5, a special meeting was held to consider question of ordering an assessment to provide funds for operating properties of company on a profitable basis. Less than three-quarters of the stockholders, the number required by law, being present, an adjournment was taken until Oct. 14 when the matter will again be considered.

Silver Bow County

FURTHER CURTAILMENT IN BUTTE MINES, in addition to the closing of seven mines of the Anaconda company, announced last week, consists in decreasing the output of the remaining mines by suspending, for the present, work on each Sunday and Monday. Most of the development work in these mines has also been stopped. The East Butte company, operating the Pittsmont mine and smelter has ordered operations stopped for an indefinite period. At the North Butte a curtailment of 40% in the output went into effect Aug. 8. Butte-Ballaklava, Rainbow Development and Butte-Alex Scott have suspended operations. At the Butte-Duluth all construction work was discontinued.

BULLWHACKER COPPER CO. (Butte)—P. W. Clark, James B. Clark and Allen Chase Klein, of Spokane, Wash., have brought suit against this company to recover $150,000, including $24,000 attorney fees. The money, it is claimed, was advanced to keep the mine going and construct the leaching plant. Mine and mill are at present shut down, due to unsatisfactory technical results from the present plant and to dissatisfaction among the stockholders with the present management.

NEVADA

Esmeralda County

YELLOW TIGER (Goldfield)—Development work is under way on 700-ft. level; level being repaired and raise started in 6-ft. shoot of $8 ore. A four-drill compressor may be installed.

PALMETTO (Palmetto)—This placer property has been bonded to Tonopah men; work will commence at once. Gold is coarse, being found in nuggets from a few cents to 50c. in value. Lode discoveries have also been made in this district.

GOLDFIELD CONSOLIDATED (Goldfield)—General clean-up of mill is under way. Old precipitate pipe lines are being replaced by new. Estimated recovery of $100,000 from this source in next three months. Lidgerwood cableway with clam shell bucket will be installed to transport tailings from pond to mill; two steel towers will be necessary.

Humboldt County

BIG FOUR LEASE (Rochester)—A one-year extension has been granted and new development is under way.

HUMBOLDT KING—This mine in Spring Valley is being pumped out preparatory to working. Dredging and ground sluicing is also being done in Spring Valley.

Lander County

AUSTIN-DAKOTA (Austin)—Capacity of ore bins is being increased. A store house and stable are being built. Work in main tunnel is being continued.

RUBY SILVER (Battle Mountain)—Repairs to mill have been made and mill is again operating. Concentrate from first run assayed $455 per ton, it is stated. Isbell concentrator is doing satisfactory work.

Lyon County

METALS RECOVERY CO. (Dayton)—The 200-ton plant to treat old Douglas tailings, near Sutro, is finished.

MASON VALLEY MINES (Thompson)—Decision in case against Nevada Copper Belt R.R. has been rendered by railroad commission. Switching charges from Wabuska to Thompson are to be reduced from $5 to $3.50 per car; to go into effect Aug. 10. There will be no curtailment in production on account of present market conditions.

Mineral County

NEW MILL AT CANDELARIA will be built below mines, and tramway from main tunnel will be built. Capacity of mill will be 200 tons daily it is stated. Its construction is result of successful tests on ores of district by 10-stamp mill and cyanide plant.

Nye County

SILVER BULLION IS BEING STORED AT TONOPAH, it is stated, rather than sell at present prices. Some bullion is being shipped to refining plants where held subject to future market price. Tonopah production is 1,100,000 oz. monthly. No shortage in cyanide will result on account of war in Europe, as first announced.

WHITE CAPS (Manhattan)—Old incline shaft is being repaired.

TONOPAH-MIDWAY (Tonopah)—Old workings have been leased for three years to Montana-Tonopah.

HALIFAX (Tonopah)—Shipment of 50 tons per day to West End mill has been resumed. Ore is hauled by motor trucks.

ROUND MOUNTAIN MINING CO. (Round Mountain)—Consolidation with Round Mountain Sphinx Mining Co. has been effected, ending many years of litigation over extralateral rights of Los Gazabos claim. Sphinx Co. is paid $20,000 cash and 175,000 shares of Round Mountain stock; capital stock of latter increased from 1,000,000 to 1,500,000. Company now owns 800 acres of mineral land. Drifts on 700-, 800-, and 900-ft. levels will be driven on Los Gazabos vein into Gold Leaf claim of Sphinx group. Placer ground will also be worked; survey for pipe line carrying 400 miners' inches from Jett Creek has been made.

Ormsby County

DIVERTING OF CARSON RIVER will be attempted at low water; a ditch being dug for this purpose. River will be diverted from its bed for a distance of 100 yds. below old Santiago mill where, it is thought, large quantities of quicksilver, amalgam and concentrate have lodged.

Storey County

WORK AT OPHIR AND CONSOLIDATED VIRGINIA has temporarily ceased. Pumps at C. & C. shaft will operate as usual.

White Pine County

ESMERALDA (Ely)—Small mill recently built in Irwin Cañon is operating successfully on Esmeralda No. 1 ore and ore from Shepard claim. Stoping is under way in Esmeralda mine.

NEVADA CONSOLIDATED (Ely)—Operations were curtailed to six days per week and on Aug. 10 to half time. Ruth orebody is being thoroughly examined in order to decide between steam shovel and caving mining. Tonnage developed in this body, 8,000,000 of 2½% copper ore.

NEW JERSEY

Morris County

RICHARD (Wharton)—The new vein lately struck in this mine has been prospected by drifting for 140 ft. It is from 21 to 25 ft. wide This orebody is beyond the fault which cuts across the eastern part of the old mine, and which was supposed to mark the end of the available ore. The ore was found on No. [illegible] slope, which is 780 ft. from the surface. Assays made of samples taken all across the vein average 60% iron, with traces of titanium and vanadium. The mine is owned by the Thomas Iron Co. and the ore is shipped to Hokendauqua, Penn., for its furnaces there.

NEW MEXICO

Grant County

BURRO MOUNTAIN COPPER CO. (Tyrone)—Mill construction work has been suspended. Mine development continues as usual. Work on power plant is unaffected.

CANADA

Ontario

JULY SHIPMENTS FROM COBALT WERE: Beaver Consolidated, 32.25; Chambers Ferland, 30.02; City of Cobalt, 42.88; Cobalt Lake, 123.65; Cobalt Townsite, 210.05; Coniagas, 64.46; Crown Reserve, 110.67; Hudson Bay, 119.37; Kerr Lake 61.40; La Rose, 131.49; McKinley Darragh, 168.39; Nipissing, 130.26; O'Brien, 62.24; Peterson Lake (Seneca Superior), 64.71. Penn Canadian, 24.96; Timiskaming, 95.69; Trethewey, 61.80; total, 1,534.29 tons.

KERR LAKE (Cobalt)—This mine has closed down on account of the war.

McINTYRE (Porcupine)—The Nipissing of Cobalt is negotiating to secure a controlling interest in this mine.

REA (Porcupine)—This company has undergone a complete re-organization and will be known as Porcupine Aurum Mines with an authorized capital of $1,000,000. It has $40,000 cash in the treasury and 50,000 shares of the par value of $1 per share.

HOLLINGER (Timmins)—The regular four-weekly report for the period ending July 15 shows gross profits of $132,712 from the treatment of 16,343 tons of ore of the average value of $13.62 per ton. The approximate extraction was 91% and the working cost per ton milled $4.32.

MEXICO

Sonora

THE EXPORTS FROM SONORA FOR JULY through the port of Agua Prieta are smaller than they have been for a long time. The following is the report of the collector of customs: Nacozari, 9528 tons; El Tigre, 76; Monte Cristo, 3; Rosales, 10; Archipelago, 92; Santa Rosa, 93; Estrella, 33; San Francisco, 6; La Prietati, 2; Esperanza, 22; San Jacinto, 10; La Ventana, 14; La Aurora, 16; San José, 38; Agua Prieta, 15; total, 9958 tons. The El Tigre also shipped 99 bars of gold and silver bullion weighing 12,675 lbs. The estimated value of ores in Mexican currency is: Copper, 1,397,700 pesos; silver, 491,800, and gold 278,900, a total of 2,166,400 pesos.

EL TIGRE MINING CO. (Esqueda)—The cyanide plant treated 800 tons of ore last month. A new vein has been cut on the fourth level of the Kelley shaft showing excellent ore. At present there is $500,000 of ore blocked out.

GREENE-CANANEA (Cananea)—The fires in the Oversight and Veta Grande have been put out. Two stopes in the Veta Grande and two stopes in the Oversight were burned besides 20[illegible] ft. of timbered drifts and No. 11 shaft of the Oversight. Water is being pumped into the mines to cool them.

The Market Report

METAL MARKETS

NEW YORK—Aug. 19

The chief feature of the markets has been the further advance in spelter. The situation in lead continues to be uncertain. In copper, the producers continue to hold aloof, hoping to conserve their business by not trying to make a market, pending some settlement of conditions.

Copper, Tin, Lead and Zinc

Copper—The situation remains the same as we reported last week. A little encouragement is to be found in the resumption of exports to England, but what is going out is chiefly on the filling of old contracts, and what is not that, is the shipment of copper on consignment.

The Raritan refinery is reported operating on only half time. Phelps, Dodge & Co. have now curtailed their production by 50%. Cerro de Pasco has curtailed 50%. Calumet & Hecla is expected to make some curtailment.

The Braden Copper Co. reports production of its mines in Chile in July at 1,332,000 lb. copper; for the seven months ended July 31 at 13,783,000 lb. This shows increases over last year of 286,000 lb. in July and 5,309,000 lb. for the seven months.

The Shattuck Arizona Copper Co. reports July production at 1,348,069 lb. copper, 24,523 oz. silver and 290 oz. gold.

Exports of copper from New York for the week were 1846 long tons. Our special correspondent gives the exports from Baltimore at 106 tons.

Base price of copper sheets is now 18½c. per lb. for hot rolled and 19½c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14¼@14½c. per lb., carload lots at mill.

Tin—The situation remains unchanged.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in June at 1762 tons; 1756 tons being from Bolivia and 6 tons from Southwest Africa.

Messrs. H. A. Watson & Co. report receipts of Bolivian tin at Liverpool in June at 20 tons bars and 2021 tons concentrates, equal to a total of 1233 tons metallic tin.

The Banka sale set for July 30, at which about 2300 tons of tin were offered was postponed.

Tin exports from the Straits, according to the corrected official statement for the five months ended May 31, were: United States, 8401; Great Britain, 14,662; other Europe, 4723; China and India, 963; total, 28,749 long tons, an increase of 2164 tons over last year.

Lead—This market has been a little stronger, although it continued to exhibit the peculiar character that we noted last week. There were differences of five points in the prices realized by the same producer on the same day, and similar differences among the sales of different producers and on different days. There is still much difference of opinion respecting the immediate future of this market. An interesting feature of the last few days has been inquiry for lead from European, Asiatic and African countries. If export sales develop from these inquiries, they will probably be in the main of bonded lead. A rumor today was that the Federal Mining & Smelting Co. had closed its mines. The fact is that the directors have authorized the closing of the Morning mine, leaving the decision to the local management, which has not yet reported. The other mines are working as usual.

Exports from Baltimore for the week included 596,497 lb. lead to Glasgow, Scotland.

Spelter—The export sales that were impending at date of our last report began immediately and aggregated a rather large tonnage at sharply advancing prices. As early as Saturday, a round lot was sold at 5.60c. However, there was at all times a considerable variation in prices accepted as well as in terms of the transactions. The average realized on a very large tonnage was about 5.50c. There were some sales to domestic consumers, but in the aggregate these were far less than the export sales. During the last two or three days, business was quieter than in the previous days. An interesting feature of the week was inquiry for spelter, not only from England, but also from some more remote countries, including Russia.

The base price of zinc sheets was advanced ¼c. per lb. on Aug. 11 to $7.25 per cwt.; and again on Aug. 20 to $7.50 per cwt., f.o.b. cars Peru, Ill., less 8% discount.

Other Metals

Aluminum—Business is quiet, and new transactions are scarce. The market is inclined to be uncertain. Quotations are nominal at 19@20c. per lb for No. 1 ingots.

Antimony—The market has settled down after the excitement of last week, and only a moderate business has been done. Quotations for Chinese, Hungarian and other ordinary brands are easier, at 14@16c. per lb.; but 20@22c. is still named for Cookson's.

Quicksilver—The price remains unchanged at $90@100 per flask. No London quotations can be obtained.

Gold, Silver and Platinum

Silver—Messrs. Handy & Harman make the following statement regarding the situation in the silver market: London cables quote the spot price for silver since the opening of business after the bank holidays, as follows: Aug. 7, 26d.; Aug. 8, 27d.; Aug. 10, 27¾d.; Aug. 11, 26½d.; Aug. 12, 26⅝d.; Aug. 13, 26⅝d.; Aug. 14, 27d.; Aug. 15, 27d.; Aug. 17, 27¼d.; Aug. 18, 26 15/16d.; Aug. 19, 26½d.

With the improvement in the situation as regards shipments and foreign exchange on account of lower war risks and easier transactions in selling exchange, producers of silver are now making large shipments of silver bullion to London, over one million ounces being shipped on the S. S. "New York," sailing Aug. 15. Spot silver has been sold in London by large producers on the basis of the prevailing quotations for spot silver in London, namely, 27d., thus netting the seller the equivalent here of over 58½ c. per oz.

DAILY PRICES OF METALS

NEW YORK

			Copper	Tin	Lead		Zinc	
Aug.	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Dts. per Lb.
13	*	*	*	*	3.85 @3.90	3.70 @3.75	5.50 @5.55	5.35 @5.40
14	*	*	*	*	3.85 @3.90	3.70 @3.75	5.60 @5.70	5.45 @5.55
15	*	*	*	*	3.85 @3.90	3.70 @3.75	5.70 @5.80	5.55 @5.65
17	*	*	*	*	3.85 @3.90	3.70 @3.75	5.70 @5.80	5.55 @5.65
18	*	*	*	*	3.85 @3.90	3.70 @3.75	5.70 @5.80	5.55 @5.65
19	*	*	*	*	3.85 @3.90	3.70 @3.75	5.75 @5.80	5.60 @5.65

*No market.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c.

The effect of these high quotations for spot silver in London has naturally been to raise the price at which silver could be bought in the New York market, and sellers are cautious in selling silver below what they hope to secure in London. On the other hand, as the English Mint seems to be the only buyer, and the London market is so uncertain, buyers here are cautious in bidding for silver, and it has not as yet been possible to establish any New York official quotation on which transactions could be based.

Cables from London on Aug. 19 quote the market 26½d., which would yield the shipper from this market approximately 58c., depending on the rate paid for war insurance and rate of sterling exchange. We understand that the chief buyer in the London market during the past week has been the English Mint, for coinage purposes. London has not been making bids for shipment, but only buying for spot delivery. Business with India and the Far East is at present at a standstill in London.

Gold—The open market for gold in London is still closed, and is likely to remain so. Every financial center is holding tightly to its gold supply and exchange is still impossible.

The gold from the "Kronprinzessin Cecilie" has finally found a resting place, having been transferred from New York to Ottawa, Canada, where it is held subject to the order of the Bank of England.

Platinum—The market has been disturbed owing to the uncertainty as to supplies. Dealers are unwilling to quote except to regular customers. A fair price today seems to be $50 per oz. for refined platinum and $58@59 per oz. for hard metal, 15% iridium. A sharp advance is possible at any time.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Aug. 15

The base price paid this week for 60% zinc ore jumped from $38 last week to $43@44 per ton for this week. The base price paid for 80% lead ore was $45 per ton.

SHIPMENTS WEEK ENDED AUG. 15

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,870,900	......	512,300
Year	95,461,850	3,520,500	23,674,970

Shipped during week to separating plants, 3,949,460 lb. zinc ore.

JOPLIN, MO.—Aug. 15

The high price of blende is $44, best ores selling on a base of $42, which was advanced Thursday to $43 and Friday to $45 per ton of 60% zinc. Some ore sold on Tuesday as low as $40 assay base, and the metal base ranges $40@41. Calamine sold $22@23.50 base per ton of 40% zinc. The average all grades zinc is $38.90 per ton. Lead is unchanged at $46 per ton of 80% metal content; the highest price was $46.50 and the average of all grades $45.92 per ton.

One company got through on a base of $42, but did not cover full orders. Among all other buyers there never was a more pronounced scramble for ore, and they bid and overbid each other for two days, and tonight are wondering why they did it, as the jump in spelter was not as pronounced as first reported. Producers were generally firm for a $44@45 base, and got it.

SHIPMENTS WEEK ENDED AUG. 15

	Blende	Calamine	Lead	Values
Totals this week..	8,900,600	660,640	1,373,250	$213,580
Totals this year..	336,493,220	24,441,820	57,244,030	8,211,380

Blende value, the week, $174,040; 33 weeks, $6,470,480.

Calamine value, the week, $8010; 33 weeks, $276,805.

Lead value, the week, $31,530; 33 weeks, $1,364,095.

IRON TRADE REVIEW

NEW YORK—Aug. 19

The situation is still uncertain, and opinion as to the consequences of the war is divided. For the present, the markets have been rather slack, chiefly owing to the unsettled financial conditions.

For this reason, new business has been rather slack, and there is not much forward business being done. The general belief, however, is that there will be a great improvement as soon as matters become more settled.

PITTSBURGH—Aug. 18

Domestic buying of pig iron and steel products has been greatly reduced, and on the whole inquiry is light, with prospects that the market will be decidedly quiet for a few weeks at least. The condition is inevitable when the war has so completely upset financial and commercial movements, and the decreased interest on the part of buyers is merely the result of a natural conservatism.

The export trade continues to be at practically a standstill, and this affects the steel trade, not only through the direct exports it had, but also through the cessation of exports by many of its customers, the agricultural implement industry being the one involving the largest tonnage.

Fears of a serious shortage of ferromanganese are greatly reduced, though the alloy will undoubtedly be high in price for a long time.

As far as can be ascertained, the steel mills have not reduced their production from the rate of between 65 and 70% of capacity that prevailed in July. They are helped at this juncture by the fairly good buying movement of June and July, and have definite shipping orders to cover operations for 30 days or more.

The steel trade realizes much more fully than a week or two ago how difficult it will be to restore the export movement, seeing that making arrangements for payment may prove a more serious problem even than the restoration of vessel movement. The expected demand from Canada is now developing rapidly, as war conditions practically prevail in that country.

Pig Iron—The market has been extremely quiet, though with prices holding steadily. Shipments are at about the former rate, but all consumers are conservative as to fresh commitments. We continue to quote: Bessemer, $14; basic, $13; malleable, $13@13.25; No. 2 foundry, $13@13.25; forge, $12.50@12.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—A sale of 300 tons at $140 is reported as having been made a few days ago, but the market on resale lots is hardly quotable at that figure. Prospects of a partial resumption of shipments from England on old contracts are now regarded as a matter of only a few weeks, and some consumers who have been carrying relatively large stocks would probably be willing to sell at less than $140, so that the market may have already passed its high point.

Steel—The market has continued very quiet as to open transactions, and remains quotable at $20 for billets and $21 for sheet bars, at maker's mill, Pittsburgh or Youngstown. Predictions are made in some quarters that within a month or two there will be additional advances, but the occasion for such advances is not explained.

The Production of All Forms of Finished Rolled Products in the United States in 1913 is reported by the American Iron & Steel Association as follows: Iron, 1,678,257; steel, 23,112,986; total, 24,791,243 tons, an increase of 134,402 tons, or 0.5%, over the preceding year.

The production of hammered iron blooms, billets, etc., made in charcoal bloomeries from pig iron and scrap in 1913 was 59,393 tons, a decrease of 6414 tons from the preceding year.

COKE

Connellsville Coke—The market is entirely stagnant, with shipments continued on old contracts and no buying or inquiry to speak of. The market stands approximately as follows: Prompt furnace, $1.75; contract furnace, $1.75@1.90 prompt foundry, $2.25@2.35; contract foundry, $2.35@2.50, per ton at ovens.

Coke production in the Connellsville region for the week is reported by the "Courier" at 264,070 tons; shipments, 269,968 tons. Production in the Greensburg and Upper Connellsville districts was 37,697 tons.

IRON ORE

Of the total shipments of 5,784,514 tons of ore from Lake Superior ports in July, a total of 4,468,788 tons, or 77.2%, went to Lake Erie ports. Three ports—Conneaut, Ashtabula and Cleveland—received over a million tons each.

The American Manganese Co. has some 40,000 tons manganiferous iron ore stocked at Dunbar Furance, Penn., and purposes turning out spiegeleisen as soon as the furnace repairs are completed

It is stated that no more ore will be shipped from Wabana Island, Newfoundland, this season.

Imports at Baltimore for the week included 141 tons ferromanganese from Liverpool also 5700 tons manganese ore from Bombay, India

COPPER SMELTERS' REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments.	2,069,960	1,279,537	585,387	1,114,758	...
Anaconda.......	23,800,000	22,900,000	23,500,000	23,800,000	
Arizona, Ltd.....	3,286,000	3,570,000	3,092,000	3,742,000	3,300,000
Copper Queen ..	7,637,042	7,562,723	8,388,203	7,613,719	7,817,318
Calumet & Ariz..	5,875,000	5,450,000	5,495,000	4,630,000	5,940,000
Chino...........	5,399,814	5,926,591	5,496,875	5,486,419	
Detroit.	1,973,725	1,790,926	2,105,034	2,129,100	1,966,526
East Butte......	1,546,180	1,178,000	1,179,762	1,215,323	....
Giroux.	287,980	45,948	429,553	425,000	....
Mason Valley....	1,250,000	862,000	916,000	950,000	... ..
Mammoth.......	1,800,000	1,850,000	1,750,000	1,725,000	1,950,000
Nevada Con.....	5,218,257	4,880,043	4,959,589	4,483,175	....
Ohio	597,520	610,518	625,000	605,000	.. ..
Old Dominion....	2,997,000	2,779,000	3,302,000	2,937,000	2,962,000
Ray.	6,036,908	6,089,362	6,300,847	5,941,567	....
Shannon	1,082,000	1,012,000	1,056,000	1,049,227	....
South Utah......	406,381	247,641	55,394	84,000	. . ..
Tennessee..	1,262,184	1,370,800	1,336,950	... ..	. . ..
United Verde*...	3,100,000	3,000,000	3,100,000	2,900,000	. . . ..
Utah Copper Co.	12,323,493	12,739,757	13,208,483	12,870,063	.. ..
Lake Superior*....	11,000,000	13,000,000	12,500,000	16,000,000	.. . ..
Non-rep. mines*..	8,200,000	8,000,000	8,200,000	8,000,000	. .
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	..
Total prod. ...	109,649,444	108,644,846	110,082,077	.	..
Imp., bars, etc..	22,676,605	17,043,191	19,081,487	.	..
Total blister...	132,326,049	125,688,037	129,163,564	.. .	. ..
Imp. ore & matte.	7,029,646	10,400,122	10,586,506	. . . . .	. . . .
Total Amer....	139,355,695	136,088,159	139,750,070	.... ..	....
Arrivals–Europe†	17,572,800	17,299,520	13,558,720	19,040,000	

† Does not include the arrivals from the United States.

CHEMICALS

NEW YORK—Aug. 19

Arsenic—Business is more active and supplies rather uncertain. Prices have advanced sharply, and the current quotation is $4.50 per 100 lb. for both spot and futures.

Copper Sulphate—Business is moderate and prices unchanged at $4.50 per 100 lb. for carload lots, and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market has been excited, and in the first part of the week a large business was done at a sharp advance in price. Today matters have quieted down a little, but prices are well held. The current quotations are 2.25c. per lb. for spot, 2.17½c. for September-December, and 2.05c. for 1915 deliveries.

Cyanide—The sudden cessation in the importation of manufactured goods from Europe, due to the war, has placed the cyanide mills of North America in a serious position, since most of the cyanide has come from Germany. The Roessler & Hasslacher Chemical Co., through which a large quantity is marketed, announces that they will be able to supply their regular customers with their normal requirements, but could not undertake to accept new business. Their plant at Perth Amboy will be operated at full capacity and will probably take care of U. S. requirements. They expect also to ship from large stocks in neutral European ports. No increase in price will be made except where rises in raw material necessitate it. Mexican plants will probably be in a more unfortunate plight. They will have to depend largely upon English material, the supply of which is likely to be depleted by the South African demand.

Assessments

Company	Delinq.	Sale	Amt.
Alta, Nev.	Aug. 18	Sept 11	$0 03
Andes, Nev.	Aug. 10	Aug. 31	0.03
Buffalo, Mont.	Aug. 2	Sept. 2	0.004
Cons. Imperial, Nev.	Aug. 18	Sept. 10	0 01
Emerald, Utah	Aug. 15	Sept. 12	0 0033
Exchequer, Nev.	Aug. 13	Sept. 3	0.02
Four Timbers, Wash.	July 29	Aug. 29	0.0015
Franklin, Mich	....	Aug. 26	2.00
Great Western, Nev.	Aug. 10	Aug. 31	0.01
Huron, Mich. (Iron)	......	....	3%
Hypotheck, Ida.	Aug. 17	Sept. 15	0.01
Laclede, Ida.	Aug. 21	Sept. 14	0.005
Lehi Tintic, Utah	Aug. 12	Sept. 17	0 0025
Lower Mammoth, Utah.	Aug. 14	Sept. 7	0 01
Lucky Calumet, Ida.	Aug. 21	Sept. 21	0 095
Maryland, Ida.	Aug. 5	Sept. 5	0.003
Monarch-Pittsburgh, Nev.	Aug. 17	Sept. 21	0 01
North Star, Ida.	Aug. 8	Sept. 10	0 0015
O. K., Utah	Aug. 17	Sept. 2	0 005
Ophir, Nev.	Aug. 21	Sept. 14	0 10
Oreano, Ida.	July 24	Aug. 24	0 002
Providence, Utah	Aug. 3	Sept. 2	0 00125
Rockford, Ida.	Aug. 14	Sept. 4	0 0015
Sandstorm-Kendall, Nev.	Aug. 10	Sept. 14	0 01
Sierra Nevada, Nev.	Aug. 18	Sept. 8	0 010
Sunrise, Ida.	July 14	Aug. 24	0 002
Tintic Standard, Utah.	Aug. 10	Sept 14	0.005
Torino, Ida.	Aug. 10	Sept. 10	0 001
Tuscumbia.	July 10	Sept. 8	0 003
Wasatch, Utah	July 27	Aug. 31	0 05
West Century, Utah.	Aug. 2	Aug. 24	0.005

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January.	56.260	62.938	57.572	25.887	28.983	26.553
February..	59.043	61.642	57.506	27.190	28.357	26.573
March.....	58.375	57.870	58.067	26.875	26.669	26.788
April......	59.207	59.490	58.519	28.284	27.416	26.958
May......	60.880	60.361	58.175	28.038	27.825	26.704
June......	61.290	58.990	56.471	28.215	27.199	25.948
July.......	60.654	58.721	54.678	27.919	27.074	25.219
August....	61.606	59.293	......	28.375	27.335	......
September	63.078	60.640	......	29.088	27.986	... ..
October ...	63.471	60.793	......	29.299	28.083	... ..
November.	62.792	58.995	. .	29.012	27.263	. ..
December .	63.365	57.760		29.320	26.720	.....
Year	60.835	59.791		28.042	27.576	.

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine

TIN

Month	New York		London	
	1913	1914	1913	1913
January.	50.298	37.779	238.273	171.905
February	48.766	39.830	220.140	181.556
March. .	46.832	38.038	213.615	173.619
April ..	49.115	36.154	224.159	163.963
May.	49.038	33.360	224.143	150.702
June . .	44.820	30.577	207.208	138.321
July. .	40.260	31.707	183.511	142.517
August .	41.582	.... ..	188.731	....
September.	42.410	....	193.074	....
October..	40.462	..	184.837	...
November...	39.810	.	180.869	......
December. .	37.635	..	171.786	....
Av. year..	44.252	......	206.279	.. ...

New York in cents per pound; London in pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January...	6.931	5.262	6.854	5.112	26.114	21.533
February..	6.239	5.377	6.089	5.228	25.338	21.413
March.....	6.078	5.250	5.926	5.100	24.605	21.460
April......	5.641	5.113	5.491	4.963	25.313	21.569
May....	5.406	5.074	5.256	4.924	24.583	21.393
June. ..	5.124	5.000	4.974	4.850	22.143	21.345
July. .	5.278	4.920	5.128	4.770	20.592	21.568
August .	5.658	.	5.508	..	20.706	.. .
September	5.694	..	5.444	.	21.148	....
October..	5.340	. ..	5.188	. ...	20.614	.....
November.	5.229	.... ..	5.083	....	20.581	.. .
December .	5.150	...	5.004	...	21.214	.. ..
Year....	5.648	...	5.504	......	22.746	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January.	16.488	14.223	71.741	64.304	77.750	69.488
February	14.971	14.491	65.519	65.259	71.575	70.188
March.	14.713	14.131	65.329	64.276	70.658	69.170
April.	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.996	68.807	63.182	74.774	67.786
June.	14.672	13.603	67.140	61.336	70.821	66.274
July.	14.190	13.223	64.166	60.540	69.446	64.955
August .	15.400		69.200	.	74.313	
September	16.328		73.125	.	78.614	
October..	16.337		73.383		79.250	
November	15.182		[illegible]		73.825	
December .	14.224		[illegible]		69.583	
Year...	15.269		68.335		73.740	

New York, cents per pound, London, pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January...	4.321	4.111	4.171	4.011	17.114	19.665
February.	4.325	4.048	4.175	3.937	16.550	19.606
March. ..	4.327	3.970	4.177	3.850	15.977	19.651
April.....	4.381	3.810	4.242	3.688	17.597	18.225
May ..	4.342	3.900	4.226	3.808	18.923	18.503
June . .	4.325	3.900	4.190	3.810	20.226	19.411
July	4.353	3.891	4.223	3.738	20.038	19.051
August.	4.624		4.550	,. ...	20.406	......
September	4.698		4.579	. ..	20.648	......
October .	4.402		4.253	......	20.302	. ....
November.	4.293		4.146	......	19.334	. ...
December .	4.047		3.929	. ..	17.798	. ..
Year	4.370	.	4.238	.. ..	18.743	......

New York and St. Louis cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14.94	$17.35	$13.23	$18.59	$13.90
February.	18.15	15.06	17.22	14.12	18.13	14.09
March.. ..	18.15	15.07	16.96	13.91	17.53	14.18
April... .	17.90	14.90	16.71	13.90	16.40	14.10
May....	17.68	14.90	15.80	13.90	15.40	14.23
June......	17.14	14.90	15.40	13.90	15.10	13.97
July..... .	16.31	14.90	15.13	13.90	14.74	13.96
August ..	16.63	. . .	15.00	......	14.88	......
September	16.65	......	15.04	......	14.93	......
October..	16.60	......	14.61	......	14.80	.....
November	16.03	......	13.91	......	14.40	... .
December .	15.71	......	13.71	......	14.28	......
Year....	$17.09	......	$15.57	.....	[illegible]	.....

The Engineering and Mining Journal

VOLUME 98 AUGUST 29, 1914 NUMBER 9

Phelps-Dodge in the Burro Mountains

By Faris V. Bush*

SYNOPSIS—Description of the work being carried on in this New Mexico copper district by the Burro Mountain Copper Co., a Phelps-Dodge company. Development work includes a long adit. Ore produced in development is tested in a small flotation plant. A concentrator of 1000 tons capacity and a power plant are under construction. Mine water is now run through precipitation flume. Character of the ore.

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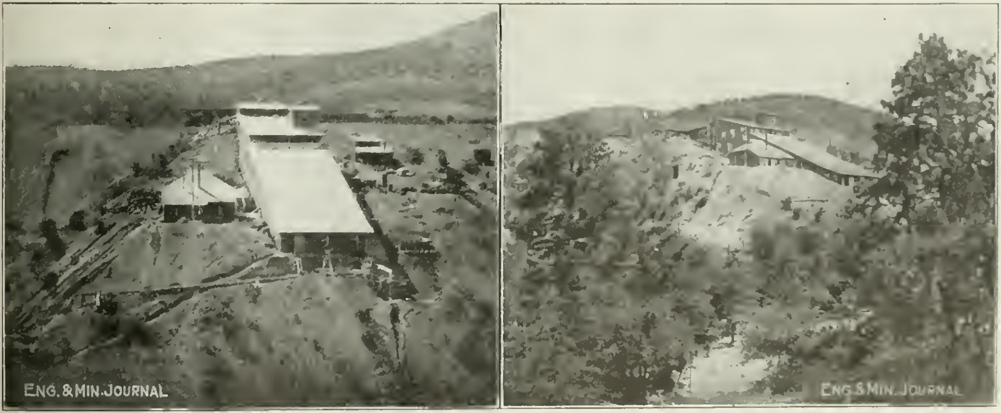

Two Views of the Flotation Experimental Plant of the Burro Mountain Company

Within a year activity in general in the Burro Mountain mining district, Grant County, N. M., has increased more than 50% over that of any previous year, the result of the operations of the Burro Mountain Copper Co., a subsidiary of Phelps, Dodge & Co., which has constructed a 15-mile railroad to Tyrone from Whitewater, the latter a point 17 miles below Silver City on the Santa Fe's branch from Deming. This railroad was built in 1913, and a regular schedule put into effect early in 1914. The road is conducted as a branch of the El Paso & Southwestern, which is also under Phelps-Dodge control.

Entrance of Phelps-Dodge

Phelps, Dodge & Co. came into the Burro Mountain district in 1904, when they purchased the property of the Burro Mountain Copper Co., situated at Leopold. This deal included the famous St. Louis mine, and also the Boston and Samson mines, with many developed orebodies. A 300-ton concentrating mill was transferred to the new operators, but it could not be operated economically and was dismantled, part of the machinery being sent to Tyrone. Later, Phelps-Dodge purchased the property of the Chemung Copper Co. and of other claim holders in the region. They now have, at a close estimate, 5000 acres of the best mining property in the section, with approximately 10 miles of underground workings. The claims are situated on the northeastern slope of the Burro Mountains, in the foothills running toward the Mangas Valley, in a rough county where the rock in general is exposed. The three peaks of Burro Mountain proper, rising to a height of 8000 ft. above sea level and visible for many miles, form a picturesque background.

Geology

A large granite mass occupies an extensive area in the district. It is coarse grained, markedly prophyritic, and is intruded by rock of similar character. At the contact of this granite and the quartz monzonite, there are found the orebodies, which vary from 100 ft. in length and 400 ft. in width to 1500 ft. in length and 800 ft.

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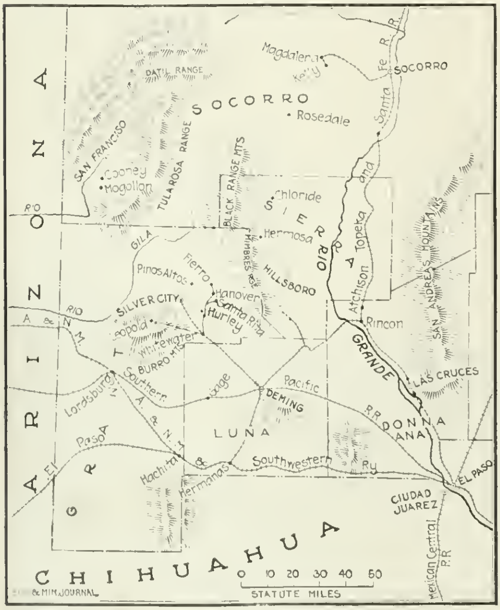
*Mining engineer, Silver City, N. M.

in width. The deposition of the ore is governed by fractures and the bodies of greatest richness are found in the zones where the fracturing has been the greatest. The fractures have a northeast-southwest trend and are believed to be deepest toward the east (Tyrone). The ore now encountered consists of copper sulphides chiefly chalcocite, the result of secondary enrichment: the ore is termed a low-grade porphyry and runs from 2½% to 4% in copper.

UNDERGROUND WORK

At Tyrone there are three shafts, Nos. 1, 2 and 3, and the Niagara haulage tunnel, which at the time of writing had been driven 4700 ft. and connected with workings at Leopold. The No. 2 shaft is about 800 ft. deep and is flooded up to the 400-ft. level. The No. 3 shaft, located half a mile up the same gulch, is about 400 ft. in depth and is also flooded. The water from these mines is pumped into precipitation flumes, several miles in length. This has solved the water supply question, as enough can be pumped to supply the 1000-ton mill and any other operations needing water. The Niagara haulage tunnel is located between the No. 2 and No. 3 shafts and extends southwest. A standard-gage track will be laid in this tunnel and electric locomotives will be used to haul the ore to the portal. A large body of low-grade sulphide ore was discovered through drifts and winzes in this adit.

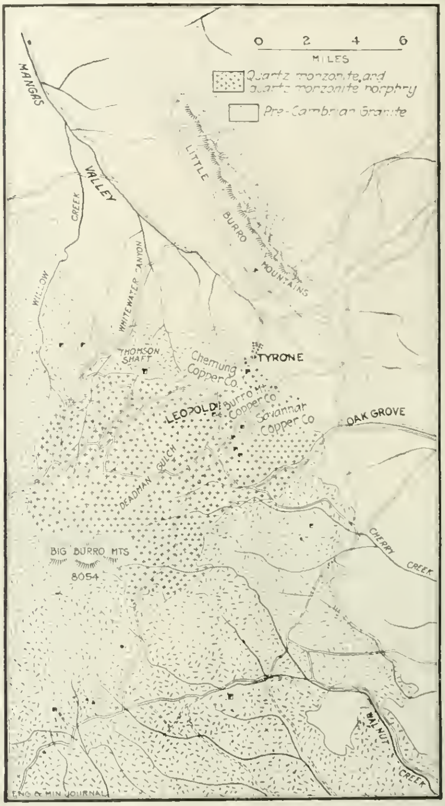


KEY MAP TO BURRO MOUNTAIN REGION

It was stated by the management of the Burro Mountain Co. that some form of the caving method of mining would be used in the future operation of the Tyrone and Leopold mines. The only ore so far extracted has been in development work. Actual commercial mining will begin when the method of ore concentration has been solved.

SURFACE PLANT

An ore-testing plant was erected near the portal of the main adit, and is now being run day and night, especially testing oil flotation. The plant is equipped with a Blake jaw crusher, Fraser & Chalmer rolls, Wilfley tables, a Hardinge conical mill and one oil-flotation unit of the Minerals Separation process. It was stated that as yet no conclusions had been arrived at regarding the success of oil flotation, and that it would be given a lengthy trial before a decision would be made. The company is well pleased with the regrinding work of the Hardinge mill. The experimental treatment plant was designed by Doctor Sandberg, of Bisbee, Ariz. The result of the methods employed in the experimental mill will govern the installation of the equipment to be embodied in the 1000-ton concentrator.



GEOLOGY AND TOPOGRAPHY OF BURRO MOUNTAIN REGION AFTER U. S. GEOLOGICAL SURVEY

Excavation is under way at the site of the large mill, three miles northeast of Tyrone, and construction work is about to begin. A townsite has been surveyed near the mill and buildings are in course of erection. The mill water supply has already been mentioned, but if at any time this supply is not sufficient a pipe line from wells at the head of the Mangas Valley is planned.

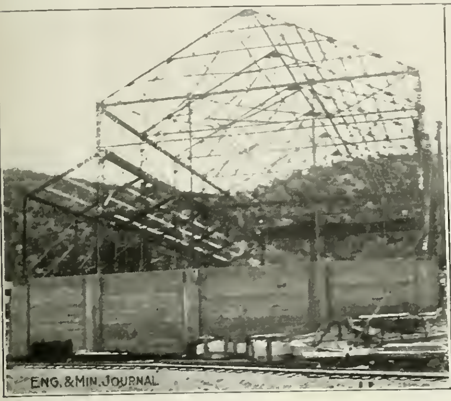
Steel construction is now being carried on at the power plant near the No. 2 shaft. The foundations for the plant are concrete. The equipment will include two 1000-hp. Diesel engines, and power will be furnished to both mill and mines. Part of the equipment is on the ground. Electric hoists will be installed at the mines and steel headframes erected.

There was one churn drill in operation at the time of visiting, but two more were to be added and the new property fully prospected.

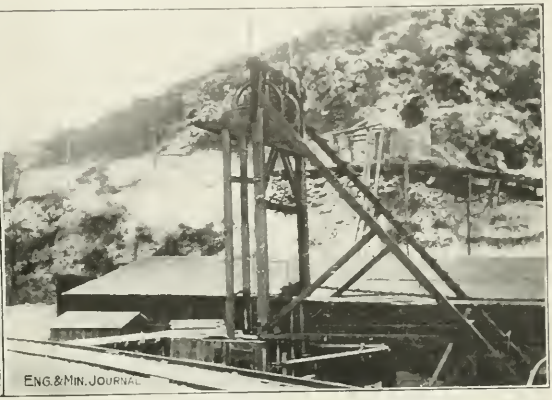
In regard to the quantity of ore blocked out it is said that there is a sufficient quantity to warrant the construction of a mill of 1000 tons daily capacity, and at present the company is not looking ahead to anything larger.

Over 200 men are now on the company's payrolls, engaged in development work, experimental mill operations, excavations, etc. There will be three townsites, one at Tyrone, one near the concentrator, and the old camp of Leopold.

E. M. Sawyer is general superintendent of the Burro Mountain company and has charge of all construction work and operations in general. E. J. Fraser-Campbell is chief engineer. While the Burro Mountain region is held by many companies and individuals, and excellent opportunities are offered men with the brains and means to make paying mines, the Phelps Dodge company is the only one now engaged in actual large-scale operations.



The Steel Frame of the New Power Plant



Headframe of No. 2 Shaft

Portal of the 5000-Ft. Niagara Tunnel

The Precipitation Flume

Butte and Lead Contrasted

A greater contrast in conditions in two mining camps would be difficult to discover than that developed by the United States Commission on Industrial Relations at Lead, S. D., and Butte, Mont., says a special correspondent of the New York *Evening Post*. The commission is now at Seattle, and is going down the Pacific Coast.

Differences in the two mining camps, Lead and Butte, were many. In Lead a man can't get a job unless he signs an agreement not to belong to the union; in Butte he can't hold his job unless he carries a union card.

Incomparably superior physical conditions were discovered in Lead. The miners working in the famous Homestake mine pay $1 a month into a hospital fund. Every man receives a thorough examination before going to work, and an excellent hospital is at his disposal, where he and his family receive treatment for all physical ailments. Conditions underground are especially fine, and everything looking to the physical well-being of the miners seems to have been done. The only condition is that he shall have nothing to say about it himself.

The Butte miners also pay $1 a month into a hospital fund, as in Lead. This is required of them by the company, but there is no medical inspection in Butte. The hospital, which receives from $6000 to $8000 a month from the miners, will treat them only for injuries and non-contagious diseases, and will not treat their families at all. Tuberculosis is said to be prevalent among the miners, but the hospital doctors will not treat them for that, for they say it is a contagious disease. Underground conditions in Butte are said to have an influence on the tuberculosis death rate, although the company is doing a great deal to provide better ventilation, spending $275,000 last year for this purpose.

WORK SEVEN DAYS A WEEK

In both Lead and Butte the mines are operated in three 8-hr. shifts, seven days a week. At first thought the commission seemed inclined to blame the companies for requiring men to work seven days a week; the testimony developed, however, that the miners themselves, even when organized as in Butte, insist upon doing so.

The most interesting testimony in Butte centered about the events leading up to the riotous scenes enacted there in June. It will be remembered that on June 13, which is a holiday in Butte known as Miners' Union Day, a comparatively small number of miners marched in the parade, and others, numbering thousands, attacked the parade, broke it up and blew up the union building, after which they took the safe from the building, blew it open, took the money and organized a new and independent union. Ten days later, when Charles H. Moyer, president of the Western Federation of Miners, tried to hold a meeting in Miners' Union Hall in order to effect a reconciliation, a battle occurred between the members of the old union and the insurgents. The latter blew up the building with dynamite, and Moyer and his friends barely escaped with their lives by going through a rear window and hastening out of town in an automobile.

The new union says that it has in its membership between 5000 and 6000 miners, or over 90% of the miners in Butte. Those remaining in the Western Federation concede 75% to the new union.

To the surprise of all who have known the Western Federation of Miners by reputation, the charge of the insurgents is that the Butte local has been dominated in every respect by the Anaconda Copper Mining Co. Company domination and excessive assessments levied against their will, are the two chief grievances of the Butte miners. During the past year assessments and dues have for months run from $4.50 to $5 a month, and it is claimed that these assessments either were never voted at all or were voted in meetings that did not represent the miners of Butte.

SAY RING CONTROLLED MEETINGS

It was this matter of meetings that gave the company its opportunity to control, the insurgents claim, with a membership of 6000 or 7000 miners, not more than 700 could be packed in the Union Hall. The faction that has been in control for many years always got to the hall first and packed it with their supporters. It is claimed that "Company Men" on shifts at the time that a meeting was to be held would be released by shift bosses, and permitted to go to the meeting on company time, with instructions as to their votes. This, it is claimed, was done whenever an important matter was up for consideration.

A contributing factor to the dissatisfaction was the fact that the union seems to have been unable to secure any substantial improvements in conditions of labor for many years. The eight-hour day is a matter of law in Montana. When the Butte local was established in 1878, it fixed a wage scale for men underground at $3.50 a day. Today the miners are getting $3.75 under a sliding scale based on the selling price of copper with a minimum of $3.50. Meanwhile other unions in Butte, such as plumbers and carpenters, have got their wages up to $8 and $9 per day. Butte is a closed-shop town in every respect. The cost of living is high, and one reason for it is the high wages paid to all classes of labor other than miners. The miners whose wages are comparatively low have supported the other unions in all of their campaigns for increased wages, and while their own wages have remained practically stationary since 1878, they are obliged to pay the prices which go with the wage scale in force in the other unions.

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Employer's Duty Concerning Co-Employees

By A. L. H. STREET

To promote the safety of employees engaged in the same line of work in such way that one is dependent upon the care exercised by another to prevent accidents, the employer must use a reasonable degree of diligence to employ only reasonably competent men, and to keep himself advised as to their continuing fitness, and not retain employees who are apt to cause injury to others. This rule of law has been lately reannounced by the Arizona Supreme Court in the case of Strinker vs. Ray Consolidated Copper Co., 141 *Pacific Reporter*, 740.

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McKenzie & Mann Are Fitting Out a Schooner at St. John's, Newfoundland, for an expedition to the Hudson Bay country to search for coal deposits. Coal outcrops have been reported at various points on Hudson Bay, but have never been explored to any extent. The object of the present prospecting is to secure a supply for the branch of the Canadian Northern to Fort Churchill on Hudson Bay.

Lead Matte Converting at Tooele

SYNOPSIS—An account of the new method of converting lead-copper matte at the International smelting plant at Tooele, Utah. The low-grade matte is converted in basic-lined vessels, 96x150 in., without the use of siliceous fluxing ores; the lead fume is recovered in a baghouse, the copper product and the heavy iron slag being transferred into the regular copper converters. This method produces a final slag low in lead, and a fume high in ZnO that does not injure the filtering bags.

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In January and February of the current year, at the Tooele plant of the International Smelting Co., Tooele, Utah, a modification of the usual method of converting, for the treatment of copper-lead matte from lead blast furnaces, was developed and put into successful operation. In brief, the method consists in blowing molten matte direct from the blast furnaces in basic-lined converters, without the addition of siliceous fluxing ores, to the almost complete elimination of the lead contained, and to the production of copper bullion, the resulting lead fume being recovered by the filtration of the converter gases through woolen fume bags. The process is carried out in conjunction with the converting of reverberatory copper matte, the heavy iron slag, together with the copper precipitated, being transferred to converters blowing copper matte. The purpose of this transfer is to reduce the copper oxide formed, due to the necessary overblowing of the lead-matte charge, and to utilize, as far as possible, the value of iron from the lead matte, for the fluxing of siliceous dry ores. The final slag from the copper converters is then skimmed off and transferred molten to a reverberatory smelting furnace treating copper ores.

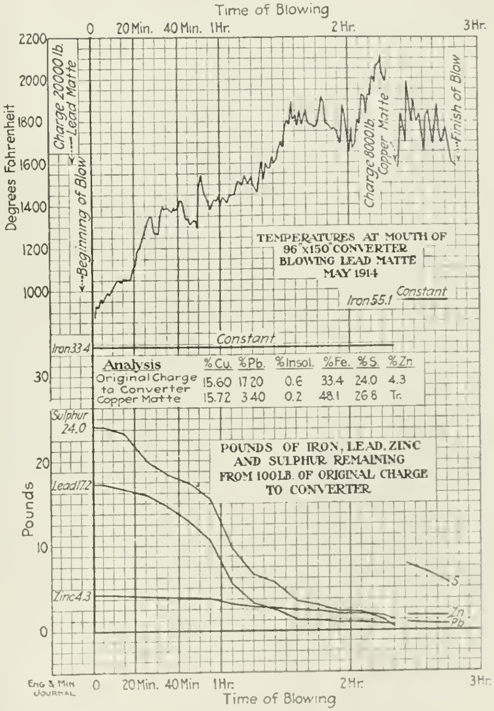
In the design of the lead plant at this works, it was planned to treat the copper-lead matte from the furnaces by direct converting without reconcentration and thereby to recover the copper, silver and gold as quickly as possible. A converter plant of ample capacity, treating copper matte, already being in operation, it was only necessary to install a baghouse, a fan and the necessary flues to complete the equipment.

The baghouse constructed has a bag-cloth filtering area of 136,000 sq.ft., provided by 960 fume bags, 18 in. in diameter and 30 ft. in length. A No. 20 Sirocco fan of 180,000 cu.ft. capacity delivers the gases from the converter plant to the baghouse. The converter plant consists of five stands of horizontal, cylindrical type shells 96x150 in. in size. A common flue received the gases from all stands. The admission of outside air was mainly relied upon for cooling the gases to the desired temperature. Means were provided for bypassing gases to the stack in case of excessive temperatures. Temperature control of gases was provided for by the installation of recording thermometers.

Converting operations were begun in February, 1913, with the baghouse equipped with woolen fume bags of cross-woven fabric, 24 threads to the inch, warp and filling. As regards the converting operation itself, test runs had shown that no difficulties attended the handling of this type of matte and operations were conducted in a manner parallel to the treatment of copper matte. For a period of two months no difficulties were encountered. The production of byproducts, however, appeared as a disadvantageous feature. The passage of 45% of the lead contained in the matte, to the slag, necessitated its retreatment in the blast furnaces.

Baghouse difficulties began after several months of operation. Leakage developed first through perforations at the tops of the bags. While leakage of water through a prepared roofing material, that had become affected by the converter gases, was partly responsible for this condition, it soon became apparent that the destruction of the fabric was due to condensation of acid inside the bags. This condensation manifested itself in the form of spots, first at the top and later at the bottom of the bags, five or six feet at each end being affected. At the points where it appeared the fabric became weakened by acid corrosion and would eventually be blown out by fan pressure, leaving enlarged perforations. The nap of the cloth was also rapidly corroded away, giving a screen-like appearance to the bags, and finally a general weakening of the whole fabric resulted in their being torn from the thimble floor. Frequent renewals of bags became necessary to prevent leakages, and inability to correct the underlying causes made it necessary to discontinue operations pending a thorough investigation of the problem

A solution of all the difficulties required either the de-



Analysis	% Cu.	% Pb.	% Insol.	% Fe.	% S.	% Zn
Original Charge to Converter	15.60	17.20	0.6	33.4	24.0	4.3
Copper Matte	15.72	3.40	0.2	48.1	26.8	Tr.

Chart Showing Temperature and Elimination in Lead-Matte Converting

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Note—Excerpts from a paper by Oscar Kuchs read at the Salt Lake meeting of the American Institute of Mining Engineers, August, 1914.

struction of acid by the addition of a neutralizing agent, such as ZnO or CaO, or the production of a fume in itself sufficiently alkaline to preclude the formation of acid, and the production of a converter slag sufficiently low in lead to permit of its disposal by pouring back into reverberatories.

As a result of considerable experimental work, the process as outlined at the beginning of this paper was worked out. Tests carried out intermittently during the day shift in a converter set aside for the purpose showed a rapid formation of a uniform magnetite coating on the walls of the converter. It was expected that difficulty would be encountered due to the gradual closing in and reduction in capacity of the converter. This, however, under continuous operation did not develop, the crusting under these conditions being confined to the wall opposite the tuyeres, being heaviest at the mouth, due to spattering of the charge, and thinning out toward the bottom. The fume produced was more actively alkaline, the percentage of zinc eliminated from the converter as ZnO approximating 50%, as against less than 10% under the previous conditions. It was not deemed necessary, therefore, to consider adding a neutralizing agent to the gases.

Preparatory to putting the process into continuous operation, changes were made in the flue system in order that gases from lead converters only would be filtered through the baghouse. Three converter stands were consequently connected with a separate flue for lead-matte work, the remaining two stands being connected directly to the stack for copper-matte blowing. The necessity for better temperature control was realized and flues were equipped with dampers to control the admission of outside cooling air. An automatic alarm system was installed, to record by gongs and colored lamps the passing of the allowable maximum and minimum temperatures. The operating range of temperature of the gases entering the baghouse is maintained at from 210 to 230° F. The baghouse was equipped with bags from the La Porte Woolen Mills, Pendleton Woolen Mills, and Knight Woolen Mills. The former are cross-woven and have 24 threads to the inch, warp and filling; the latter is a twilled weave bag.

Converting operations were begun in February, 1914. Rather rapid building up of the converter mouth at first gave considerable trouble; however, enlargement of the mouth relieved this condition materially. Corrosion at the tuyere line proved to be somewhat more severe than results from the blowing of copper matte, and more frequent patching is necessary.

The time required for the blowing of a charge of 10 tons is about two hours, the time depending on the care given to the tuyeres. Frequent punching is necessary. A tendency on the part of the tuyeres to blind when silica is absent is very marked. Fume is evolved in dense clouds as soon as blowing begins. The volume of fume gradually diminishes after the blow is half over, and finally, if the blowing is continued long enough, fades out. The end of the blow is thus indicated by the character of the fume and flame, the flame becoming more and more visible as the fume diminishes. The charge in the converter at this stage contains about 1 to 1.5% lead and has been reduced in weight to approximately 65 to 70% of the matte charged. The fume produced under the new conditions does not seem to affect the bags materially, conditions at the baghouse being greatly improved. After three months of operation only four bags had failed. These failures were due to apparently defective material, in that one failed through splitting at the seam and the remainder were torn, shaking of the bags appearing to have gradually opened up and extended flaws in the fabric. No acid spotting of the bags is noticeable.

To show the rate of elimination of lead, zinc and sulphur from matte and the temperatures generated when the blow is continuous and the tuyeres are kept fairly free, elimination and temperature curves applying to a single test are given in the accompanying chart. These curves are derived from data obtained during a test when copper matte was added at the end of the blow to reduce copper oxide. Iron is taken to be constant in the converter. These curves show about 75% of the lead and 65% of the sulphur are eliminated in 70 min. of a 140-min. blow. Zinc is eliminated at a fairly uniform rate throughout the blow.

The following are comparative figures of matte blown and products formed under the former practice as compared with the present practice.

1913—CONVERTING LEAD MATTE WITH THE ADDITION OF SILICEOUS FLUXING ORES

	Pb, %	Cu, %	Ag, Oz	SiO_2, %	Fe, %	CaO %	S %	Zn, %
Matte	16.5	7.66	32.8		37.4		22.5	5.0
Siliceous ore	3.4	0.3	21.3	62.2	6.0	5.1	0.7	
Converter slag	6.8	5.8	9.2	22.0	38.7		3.2	
Baghouse fume	63.3	1.2	5.6	1.1			67.5	2.5

1914—CONVERTING LEAD MATTE WITHOUT THE ADDITION OF SILICEOUS FLUXING ORES

	Pb, %	Cu, %	Ag, Oz.	SiO_2, %	Fe, %	CaO %	S, %	Zn, %
Lead Elimination Blow:								
Lead matte	15.0	9.05	20.3		37.9		23.0	5.4
Transfer slag to copper converter	1.4	....	.	1.7	59.1		1.8	4.0
Baghouse fumes	64.2	0.37	5.7	0.2	0.4		6.0	10.4
Copper Converter Blow:								
Copper matte		22.2	21.8		11.7		26.6	
Siliceous ores	3.4	0.3	17.1	75.1	7.4	3.0	0.8	
Converter slag	2.3	1.79	1.6	23.1	48.8	1.5	1.2	2.9

As indicated by these analyses, the converter slag from present practice can be disposed through either reverberatories or blast furnaces, depending on economic conditions. The high active alkalinity of the fume, as indicated by the percentage of ZnO present, should afford ample protection against acid corrosion for the filtering bags, the condition of the baghouse after nearly four months of operation seeming to vindicate this view.

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Mechanics' Liens against Mining Property

Holding that under the statutes of Colorado liens for labor or materials furnished in the improvement of mining property are governed by the same general rules as ordinary mechanics' liens, the Colorado Court of Appeals recently decided in the case of Milwaukee Gold Mining Co. vs. Tompkins-Cristy Hardware Co., 111 *Pacific Reporter* 527, that one cannot enforce a lien for materials furnished for a mining improvement without showing that it was previously agreed that the materials should be used in the improvement of the particular premises against which the lien is sought. And it is further held that the interest of a lessor of mining property is not subject to lien on account of an improvement constructed by the lessee, unless the lessor failed to give notice that he would not be liable, after receiving knowledge that the improvement was to be made, as required by the laws of Colorado

Mine Taxation

By Heath Steele[*]

SYNOPSIS—The following discussion on mine taxation is to suggest a system of taxation based upon the yearly profits of a mine.

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Tax is defined as a compulsory contribution levied upon persons, business or property for the support of government. A government, particularly as we have it in this country, is a corporation of the people for the common interest of all concerned. Therefore the vital question in the promotion of the common interest is to secure funds to carry on the government in a correct proportion from all sources.

An equitable assessment of taxes has never been obtained in this country. To prove this assertion, one has to grant that there is only one correct way to accomplish an equitable assessment; then point to the tax laws of our states, all characteristically different in principle and method of levying assessments for taxation. It is easy to comprehend that the prosperity of any government depends first upon the success of its business enterprises. The value of its property is regulated by the amount of business transacted and the ability of its people to pay taxes comes only through enterprises yielding a profit. We do not need to go further than this to grasp the fact that a state or government should encourage all enterprises and do as much as it can toward securing new fields of endeavor for its people.

To encourage business in all directions and promote common interest we must not ask one branch of tax-paying enterprises to contribute a greater proportion than another, either directly or indirectly. If we as a nation or a state should pay taxes or assessments to our government and produce nothing at a profit we would soon become bankrupt. Then it stands to reason that we will inevitably do injustice to any branch of business called upon to pay more than its proportion of profits to the support of government. It may be suggested, in an argument against a direct tax on profits, that it is not right to tax one individual more than another merely because he has the ability to make a success where others fail. But, after all, is it not the successful ones by whom the government is actually maintained? So much for the tax question in general. It seems to have about exhausted the resources of the various states to arrive at some system of taxing mines on an equitable basis. It will certainly be enough for anyone eventually to work out a just system of taxation for mining and leave the solution of the problem related to other enterprises to those versed in the separate branches.

Mining as a Basic Industry

There is no industry save agriculture in which the human race is engaged of such importance to civilization, as mining. But as to its relative importance to a state or community, there is no other industry that will cause new areas and out of the way places to be populated, with a consequent growth of other industries, quite so quickly as mining operations. The Upper Peninsula of Michigan, generally speaking, is not a farming country. It is probable its population and certainly its consumption of home products would be of no great consequence to the state were it not for the copper and iron mines. Take the copper district as an example, close down the mines of this district and what will become of the towns of Houghton, Hancock, Calumet and other settlements? The copper industry has not only given to this state a considerable income in direct taxes but has brought thousands of people into the state, built towns, and populated counties. It has not only opened up a large field of consumption for the products of the state within the state, but has also been the means of giving shipping facilities for local farm and manufactured products to outside markets. The state not only gets its taxes from the mines but from the towns they have built and all business enterprises connected with the towns and increased business in other parts of the state due to the mines. The taxes paid by these are the indirect taxes of the mining industry received by the state. The same is true in every section where mining operations are carried on.

Butte, Mont., if it were not for the mines, would not have its present population and resultant indirect taxes. No one disputes that California is a great state without its mines, but its beginning was due to mining and the business has played no little part in its subsequent growth. Nevada, Alaska, Arizona and others owe almost all to their mines; and whatever some of them do or may amount to in other directions, their mines will have been the most important factor in their development.

It is only necessary to pass over the importance of mining in a general way for even the laymen can realize what the industry means in any community. Mining and farming are the two basic industries for they create new wealth. Including in the former all concerns taking the products from the earth and in the latter all products raised from the soil or grown upon its fruits—there are no other branches that actually produce new wealth. Manufacturing, transporting and merchantile enterprises are only the branches of business that shape and distribute the products of the two basic branches. Therefore, is not the importance of mining a justification for an equitable method of taxation and a defense against such crude methods of assessment as are now carried on in some states?

Present Methods of Assessment

New York, New Jersey, North Carolina, West Virginia, Alabama, Iowa, California, Oregon and Washington have no special laws providing for the valuation of mining property. Mines are appraised as other real property; viz., at its "true cash value," "true value in money," etc., depending upon the phrase used.

Pennsylvania taxes its mines on a valuation of tangible assets and to arrive at this valuation each mine is required to report its earnings, expenditures, a list of assets, a statement of lands owned, an estimate of ore supply, etc. From these data an appraisal is made.

Michigan and Minnesota assess their mines on a valuation basis, no different from the other states just named except that they have used more scientific methods of valuation.

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[*] 52 William St., New York.

We may group all the states mentioned under one head as states taxing their mines by a physical valuation of their assets. The following may be grouped under the head of states taxing their mines on a basis of production. In this group we have two divisions. First, a system of appraisal, based upon the production, that is at best a makeshift. Second, a system of appraisal based upon the production, that is apparently the most equitable form of assessing mines now employed. In the first division of this group are Colorado and Arizona. In Colorado the assessor determines the net proceeds of a mine by deduction from the gross value of the production; the actual cost of extracting the ore from the mine, not including salaries of any person not actively and consecutively engaged in or about the mine; the actual cost of transporting the ore to place of reduction or sale. The assessed valuation of the mine is then arrived at by adding one-half the gross value of the output of the mine for the year to the net proceeds as obtained by the method just described. By gross is meant the value of the production without deducting any expenses incurred in producing, selling or reducing the ore.

In Arizona, mines and mining claims are divided into two classes: Class 1, productive mines and mining claims; Class 2, nonproductive mines and mining claims. A productive mine or claim is defined as one which after deducting the expenses of operation and such other expenses as permitted, shall yield net proceeds during the calendar year. The following costs are allowed, actual cost of active operation and management of mine; actual cost of transporting ore to the place of reduction or sale; actual cost of marketing production, including smelting and refining; expenses for betterments in or about the mine; expenses for repairs and betterments of mills and reduction works.

The following costs are not allowed: the purchase price of the mine, construction of new reduction works, salaries of any but those personally and consecutively engaged in the enterprise within the state. The value of the output is based on the average market conditions of the metals in New York. The assessment value is arrived at by taking four times the amount of the net proceeds plus 12.5% of the total value of gross proceeds. The rate on this taxable valuation is the same as on other property. In addition to this the reduction works, mills and smelter on mining claims or used in connection therewith are assessed in the same manner as other property. Surface ground of any mine used for any other purpose than mining is assessed as other real estate in the county. Nonproducing mines are taxed as any other real estate.

In the second division of this group are Nevada, Idaho and Montana. In Nevada, all patented mining claims are assessed at $500 unless it is shown that work to the amount of $100 has been performed during the year. Improvements are assessed at the full cash value as other property in the county is assessed. A tax is levied on the net proceeds from the mines. The net proceeds are determined after deducting such charges for operating, transportation and reduction or sale of product as the Tax Commission deems proper. Under the present conditions the commission allows the following charges; actual expenditures for operations; the cost of mine plants at the rate to cover the whole life of the mine, but in no case to allow plant investment to depreciate to less than 20% of its original cost. No charges for offices other than operating offices are allowed.

Idaho taxes the ground of mining claims at the price paid the U. S. Government therefor. Improvements are assessed at their full cash value. Net proceeds are also used as an assessment value.

The constitution of Montana provides that mines shall be taxed only upon their net proceeds. The surface of the mines is assessed at the price paid the U. S. Government for the land, which is $5 per acre for metal mines and $20 per acre for coal lands. In case the surface is valuable for other purposes as town lots, farm lands, etc., it is assessed at the local value of such property. The machinery and plants are taxed at their local value.

There is another system of taxation for mines known as the "tonnage tax," which has been advocated, particularly in Michigan, where it is strongly indorsed by the farming element of the "Lower Peninsula." This will be discussed later in connection with other systems.

OBJECTIONS TO VALUATION SYSTEM

To review the objections of taxation on a valuation basis let us take Michigan as an example. This state, like others named in the first group, has a law that requires mines to be assessed at their true cash value, the only difference being that after some agitation on the question of mine taxation, the legislature passed an act authorizing the State Tax Commissioners to engage a mining engineer to make an appraisal for them. Before this, appraisals had been made by the regular local assessors. In 1911, the Commission employed J. R. Finlay to make an appraisal of all mines and mineral lands within the state. As outlined by the Commission, the duty of the special appraiser was to appraise the total value of mines and mineral lands within each taxing district rather than to appraise the mines separately. Nevertheless, this valuation given each county or taxing district was proportioned as nearly as possible among the mines and mineral land owners and used for assessment purposes for the individual mines.

We have here an example of mine taxation on a valuation basis which was not only an elaboration of the system but, I believe, may be called the culmination of applying the principles of mine valuation for taxing purposes. Mr. Finlay was not employed by the state to work out a system of taxation but to appraise the mines. To do this on an equitable basis it was evident that only one theory of appraisal could be used and applied to all properties. The theory applied may briefly be stated as follows: the true cash value or present value of a mine is its average annual profits deferred, at a certain rate of interest; for a number of years representing the life of the mine or period during which a profit will be earned. This value is calculated from the following main factors:

A—Ore reserves.
B—Average annual production.
C—Cost of production.
D—Average price to be obtained for product.
E—Average annual profit.
F—Rate of interest or value of money.

Theoretically, this method is correct and is the one used by most engineers to arrive at a value for a mine, if all factors can be obtained or fairly assumed.

No one can dispute that a stated annual income for a certain number of years has a present value easily determined at a fixed rate of interest. If this were all for a correct appraisal, I should not question the fairness of this system of taxing. But as my idea of the principle involved requires a system which takes from each in the same proportion, there must be no liability of error in the method of assessment. Working from this point of view, let us take up each main factor as previously stated.

A—To arrive at the amount of ore to be considered in an appraisal of this kind we must not only consider fully developed ore but all indications for further extensions of orebodies beyond mine openings. Here we run into difficulties much greater than is encountered in measuring developed ore. The developed ore factor is more or less approximate, but estimates of further extensions are bound to vary greatly from fact. However, these are not the only obstacles in the way of a correct statement of ore reserves. The average content of valuable minerals is a very difficult factor to determine correctly for a large ore reserve and is in most cases a guess, regardless of elaborate sampling and inferences that may be drawn as to the uniform contents within certain blocks. The best we can do is to concede that the ore-reserve factor is an estimate consisting of two basic factors, both of which may be wrong.

B—The factor of average annual production not only serves to determine the length of life but the average annual profit. If the rate of production is greater than estimated the profit will be more or *vice versa*. *B* is dependent upon *A* and is subject to the errors in *A*.

C—The cost of production may be closely estimated. I say estimated because no matter how much of a record one may have to judge from, future expectations in connection with costs are no more infallible than the assumption of the ore-reserve factor. This is particularly true where metals of changing value are involved, for, granting the cost per ton of ore is the minimum, a lowering of the grade of metal content will increase the cost of the metal.

D—The factor of average price to be obtained for the product is a presumption and nothing else. One man's judgment may be better than another's because he has studied the supply and demand and is conversant with all market governing factors but we cannot grant him the powers of a true prophet.

E—This factor, the average annual profit expected, is a sum of all the errors in *A*, *B*, *C* and *D*, all of which will reflect in the profit. If the average price to be received for the product is a correct assumption, so far as it relates to the average price for the whole period, the average annual profits may be the sum estimated. But the present value obtained by this calculation and the present value that may be obtained at the exhaustion of the mine with the actual annual earnings as a basis will hardly be the same. This is particularly true with metals that fluctuate widely in price. If, during the first half of the operating period, the price of metal should be lower than the average used, the actual present value of the property will be less than estimated. If higher prices are secured the value will be raised. A fair check will only be made when a practically uniform price prevails or the highest prices are received during the middle of the period.

F—The rate of interest is a factor that may be adjusted to suit the individual in private work. For taxation purposes the worth of money is a debatable question, but a rate should be used that will represent the actual earning power of money without special effort. If the business is hazardous, all factors of safety will properly have been provided in the basic factors.

Here it is shown that the only calculation involved in mine appraisal for which we can absolutely vouch as being correct is the deferring of the expected annual income at a fixed rate of interest. We may have errors in each of the five main factors together with those in the basic factors of which they are composed. I do not think that the most ardent advocate of mine taxation on a valuation basis will, if he considers the presumptive character of the data necessarily involved, contend that an equitable distribution of tax burdens can be accomplished by this method. It is impossible to value any mine correctly until it has been worked out, therefore, if we attempt to value a number of mines in a taxing district some will surely be assessed too high and some too low. A yearly appraisal would probably correct this fault to some extent but this involves a great amount of expert work and is likely to develop into a sort of superficial adjustment.

TONNAGE TAX

In Michigan, certain factions have advocated a tonnage tax on iron ore at a fixed rate and a tax on copper, I believe, at the rate of 0.5c. per lb. Any system that will collect from all mines a fixed amount on a tonnage or unit-of-metal basis will give about as unequal a distribution of tax burdens as could be devised. A pound of Wolverine Copper Co.'s copper is worth a great deal more to its owners than is a pound of Isle Royale's to its owners. A pound of Mass Consolidated copper has, practically speaking, been worth nothing to this company because it has cost them more to get it out than the company can sell it for. A 60% bessemer ore mined at $3 a ton at one mine is worth more to its owners than the same ore is to the owners of another mine where it costs $3.50 to get it out. An equitable distribution of tax could never be accomplished by this method unless a separate rate were worked out for each mine after considering its costs, grade of ore and other conditions. If the champions of tonnage tax have in mind an equal distribution of tax burdens among the mines or to devise a system through which the state will get a certain proportion of all the mines get in return for operating. Why not begin by working forward instead of backward and tax the actual profits of the mines?

TAX ON PROFITS

If we tax the profits of an industry at a fixed rate, each operator will be called upon to pay no more than his proportionate share. A rate could be established in each state that would tax the mining industry as a whole proportionately to other industries of the state. If necessary, this rate could be raised or lowered as conditions demanded The fact is that any system of mine taxation that takes the profits as a basis will distribute tax burdens equally among the mines. The question of equal distribution in this case between mines and other industries depends upon the rate fixed by the state for the mines. If the taxes paid on plants and profits now levied by some of these states on mines amount to more than on other industries, according to the actual profits derived, the mines are not enjoying equal taxation.

TAX SYSTEM ADVOCATED

The essential requisite for the working of the system I would advocate for mine taxation is for each state to determine the ratio of its mining industry to other industries and enterprises in the state. From this, proportion to the mining industry its share of the tax burden. Then let this proportion of the tax burden alloted to the mining industry be proportioned to the separate mines in the following manner:

First—A tax upon all surface of the lands owned, the assessment to be made and a tax collected in the same manner as on other lands in the district. A minimum value per acre to be placed on all surface holdings. If the land is valuable for farming, town lots, etc., it is to be valued as such.

Second—After the surface tax has been adjusted and the total amount of taxes collectable from the mines from this source is known; a rate, to be used in taxing the yearly profits, to be established that will make up the remaining balance of the tax burden collectable from the mines. In determining the remaining balance to be made up from profits any lands used for such purposes as: dwellings for employees; stores selling general merchandise to employees or the public; or lands for any other purpose than mining, milling, or reduction works in connection with mining; are to be excluded. A tax at this fixed rate is then to be collected on all yearly profits from mining, milling or smelting operations in connection with mining. I do not mean to imply that this rate could be so accurately established that it would yield an exact sum that might be estimated beforehand. It would probably have to be made somewhat higher than indicated in order properly to provide the amount expected. Both the ratio of the mining industry to other industries and the rate of taxes on profits would no doubt have to be adjusted at times.

Third—All buildings used as dwellings for employees; store buildings or stores for general merchandise, or any business enterprise owned by mining concerns or profits from any source that is not actually a department of mining or ore-treatment operations; to be taxed as any other real estate or personal property in the district.

Fourth—All plants; mining, milling, smelting, or equipment used in connection therewith, ore reserves and untreated ore on hand to be exempt from taxation.

Fifth—Profits should be determined in the following manner:

Receipts:
- (a) Total receipts from the sale of product.
- (b) Total value of finished product on hand.
- (c) Miscellaneous receipts to operating accounts.
- (d) A deduction for product carried forward from the previous year, at the same value as given in last report.

Costs:
- (f) Actual expenditure for mining.
- (g) Actual expenditure for transporting ore.
- (h) Actual expenditure for treating, refining and selling product.
- (i) Actual expenditure for current construction, such as changes and upkeep of plants and machinery.
- (j) Depreciation of original cost of plant and equipment.

Profit being the balance of receipts over costs.

All receipts from rents, merchandise profits, and other profits not a direct credit to operations should be excluded from receipts. In case any dwellings are furnished free of charge to employees a reasonable charge should be allowed in the costs.

The property purchase price should be excluded from the costs as well as salaries of those not connected wit active operations. Any construction work that mate ially increases the tonnage capacity should be charged t the original cost of plant and equipment and charge out as depreciation. Depreciation cannot be charged at th same rate for all mines, therefore, the Tax Commissio ers should have full power to fix the rate in each case however, a maximum and a minimum rate might b fixed. In no case should a company be allowed to repo a profit to the state, less than the profit shown in it annual statements or reports after making allowance fo outside profits excluded from the receipts in the ta statement.

The foregoing is an outline of a policy which, I believe, if adopted, would not only give to the state all i should have from the mining industry but give the mine a just tax system. The actual profits to the owners ar less than outlined above as the purchase price of th property has not been included in the cost. But owing t many ways in which this account could be figured it i possibly safer not to consider it as a cost. The hazard of the business are great and the profits as figured ar hardly ever more than a just return for the risks taken The caution and good business judgment displayed b developing large ore reserves by a mining concern is certainly to be encouraged rather than made an excuse fo piling on more taxes.

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The New Arizona Smeltery of the Anaconda Company*

The Arizona plant of the International Smelting & Refining Co., owns 38 acres of ground upon which a smeltery is being built, located about one mile from th Inspiration and Miami Copper Co.'s mills, whose concentrates it will treat under long-term contracts.

It will be served by a standard-gage railroad about one mile in length, having 24 sixty-ton concentrate cars in operation, also an industrial-railway system of standard gage equipped with trolley wires for motive power, also electric locomotives, cars, etc., for handling materials.

The plant will have a capacity of 900 tons per day and will consist of: A system of steel receiving bins of 1000 tons capacity; a sampling works with system of belted conveyors; three 3000-ton steel bins for smelting mixture; six 22-ft. diameter drying furnaces; three reverberatories which will be furnished with waste-heat Stirling boilers; one steel stack 300 ft. high and 22 ft. in diameter; six 12-ft. converters capable of producing 250 tons of copper per day.

There will also be suitable smelter offices and laboratories, shops, warehouses, etc., pipe lines, change house and several residence buildings. The power house for this plant will be jointly owned with the Inspiration Consolidated Copper Co. Completion of all of said additions is expected within the next 18 months, and that the plant will be in operation the early part of 1915.

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Sand and Gravel Production in 1913 in the United States was 79,555,849 tons, according to the U. S. Geological Survey. Of this 1,791,800 tons were glass sand, and 3,563,583 tons were molding sand.

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*From the application of the Anaconda Copper Mining Co. to list 330,000 additional shares on the New York Stock Exchange.

Cyanide Development at Porcupine, Ontario--I*

By Herbert A. Megraw

SYNOPSIS—Cyanide mills in the Porcupine district are experiencing a period of expansion and metallurgical development. The Dome mill has materially increased its treating capacity and has changed its metallurgy, adopting a separate treatment system for sands and slimes. The Hollinger is also enlarging, and is making increased use of counter-current decantation. Both are forward steps.

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The methods applied to the metallurgy of the Porcupine gold ores of Ontario, Canada, are in a constant state of change. While there is no great difficulty in the chemistry of gold recovery, there is a continual and gradual development toward improved and mechanical methods which tend to reduce costs, while at the same time maintaining the high standard of percentage recovered. These developments have not been startling, and only in exceptional cases radical. Rather, they have been simply the day-to-day improvements upon existing methods, building up one insignificant detail upon another, until a real departure is reached.

Treatment Change at Dome Mill

Perhaps the most radical change to be noted in the Porcupine district is the change in the Dome mill, which has come through the necessity for enlarging it to handle a much greater quantity of ore than was possible in the original installation. It is well known that the stamp installation has been doubled, the total number now in use being 80. It is a back-to-back plant, with the 40 new stamps placed in a line behind the 40 originally installed. The new stamps are of the same weight and have the same details as the old ones.

The rock-breaking system had already been changed, as described in a recent issue of the Journal.[1] The ores from the preliminary breaking department are still carried to the mill upon the inclined belt conveyor, the difference being that the conveyor has been lengthened in order to account for the additional height of the battery bins, which were raised 6 ft. all around, in order to accommodate the mill supply for the larger installation. The inclined conveyor belt formerly delivered the ore into the bins by means of an automatic tripper arrangement, which traveled over the bins and could be discharged at any desired point. This has now been changed, and the belt conveyor delivers into a three-legged chute, the two side legs of which discharge on two shuttle belts, by means of which the ore can be deposited in any portion of the bin, and the middle leg is occupied by a screen department, which separates the fines, under ⅛-in. mesh, and bypasses them around the stamps, so that they will go directly to the tube mills without having burdened the stamp batteries with work which they cannot economically perform.

The treatment of the crushed ores from the battery is to be altogether different from the method applied in the original mill. It will be remembered that the ore was formerly treated as an all-slime product, being reground in tube mills having a closed circuit with Dorr classifiers.

The Dome Mill, South Porcupine

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*This is the thirteenth of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvements. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, Jan. 31, Mar. 7, Mar 21, Apr. 25, May 23, June 20 and July 25. The next article will deal with "Cyanide Development at Porcupine, Ontario—II" and will appear in the issue of Sept. 12, 1914.

[1] "Eng. and Min. Journal," Aug. 15, 1914.

until it was all fine enough to be treated by agitation. In the new installation, only one pass through the tube mills will be given, and the sand will be separated and leached.

The mill originally contained amalgamating plates placed in front of the batteries for a preliminary amalgamation, but this has for some time been considered not altogether satisfactory. In the re-design of the mill, these plates are omitted. The pulp is passed directly to the tube mill, and from there carried to an elevator which raises the pulp to a series of amalgamating plates which are placed in the highest portion of the new addition to the mill.

SEPARATE TREATMENT OF SANDS

From the plates, the pulp is carried through large separating cones, from which the slimes are overflowed and taken directly to the agitation system. The metallurgy of slimes is in no way changed from the original plan, but receives the same treatment originally devised for the whole pulp. The sands from the separating cones are taken to a series of Merrill concentrating cones, from which the richest portion, or concentrates, is taken out. This portion is sent back to the tube mill for regrinding. Rather than make a separate product of the concentrates, they are separated continuously in this way, returning invariably to the tube mills until they are ground fine enough to pass out with the slimes. It has been found that an entirely satisfactory extraction can be obtained upon this material by such treatment, the percentage extraction seeming to depend almost entirely upon the fineness in grinding, the higher extractions accompanying the finer grindings.

The sands, which are separated in the large cones, and which go through the concentrating cones, are to be leached. They are taken to a set of large leaching tanks through a distributor of the Butters & Mein type, which deposits the sand in a leachable bed in the tank. These leaching tanks are without any special features, except that they are large, being 40 ft. in diameter and 8.5 ft. deep. The filter bed is coco matting, laid, as is usual in such cases, upon a wooden grating in the tank bottom. The bed is not exactly flat, but is slightly sloped, being high on two diametrically opposite sides, and low on the two opposite sides. This leaves a sort of a trough along one diameter of the tank, at each end of which is a side-discharge door. Upon opening these, the sand charge, saturated with water, may be sluiced out at little cost. The abundance of water, and the consequent cheapness of disposing of sand tailings in this way, is one of the important features which has led to the adoption of the process. Had the sands to be handled by manual labor, or by expensive machinery, the decision might have been otherwise. The leaching period is expected to be about five days, and in that time a high economical percentage of the contained gold is obtained. The plant has not been running long enough to furnish authoritative data as to what the results will be, but it has been calculated conservatively that there is a material saving over regrinding the sands and agitating them. While the percentage extraction may not be quite as high as with regrinding and agitation, still the much lower costs make a larger ultimate profit obtainable.

Water will still be used for the grinding and amalgamating circuit at the Dome mill as formerly, and cyanide will be added to the slimes department at the agitating tanks, as before, while with the sands, the cyanide treatment will begin with the leaching solutions after the sands have been laid down in the tanks. The addition to the Dome mill is sufficiently large to care satisfactorily for the additional apparatus required for the new department, and the mill, as a whole, while perhaps lacking some of the conveniences and good appearances of the original plant, is nevertheless expected to be considerably more efficient than before.

EXTENSION OF HOLLINGER MILL

Another mill in the Porcupine district, which is being expanded, is the Hollinger, at Timmins. When the new installation is complete, the total will be brought up to 60 stamps. Some changes of system are being incorporated along with the new installation, and these are worthy of note. As will be remembered, the Hollinger ores are crushed in cyanide solution at the stamps and sent directly to the tube mills, in closed circuit with Dorr classifiers. The pulp issuing from this circuit will now be taken to primary thickeners. These are 13x6-ft. Dorr machines, installed for the special purpose of giving a prompt thick product for concentration. In the concentrating plant, with the new addition, there will be 52 No. 3 Deister tables, upon which careful concentration of the slimes will be carried out.

The overflow from these primary thickeners is not expected to be clear, but will be of a more or less muddy consistency. This mixture is to be taken to a large Dorr thickener, which is used as a collector for the high-grade muddy solution. This machine is 30 ft. in diameter by 6 ft. deep. The lighter slime, which is naturally carried over to this thickener, contains comparatively little concentrates, in fact, so little that the problem of recovering them from the pulp may be considered as unimportant. The thickened slime is therefore sent to a sump from which it is pumped up for the agitation treatment.

IMPROVED TREATMENT OF CONCENTRATES

The concentrates obtained in the concentrating plant are treated intermittently in the same plant which was originally installed for that purpose. There is, however, a radical change in the treatment itself. The original system was to grind the concentrates in contact with mercury, amalgamating their values as far as possible. By the new process, the concentrates will be treated in the Wheeler pans and settlers by agitation with cyanide solution alone, no mercury being used and no recourse had to amalgamation. This treatment of the concentrates has already been in use for a considerable time, the tailings from the treatment being added to a mill pulp and going through the agitation treatment along with the regular bulk of the mill product. Some study having been given to the matter, it has been decided that the additional recovery gained in passing the concentrates through the mill circuit is not sufficient to justify that course. In the future, these tailings will not be added to the mill circuit, but will be washed separately, in order to recover any solution and gold dissolved in solution, and then stored until some more satisfactory method of handling is arrived at. The concentrates, therefore, will be sent to a multiple-deck Dorr classifier. In this, by a series of washings, the valuable solution will be removed, and the tailings dewatered for storage.

The concentrate tailings obtained by this method contain approximately $7 per ton. This is entirely too much value to discard entirely, and it has been found economically impossible to recover any more through cyanide treatment upon the material in its condition. It is more than likely that a separate process involving roasting will be devised, whereby the major portion of this gold may be recovered. Experiments have shown rather clearly that a desulphurizing roast will place the gold in such condition that it may be easily obtained by cyanide treatment. For the present, however, the concentrates will be stored, and additional study will be put upon devising a method which will be satisfactory for recovering the gold in the concentrate tailings.

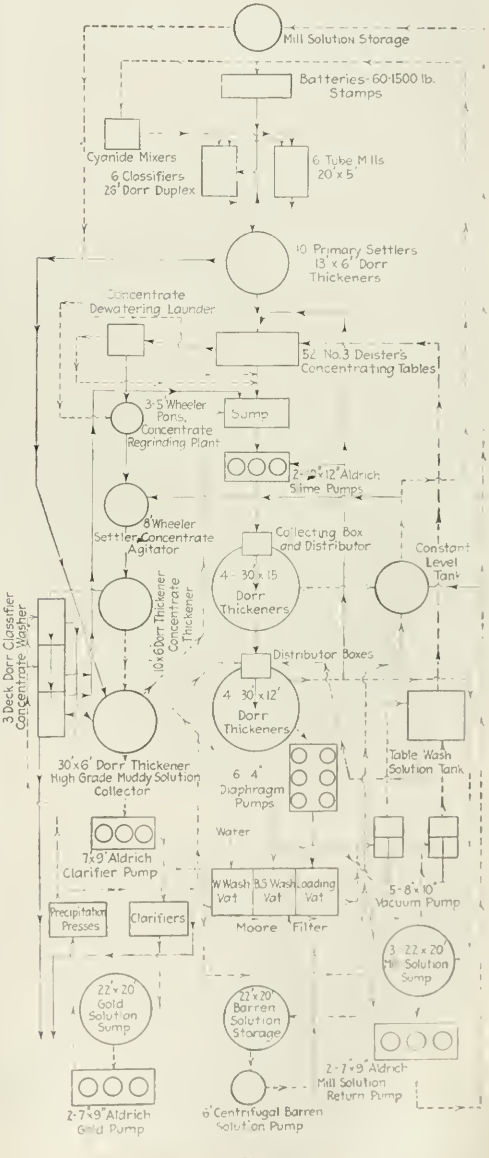
METHOD OF SLIMES TREATMENT

The treatment of the slimes pulp is by a modification of the counter-current decantation system. The first step is performed in four 30x15-ft. Dorr thickeners. The pulp issuing from these is taken to another set of four 30x12-ft. Dorr thickeners, among which it is distributed by a distributing box. It is diluted with treatment solution before entering these thickeners, whereby an additional dissolving of gold, with its consequent recovery, is obtained. From the second set of thickeners, the pulp is raised by diaphragm pumps and sent to the filtering system. The filter is the same Moore removable-leaf system which was installed in the original plant and which is now operated in the same way as formerly.

The accompanying flow sheet shows the method of progress of pulp and solutions through the mill. It will be noticed that the arrangement is such that solution pumping and pulp pumping or elevating is reduced to a minimum. If all solutions were sent from one end of the mill to the other, and had to be pumped back, the cost, involving extra solution precipitation, would be an item of importance. By reducing the amount of solution pumped, the amount precipitated is also reduced, and costs, both of pumping and of precipitation, are reduced to the lowest possible point.

The head value of the ore being treated in the Hollinger mill at the present time is about $18 per ton. The concentrates extracted on the Deister tables average about $55 per ton. The ore which gets past the concentrators and goes to the cyanide department averages about $1.50 per ton, while the mill tailings from general treatment average about 15c. per ton.

It is to be noted that the overflow from the large Dorr thickener, which receives the muddy overflow of the preliminary settler, is pumped through clarifying presses and is then taken to the precipitation system. Or this solution may be diverted back to the concentrate-treatment department or to the original battery crushing department. The whole solution flow in this mill has been admirably designed to meet all contingencies. Under normal circumstances, however, a system of floats attached to valves has been so devised that it is almost never necessary for operators to manipulate the valves at all. Constant levels are maintained as required, and the different solution levels automatically arrange for their transportation to the proper department, as they are required. As now arranged, it is only in the extraordinary case, when some emergency arises, or when some unforseen difficulty makes its appearance, that the operator on shift has anything to do with solution valves in the main treatment. Naturally, in such department as the filter, the operator is required to make the few necessary changes for filtering, washing, etc. Taking it all in all, the Hollinger mill is a fine one, admirably adapted for the ore it has to treat, and arranged in an extremely convenient way. It is, perhaps, one of the best large-scale mills in operation, in that so little care and attention are necessary. The new stamp installation is not altogether complete, but within a short time it will be operated as is shown in the flow sheet.


Mill Solution Storage
Batteries-60-1500 lb. Stamps
Cyanide Mixers
6 Classifiers 26' Dorr Duplex
6 Tube Mills 20'x 5'
10 Primary Settlers 13'x 6' Dorr Thickeners
Concentrate Dewatering Launder
52 No.3 Deister's Concentrating Tables
3-5' Wheeler Pans, Concentrate Regrinding Plant
Sump
2-10"x12" Aldrich Slime Pumps
8' Wheeler Settler, Concentrate Agitator
Collecting Box and Distributor
Constant Level Tank
4-30x15 Dorr Thickeners
3 Deck Dorr Classifier Concentrate Washer
10'x6' Dorr Thickener Concentrate Thickener
Distributor Boxes
4 30'x12' Dorr Thickeners
30'x6' Dorr Thickener High Grade Muddy Solution Collector
6 4" Diaphragm Pumps
Table Wash Solution Tank
7x9' Aldrich Clarifier Pump
Water
W Wash Vat
B.S Wash Vat
Loading Vat
Moore Filter
5-8"x10" Vacuum Pump
Precipitation Presses
Clarifiers
3 22'x20' Mill Solution Sump
22'x20' Gold Solution Sump
22'x20' Barren Solution Storage
2-7"x9" Aldrich Mill Solution Return Pump
2-7"x9" Aldrich Gold Pump
6' Centrifugal Barren Solution Pump

FLOW SHEET OF HOLLINGER MILL

Porcupine Practice as Distinguished from That of Cobalt

An interesting circumstance is noticeable in the comparison of the mills of the Porcupine district with those of the silver-treating mills of Cobalt and adjacent territory. While in Porcupine, with its gold metallurgy, all efforts have been put forth toward devising automatic systems with their low costs and small supervision requirements, in the silver camp, efforts have been made, on the contrary, toward mechanical and metallurgical refinement directed toward securing the ultimate limit of high extraction. Thus, at the Nipissing mill, an extremely complicated system is installed, whereby the ore is first ground in water, and in water treated with caustic soda and aluminum to desulphurize the complex silver minerals occurring in the ores. Even before the treatment begins, however, the system is rather complex, since stage ore breaking and extremely accurate weighing are the rule. The weighing, as has already been mentioned in the JOURNAL[2], is done on recording scales, each car being passed over the scale before it goes to the mill. In this way an accurate record of the weight of the incoming ore is obtained. Since the ore is also accurately sampled before reaching cyanide solution, its exact content is easy to determine. In the Porcupine mills, on the contrary, sampling is not accurately performed, nor is weighing, although, of course, checks are made both ways so that an approximation of the ore content received at the mills may be made.

In most of the Cobalt mills, which use cyanidation, agitation is by the charge system and not by the continuous methods which are preferred at Porcupine. An approximation of the Porcupine system is found in the new high-grade mill of the Buffalo company, which treats its high-grade ores and concentrates through a special system of amalgamation and cyanidation. Amalgamation is performed in a tube mill and the tailings are cyanided in Dorr agitators, thickened and filtered through a Moore filter system. The one unique step in this plant is the method of recovering mercury from the tailings by passing a mercury solvent through the cake upon the filter leaf. Silver ores require entirely different methods from those which may be applied to gold ores, and this is particularly the case when the silver is high grade, as at Cobalt.

(To be concluded)

⁂

G.-O. Glass Table Top*

The General Ore Concentrating Co., Inc., of 40 Cedar St., New York, has brought out a glass top for concentrating tables, which has given promising results in a test at the Miami mill and at another concentrating plant in Arizona. The table top consists of one piece of wire glass ⅜ in. thick, having eight corrugations or riffles to the inch. The riffles are 0.06 in. deep, but are diminished in height as the feed end of the table is approached. This is the opposite of standard practice with coarse riffling, but where so many riffles or corrugations are used, the action on the glass table top is said to warrant this difference. The tailings discharge at approximately the same speed as the wash water from the table, while the concentrates being moved only by the reciprocating motion of the table, accumulate, so that it is necessary to provide on the advanced section of the table a greater protective area than at the feed end, where the ratio of the concentrates to tailings is equivalent to that of the original ore.

A section of the table top directly under the feed box is made either from linoleum, concrete or rubber, and is so arranged as to be horizontal when the table is at its normal operating pitch. This causes stratification before decantation and is designed to assist in the precipitation of the heavier minerals.

The distribution of the concentrates on the G-O table top differs greatly from that on the ordinary table. The concentrates leave the ordinary table in greatest abundance close to the tailings. On the G-O top, the distribution of the products at the end of the table is reversed, the greatest amount of concentrates coming off high on the table, leaving a section several feet wide between the main body of concentrates and the tailings where only lean middlings pass over, so that in case of fluctuations of feed there is a considerable margin before the main body of the concentrates is in danger of passing out the tailings launder. This is an important factor in the ordinary operation of a mill, and especially on night shifts, where tables are likely to receive less attention than normally. With the G-O table tops, there is almost no free mineral mixed with the middlings; hence in case of subsequent regrinding, they produce less slimes and tend toward greater recovery. Superior results were obtained in this respect both at the Miami mill and at the tests at the Consolidated Arizona Smelting Co.'s mill at Humboldt, where some preliminary work was done in competition with the flotation method with favorable results, particularly in the elimination of silica and the saving of iron, these minerals not being so favorably handled by the flotation method. Thus, more favorable smelting charges may be obtained on account of the superior fluxing value of the table concentrates.

The wire-glass table top is not so delicate as might be expected. The manufacturers state that a sheet of glass 10 ft. long will stand a deflection of 8 in. Once attached to the table, the possibility of breakage is practically eliminated, but even if the top should be cracked, the wire insertion prevents the scattering of the pieces, and such a table may be operated for months. The glass top is provided with a felt cushion which obviates the effect of the warping of the wooden surface underneath. The top may be laid on any ordinary wooden deck by applying a damp-resisting cement; the glass, with the felt already attached, is then laid on the table, the corners fastened and the two small steel plates attached. The table is then ready for operation. The wearing qualities of the glass as applied under the circumstances existing in concentrating practice is satisfactory; as the sand travels with much less speed than it does in launders, the wear is much reduced. The glass has the advantage of being noncorrosive and nonporous. It is natural that a surface which lasts longest unimpaired will give the greatest average extraction; the polished surface in the bottom of the grooves of the glass top remains intact on account of the fact that the concentrates which travel therein are soft. The G-O glass table tops can be attached to any of the standard concentrating tables.

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*From data furnished by the manufacturers.

Details of Practical Mining

Ore-Chute Side Pocket

By Lewis B. Pringle*

The accompanying illustration shows an ore chute used by the Cananea Consolidated Copper Co., in its Capote mine. The chute was designed by the geological department of the company, and was first used in getting the silica ore from the "silica stope." The chute in itself need not differ from any of the many chutes now used. The feature newly introduced is an elevated pocket on one side of the chute, reached by a short ladder.

Ordinarily, if a chute becomes jammed, the jam must be broken by one of two methods; i.e., either by discharging a piece of dynamite in the chute, or by breaking the jam with a crowbar or "prod." The first method is frequently objectionable because of the danger of injuring the chute, and because of the resulting fumes. When the latter method is preferable, the arrangement herein described will prove to be a time-saver and a help to the man who is using the crowbar.

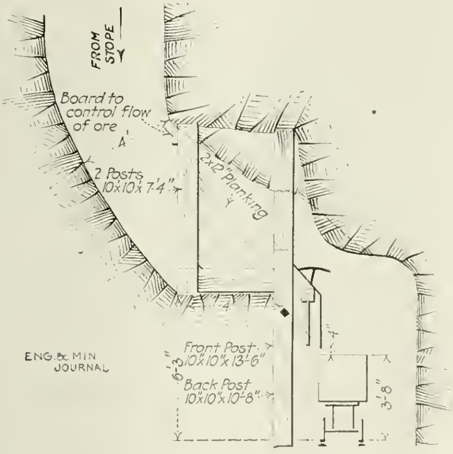

Fig. 1. Side Elevation and Section

The car-filler generally has either to reach over the partly filled car, or get upon it, and poke his bar up through the chute gate. The arrangement herein described permits the car-filler to climb into the adjoining pocket, reach over the planking shown in Fig. 1 and get at the seat of the trouble more easily and more quickly than otherwise. Often the rock jams at the elbow of the chute, and the pocket herein described enables a man to reach this elbow, as he could not, working from below.

The erected chutes do not follow the drawing in detail; the latter merely illustrates the idea and the chute builder constructs the chute to meet the required conditions. In building the first chute of this type, the sharp elbow shown was cut off, and the back stulls were lengthened a foot or more. The few dimensions given are more or less standard.

The planking which keeps the rock from filling into the pocket, can be raised or lowered as necessary, leaving enough room between the top plank and the roof for a man to work over. The board that controls the flow of the ore is also raised or lowered as required.

⁂

No. 8 Detonators for Fast Tunneling

On the development tunnel of a Western gold mine, according to the *du Pont Magazine* for July, 1914, blasting had been done with 40% gelatin and No. 6 caps. The superintendent, thinking he might obtain more perfect detonation thereby, substituted No. 8 caps for the No. 6 and increased his progress from 4 to 5 in. per shift. This, of course, more than accounts for the increased price of the caps. The magazine notes that in many tunneling operations there is no other way of increasing the footage broken per round. It is impossible to increase the number of holes, and a more powerful explosive may be unsuitable for the rock. Increasing the quantity of explosive in each hole would cut down the tamping and result in blown-out shots. It is probably not possible to develop the entire potential strength of any high explosive; decomposition is always theoretically incomplete, but the more nearly complete it is, the more work is done and the less noxious are the fumes produced. Practically complete decomposition of an explosive and production of a maximum disruptive effect can be had only by using tamping and the largest and strongest detonator practicable.

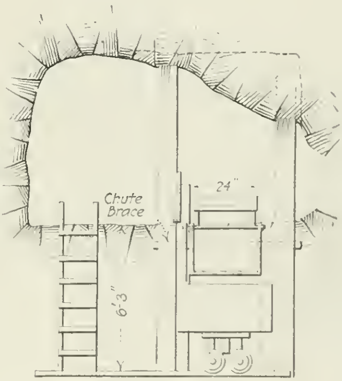

Fig. 2. Front Elevation

When blasting is of such a character that the drill holes are overloaded, that is, when more explosive is put in or stronger explosive is used than that actually necessary to break the rock, it is unlikely the substitution of a stronger detonator will be noticed; but where overloading the drill holes produces less effect, as in tunneling where a definite amount of tamping is absolutely required to prevent the charges from blowing out, supposing the rock to be hard and tough, and where accurate measurements are possible, it will be found that in practically every instance a No. 8 detonator will result in faster progress than a No. 6.

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*Quincy, Ill., formerly geologist for the Cananea Con Copper Co., Son., Mex.

[This insistence of the du Pont experts on the use of tamping in tunneling is interesting, in view of the opinion set forth by Messrs. Gray and Brunton in Bulletin 57, published by the U. S. Bureau of Mines on the subject of tunneling, to the effect, namely, that tamping in most tunneling does not pay.—EDITOR.]

⁂

Converting Steam Hoists to Electric

The introduction of electric power at the mines of the Penn Iron Mining Co. in Michigan necessitated changing over to motor drive the steam driven hoists in use (*Bull. A. I. M. E.*, February, 1914). Two geared hoists with tandem drums shown in Fig. 1 were converted by extending the pinion shaft, which lies between the drums, some distance on the side opposite the steam cylinder and putting on the extension a large rope wheel for an American system rope drive from the shaft of a reduction motor. The connecting-rod of the steam engine was disconnected. In one case the motor is rated at 200 hp. and hoists a skip load of 6700 lb., the speed of the cage and the skip being 590 ft. per min. and the maximum distance of travel for the skip, 1557 ft. The motor at the other shaft is rated at 350 hp., and handles a skip load of 6000 lb., the skip and cage speed being 558 ft. per min., the maximum distance of skip travel being 1546 ft. This motor is larger than necessary. In operation the motor rope wheels, gear wheels and drum shafts are started first when a trip is begun and when they are up to speed, the drum clutch is applied gradually and a quick acceleration obtained.

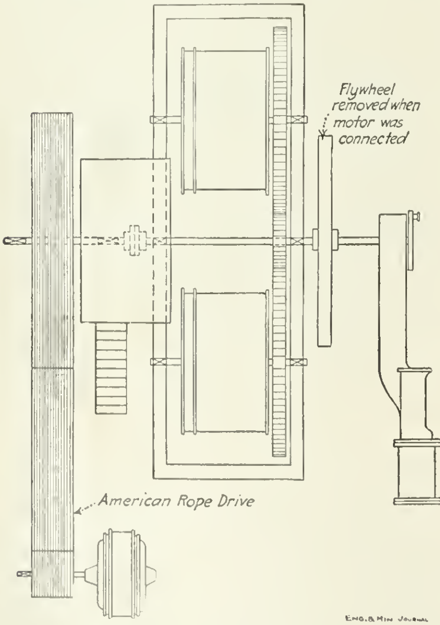


FIG. 1. METHOD OF CONNECTING TANDEM-DRUM HOISTS

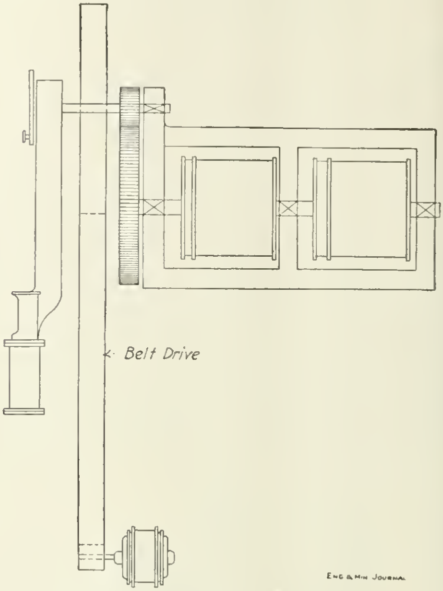


FIG. 2. DRUMS ON THE SAME SHAFT

Two other hoists similarly driven by a single steam cylinder, but with their two drums set side by side on the shaft were converted as shown in Fig. 2, a belt drive being used with the motor in this case.

⁂

Roller-Bearing Results on Mine Cars

Interesting figures on the saving to be effected by using roller bearings instead of ordinary bearings for cars are furnished by the Sanford-Day Iron Works, of Knoxville, Tenn., who make the Whitney roller bearing. The figures are given in the accompanying table; they are the result of a test conducted by the engineer of a large company which has in use about 550 sets of the "Whitney Wonder" roller-bearing trucks. The test was not conducted by the manufacturers, but by the company, for the sake of finding out the relative advantages of the two types of bearings.

Three trips were made with each type of bearing, each consisting of 20 cars loaded with 3.1 tons each, hauled 3250 ft. and back. Ammeter and voltmeter readings were taken as often as possible, about 18 times each way, and these were checked with wattmeter readings. The trips were made over the same track, for the same distance, by the same motorman, and the same locomotive, and the best possible time was attempted in each case. The slow time of the first trip with the solid hub is due to the fact that the preceding trips with the roller bearings had been made on an unsanded track and it was found that the sanding was necessary for the ordinary type of bearing.

The saving was 58% in power and 50% in time. Furthermore, a long life and little care are claimed for the roller bearings. Figures are lacking on the size of wheel, gage of track, weight of locomotive, etc. But it is stated by the company that the additional cost for the roller bearings over the common type of solid hub is between $6 and $7. We assume that this is per pair of wheels. Thus, where a solid-hub truck would cost about $18. a roller-bearing truck would cost between $25 and $26.

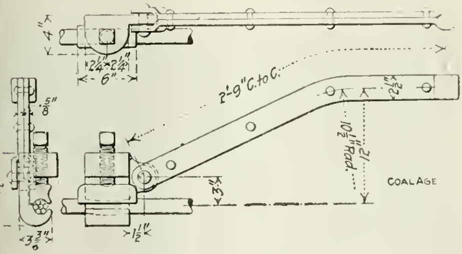
TEST OF POWER REQUIRED FOR HAULAGE WITH SOLID HUB AND WITH ROLLER BEARINGS

Trips	Solid Hub No. 1 Min.	Solid Hub No. 2 Min.	Solid Hub No. 3 Min.	Solid Hub Average Min.	Roller Bearing No. 1 Min.	Roller Bearing No. 2 Min.	Roller Bearing No. 3 Min.	Roller Bearing Average Min.
Time of round trips.	23.5	10.25	11.0	14 9	8.66	7.16	6 66	7.5
Average amperes...	185	169	180	178	155	156	152	154
Average volts.	478	472	460	470	460	469	467	465
Kilowatts...	88.4	80.0	82.9	83.78	71.3	73.16	71.0	71 81
Kilowatt-hr....	34.6	13 7	15.2	21.0	10.6	8.75	7 9	8 8

⁂

Endless-Rope Gravity Inclined Plane*

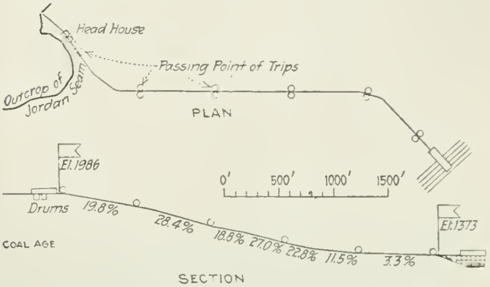
The Gem mine lowers its coal from the mine entrance to the tipple on the railroad, a vertical distance of 613 ft. The horizontal distance covered is 3640 ft., the length of the plane is 3700 ft. and its average inclination is 16.8%. The plane starts with a 19.8% grade; this runs for 750 ft., increases to 28.4% for 600 ft., decreases to 18.8% for 300 ft., and then gradually decreases until it end with a 3.3% grade. Two 36-in.-gage tracks are laid on 6-ft. centers with 30-lb. rails. Cast-iron rollers, 6 in. in diameter and 6 in. wide, with chilled surfaces, are placed in the center of each track on 50-ft. centers. The ties are placed on 20-in. centers; a 10-in. board spiked to these keeps the rope from dragging on the ground. There are two curves, one near the top which is on an inclination of 20%, the other near the bottom on a 3% grade. On the curves the outer rail is elevated and sheaves are placed 20 ft. apart to deflect the rope.



Details of the Grip

The rope is of plow steel, 1⅛ in. in diameter and composed of six strands of 19 wires each wrapped around a hemp center. The rope runs around a sheave wheel placed on a tension carriage underneath the tipple floor and four times around the drums, which are beneath the floor of the head house.

The tension carriage is made from a standard freight-car truck. Upon this is mounted an iron sheave, 6 ft. in diameter with a $4\frac{5}{16}$-in. shaft. This truck rolls on 30-lb. rails set on an angle of 35° to the horizontal and is loaded with scrap until it weighs three tons. Its distance of travel scarcely exceeds 3 in. The two cast-iron drums at the head of the plane are 6 ft. in diameter and 4 ft. high, set vertically on 10-ft. centers with their line of centers parallel to the plane and grooved to receive the rope. These drums are controlled by an ordinary friction-band brake, suitably counter-weighted so that the brake is set, except when held released by the drum man. This brake is connected by a ½-in. chain to a handwheel, such as is used on freight cars. This wheel is on one side, out of the way of the cars, but close enough for the operator to see the headmen attach and detach the trains.



Plan and Profile of the Plane

The cars are pushed into the head house by the mine motor and made up into trains of five cars coupled together by the regular mine-car couplings. To the rear drawbar of the last car a special grip is attached. While the loaded train is being attached to the rope, an empty train has been detached on the adjacent track; at the same time the couplers in the tipple have detached a loaded and attached an empty trip.

The drum man gets signals from both the tipple couplers and the top couplers, then releases his brake and allows the loaded train to descend, until an empty train ascends to the proper point in the head house. The distance traveled in one interval is about 700 ft.; in operation five loaded trips are on the rope.

There is surprisingly little difference in the spacing of the trains and it is seldom they have to be respaced. There is no difficulty in increasing the number or size of trains, but the rope distance between the attaching and detaching points must be the same, and this distance will govern the spacing. In this particular installation there are six loaded trains and six empty on the plane at one time, counting those at the head and at the tipple.

The grip arm is made from machine steel, 2½x⅝ in., doubled back and riveted by ⅝-in. rivets. The upper end is rounded out to receive the 1⅛-in. clevis pin of the car coupling; the lower end is flared out in the form of a yoke to receive the head. The arm is bent vertically to compensate for the difference in height of the drawbar and rope. The head setscrew is 1½x4½ in. The grip block is made from a piece of steel, 2x2¼x6 in., forged as shown and drilled to receive the point of the setscrew.

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*An abstract of a paper read before the West Virginia Coal Mining Institute, June 3, 1914, and published in "Coal Age," Aug. 1, 1914

The bottom and outside are grooved, the bottom to receive the rope and the side to clear the flange of the curve sheaves. The jaw is forged from a piece of steel, 4x4¼x6 in., recessed as shown to receive the rope and drilled and threaded for the setscrew. Both the grip block and the jaw are turned in the form of an arc, so that when the setscrew is tightened the rope is crimped, thereby preventing any slippage. The crimping being only ¼ in. does not injure the rope. The grips weigh about 50 lb. each and their maintenance is almost negligible. To attach or detach one takes considerably less than a minute.

Seven men are required to operate the plane. The drum man operates the drum and has supervision over the head. Two couplers in the head house and two on the tipple attach and detach the trains. A man is stationed where the loaded trains first stop, and at this point there is a derailing switch which can be thrown in case of a wreck or runaway on the track above. This plane man is furnished with a wrench, and tests the grips and oils the outer wheels of the descending cars. At the first stop of the ascending train an oiler is placed who oils the outer wheels of the ascending cars. Both of these men command a view of the upper and lower curves respectively, and at each station is placed a switch, which, when thrown, flashes an electric light in the head house; thus, in case of a wreck or accident, warning the drum man, who immediately stops the rope.

Two years ago the present rope was installed and cost in place $2000. A new rope, recently ordered for installation during the summer, will cost much less. In 1913, 110,497 tons was lowered in 268 days of nine hours each, or an average of 524 tons per day. The maximum handled in one day was 885 tons in 8½ hr., or 104 tons per hour.

Taking the life of the rope at two years, which has been proved by past experience to be the average, the depreciation of the rope amounts to 0.7c. for each ton of coal handled. The wages of the seven men employed aggregate $14.83 per day, or 2.25c. per ton; this also includes the labor of oiling the mine cars. The cost of maintenance and renewal of ties, rollers, sheaves, grips, etc., averaged over a period of months is approximately $25 per month, or 0.2c. per ton of coal handled. This includes cleaning up wrecks, replacing derailed cars, etc. There is an average of one wreck per month, which takes two hours to clean up. Most of the wrecks occur on the curves. The total cost of running and maintaining the plane per ton of coal handled, is therefore, 3.15c.

The tension on the rope can be calculated in a simple manner by assuming it to be stationary and composed of two independent ropes suspended at the top of the drums. Then the point of maximum strain will occur where the rope supporting the loaded cars first comes in contact with the drums and the strain at this point will be the greatest just as the loaded train goes on the slope and the rope is supporting 25 loaded mine cars plus the length of one rope from the drum to the tension carriage plus half the pull of the tension carriage. The other rope will be sustaining the same weight less the actual weight of the coal in the cars. The empty cars weigh 1200 lb. and the loaded 4000 lb., so that the total movable weight on the loaded side that the drum supports is:

	Lb.
25 loaded cars @ 4000 lb.	100,000
½ weight of 6000-lb. tension carriage	3,000
4000 ft. of rope @ 2 lb.	8,000
Total	111,000

The average inclination of the trains at the time when the tension on the drum is greatest is 18.8%, or 10° 39′. The tension T on the rope due to the loaded trip is:

$T = W (\sin a - \cos a \times Z)$ where
W is the weight of the loaded trip, 100,000 lb.
a is the angle of the plane, 10° 39′.
Z is the coefficient of friction equal to 1/20.

Substituting and solving for T, we find that the tension on the rope due to the loaded trip is 13,568 lb. Morin gives the coefficient of friction of metal on oak as ½. Using this coefficient and W, the weight of the rope as 8000 lb., in the formula, it can be shown that the dragging of the rope acts as a brake to the extent of 2453 lb. In the same way, it can be shown that the pull exerted by the tension carriage amounts to 1598 lb. The total tension on the loaded rope at its point of contact with the drum will be 13,568 plus 1598 minus 2453, or 12,713 lb., or 6.4 tons.

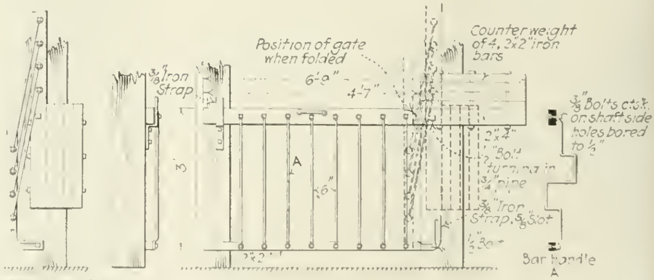
*

Folding Gate across Shaft

By W. H. Jobe*

The accompanying illustration, published in my report for 1912-1913, represents a shaft gate designed by Capt. Edward Jacka, of the Armenia mine, Crystal Falls, Mich.

It consists of two horizontal wooden bars, the top one 2x4 in., the lower 2x2 in. These are connected by eight vertical iron bars bolted loosely at the top and bottom. The upper horizontal bar pivots on a ½-in. bolt, turning in a ¾-in. pipe in the shaft timber. The lower horizontal bar ends in an iron strap turned at right angles, ⅜ in. thick with a ⅝-in. slot along its middle. A ½-in. bolt through the slot holds the strap to the shaft timbers but permits it to slide. Thus, as the gate is raised, it folds up as shown.


⅜" Iron Strap
Position of gate when folded
Counter weight of 4, 2x2" iron bars
6'-9"
4'-7"
⅜" Bolts ctsk. on shaft side holes bored to ½"
2"x4"
½" Bolt turning in ¾" pipe
A
6"
3'
⅜" Iron Strap, ⅝" Slot
½" Bolt
2"x2"
Bar handle
A
ENG. & M. JOURNAL

FOLDING GATE FOR SHAFT

A counterweight of four 2x2-in. iron bars is bolted to the upper horizontal bar. One of the vertical bars has two offsets as shown, and serves as a handle.

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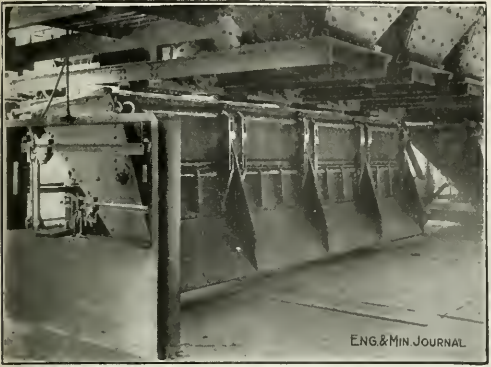
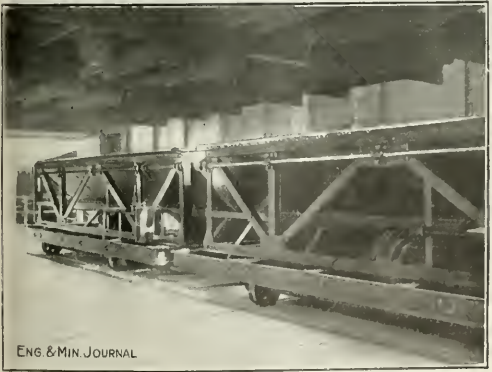
*Inspector of mines for Iron County, Crystal Falls, Mich.

Details of Milling and Smelting

C. & A. Charge Car



C. & A. Charge Cars, Stock Bins and Scale



Charge Cars Moved Forward to Furnace Doors

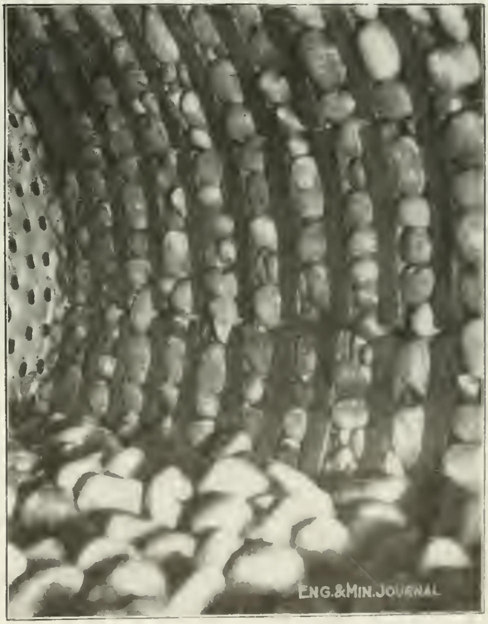
The blast-furnace charging arrangements at the new Calumet & Arizona smelting works at Douglas, Ariz., are interesting. The accompanying illustrations of the C. & A. charge cars will also give some idea of the general charging arrangement. The blast furnaces are 40 ft. long, and on each side of a furnace are two charge cars that never leave the charge floor, merely running between the stock bins and furnace doors, the two positions being illustrated in the accompanying engravings. The furnace charge is delivered by belt conveyors into stock bins on each side of the furnaces; there are also bins for coke, which is loaded on the top of the charge.

The charge cars are of the gable-bottom type, and are propelled by their own motor. The tops of the cars are close to the hoppers of the stock bins, so that little material is spilled on the floor. The gates of the bins are operated by compressed air, and after the charge is dropped into the car and weighed by the platform scales, shown at the left of one of the engravings, the car is propelled to the furnace doors, as shown in the other illustration. There are but two doors on the side of the furnace, and each car corresponds to the length of a door. This arrangement enables these large furnaces to be fed with a minimum of confusion on the furnace feed floor, and eliminates many of the undesirable features that exist when charge trains are run through a furnace building.

⁂

Globe Tube-Mill Lining

Tube-mill linings of the Globe type are in use at several mills in Ontario. This lining is based on the same principle as the well known El Oro lining, that is, deep iron plates having channels into which pebbles wedge themselves, forming a lining which prevents wear of the iron. The difference is that in the El Oro type the channels run longitudinally from one end of the mill to the other, while in the Globe design, the channels run around the mill. The taper is arranged so that the turning of the mill wedges the pebbles more and more firmly into their places. The accompanying illustration shows the appearance of the interior of a mill so lined.



Interior of Tube Mill with Globe Lining

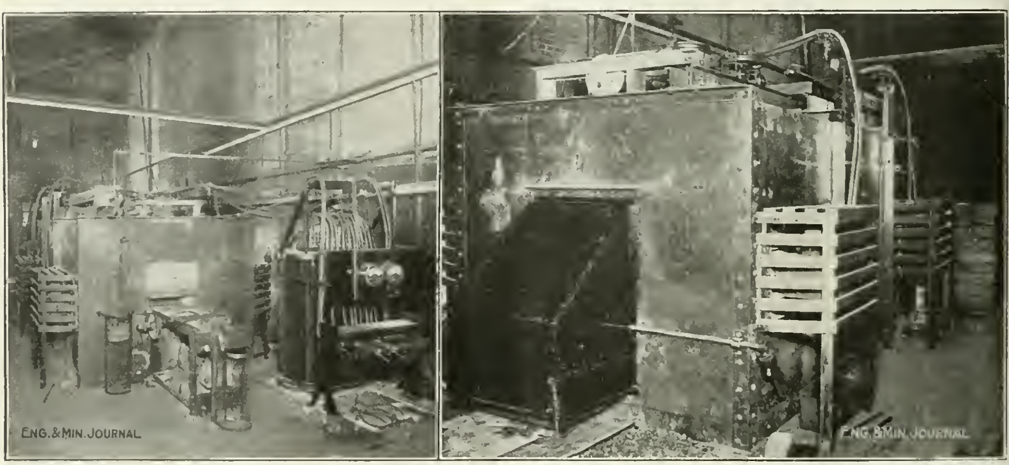
Tube mills equipped with this lining have been in use for some time at the Hollinger plant, Timmins, Ont., where they are said to be giving about three months' service more than the El Oro lining. The Cobalt Lake mill, at Cobalt, Ont., uses it with satisfactory results, and one mill is being equipped with it at the Dome mill, South Porcupine, for test. The type was designed by A. R. Globe, assistant general manager of the Hollinger Gold Mines, Ltd.

⁂

Electric Annealing Furnace*

An electric heating furnace for annealing brass and german-silver flat-ware blanks has just been installed by a Niagara Falls maker of plated table ware.

The furnace framework is made of steel shapes and plates, and is 15 ft. long, 8 ft. wide, 7 ft. 6 in. high. The doors are situated at both ends of the furnace.



Electric Annealing Furnace

Charging end

Water-sealed discharge

A mechanical pusher operated by compressed-air cylinders running over cast-iron idler sheaves operates the pusher mechanism situated at the charging end of the furnace. The material under treatment is packed in steel pans 20 in. square, which were forced through one after another, seven pans being in the furnace at one time. The pans passing through the furnace are supported by a hearth made of cast-iron grids 24 in. square, and are of a design which prevents undue warping at furnace temperatures. The pan coming out of the discharge end of the furnace is automatically dumped into a water-sealed discharge hood. The metal falls into a tank of either clear water or pickling solution, depending upon the cleanliness of the material before it is charged into the furnace. The pan itself is caught by two rails and held suspended above the trough and may be taken out from under the water-sealed hood through the counterbalanced swing door shown in Fig. 2.

The material is not exposed to the atmosphere at any time after entrance to the furnace until it is taken from the quenching tank cold. This entirely eliminates any possibility of oxidation at any stage during the heating or cooling, as the furnace itself has a reducing atmosphere at all times.

The operation of this furnace has demonstrated clearly the superiority of continuous electric furnaces for the class of work handled, as the desired temperature may be reached with the utmost precision and without danger of overheating.

This furnace was designed and installed by the Electric Furnace Co. of America, Alliance, Ohio, which has recently received a duplicate order from the same plant.

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Sand Separation at the Dome Mill

As newly arranged, the Dome mill, South Porcupine, Ont., will treat sands and slimes separately. The batteries will probably be equipped with 3- or 4-mesh screens. Pulp from them will go to a 4x16-ft. duplex Dorr classifier, which delivers the oversize to a 5x22-ft. tube mill, and the slimes to the foot of an elevator. There is but one passage of material through the tube mill, none of the product being returned. The tube-mill discharge joins the slimes going to the elevator.

From the elevator, the pulp is led over a series of amalgamating plates, twenty-four 54x144-in. plates being installed. Crushing is in water, and an extraction of between 70 and 80% is secured by amalgamation.

From the plates the pump passes to a battery of Merrill hydraulic cones, the slimes from these going to the thickening and agitation tanks, and treated exactly as the system was before the change. Sand from the classifiers goes to a battery of Merrill concentrating cones, two to each classifying cone. Sands from these overflow to the sand-treatment tanks, and the concentrates pass over amalgamating plates, and thence to the Dorr classifier, where they are taken out with the sands and go into the tube mills for further grinding. By this system the concentrates circulate between the tube mills and amalgamating plates until they have been ground fine enough to pass out into one of the treatment systems, in either case fine enough to give up their metal content to the cyanide solutions.

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*From data furnished by the manufacturers.

The Assayer and Chemist

Determination of Thorium in Monazite Sand*

The method depends upon the complete precipitation of thorium pyrophosphate by means of sodium pyrophosphate in acid solution. The pyrophosphates of cerous cerium and of the other rare earth metals with the exception of zirconium are soluble in acid and remain in solution. The sand is first decomposed with concentrated sulphuric acid and an aliquot portion of the diluted and filtered solution, representing about 2.5 grams of the mineral, is diluted to 450 c.c., acidified with 5 c.c. of hydrochloric acid and 15 c.c. of 5% solution of sodium pyrophosphate added. After boiling, the precipitate of thorium and zirconium pyrophosphates (containing also traces of ceric and other pyrophosphates mechanically brought down) is filtered off and converted into sulphate by digestion on the filter paper in a Kjeldahl flask with 15 c.c. of concentrated sulphuric acid and a few crystals of ammonium perchlorate. After cooling the clear solution is diluted and the hydroxides are precipitated with sodium hydroxide. These are then after filtration dissolved in hydrochloric acid, a few cubic centimeters of concentrated sulphur-dioxide solution added to reduce any ceric cerium, and the phosphate precipitation and subsequent conversion into sulphate and hydroxide repeated. The hydroxides of thorium and zirconium are dissolved in hydrochloric acid and the thorium precipitated from this solution as oxalate by the addition of 2 grams of oxalic acid. The solution is diluted to 450 c.c. and allowed to stand over night. The pure thorium oxalate is then filtered off, and ignited and weighed as oxide. The oxide obtained was always quite white, and free from phosphate and from cerium. The results of analyses, both of mixtures of thoria with pure rare earth salts, and of various samples of monazite demonstrated the reliability of the method, and they were in close agreement with those obtained by the iodate method of Mayer and Speter.

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Determination of Sulphates by Barium Precipitation

The difficulties of obtaining a pure barium-sulphate precipitate in the presence of other salts is well known. A method is proposed by W. A. Turner (*Am. Journ. Sci.*, July, 1914) to get rid of sodium and to a lesser degree, potassium, before the sulphate precipitation. The sample, representing a quantity of sulphur which will give about one gram of barium sulphate, is dissolved (after fusion with sodium carbonate and peroxide, if necessary), in the least convenient quantity of water.

It is then treated with five volumes of concentrated hydrochloric acid, and the resulting precipitate of alkali chloride is filtered off on asbestos under suction. Wash the precipitate clean with concentrated hydrochloric acid. Evaporate the combined filtrate and washings on the steam bath, take up the residue with a little water and 1 c.c. of 4% hydrochloric acid, and filter through a small filter. Dilute to 350 c.c., heat to boiling and add 10% $BaCl_2$ solution drop by drop to 1 to 2 c.c. excess. The precipitate is allowed to digest on the steam bath for several hours, over night if convenient, filtered on asbestos, ignited at low red heat and weighed. The method is especially recommended after alkaline fusions, substituting sodium peroxide for potassium nitrate.

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A Laboratory Filter Press

By Bancroft Gore*

A miniature filter press for rapid testing work, designed for study of problems involving filtration of solutions, lake formation, leaching in solution, washing and air-drying, which is a valuable unit for a miniature ore-testing plant or works laboratory, was specially made for use by the department of metallurgy of the Montana State School of Mines. It forms one unit in a series of miniature testing apparatus where samples not exceeding 25 lb. can be put through the usual steps of fine grinding in acid or cyanide solutions, air agitation, filtration, washing and precipitation of pregnant solutions.

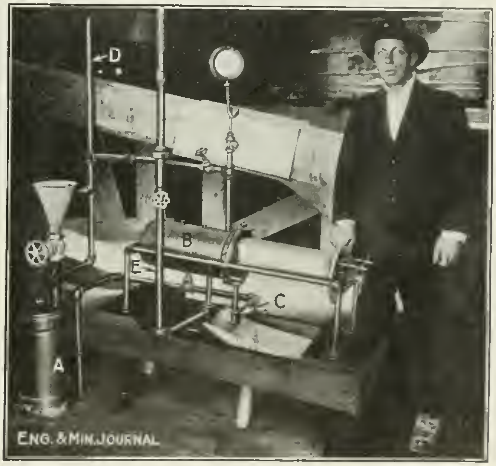

Fig. 1. General View of Filter Press When Open

In selecting a press for class work and general testing purposes, the importance of being able to use it for a large variety of work under varying conditions, was a governing factor. Furthermore, it was essential that a number of tests could be made rapidly in a three-hour period without undue loss of time resulting from cleaning up and preparing the press and accessories for each cycle of operations. The type selected was supplied by the Kelly Filter Press Co., of Salt Lake City, and is shown in Fig. 1, where it is set up for filtration and washing of slimes resulting from the agitation of oxidized copper ores in sulphuric-acid solution. Its dimensions are as follows: *A*, montejus, 10-in. wrought-iron pipe, lead lined; *B*, pressure tank, 15x7-in. diameter outside, length overall when discharging cake, 35 in.; *C*, slime-inlet pipe from montejus, ¾-in. diameter; *D*, air-pressure line, ½-in. diameter; *E*, water-inlet pipe, ¾-in. diameter. The leaves measure 4¼x13 in. and from one to four may be used. The capacity in dry slime is 25 pounds.

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*Abstract in "Journ. Soc. Chem. Ind.," July 25, 1914, of article in "Journ. Am. Chem. Soc.," p. 1131, 1914

*Butte, Mont.

The leaves, one of which is shown in Fig. 2, coated with cake of slime 1 in. thick, are easily removable for changing filter cloths. The inner surfaces of all piping connections and of the pressure tank are coated with acid-resisting paint. The locking device on head of pressure tank is designed to facilitate opening and closing of the press giving an air-tight joint, thus making it possible to put through a number of tests in an afternoon, using variations in pressure, thickness of cake formed, density, and temperature of pulp treated, amount of wash water, etc. Cakes ranging in thickness from ⅛ to 1¼ in. have been made in this press. A study of a wide variety of filter mediums is possible, owing to the ease with which the filter frames can be removed from the tank, stripped of their filter cloths and different material substituted.

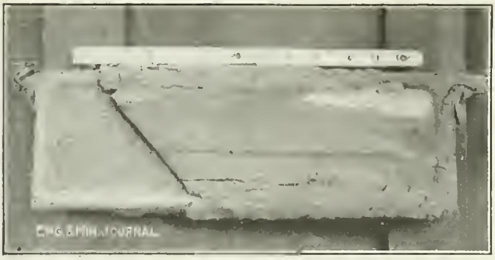

Fig. 2. Leaf from Laboratory Filter Press, Showing Cake 1 In. Thick

Fabrics tested at the school include asbestos, different weights and qualities on canvas, woolen cloths for acid work, burlaps, fiber-cloth, sheetings and byproduct paper pulp.

Another application of the press is in connection with the zinc and aluminum-dust precipitation of pregnant solutions from cyanide work. The pulp is first filtered and washed in the press and the clear filtrate after agitation with the dust is returned to the montejus and forced into the pressure cylinder, containing one leaf covered with heavy filter paper.

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Zirconium Dioxide Crucibles

Crucibles prepared from zirconium dioxide (mixed preferably with 1% of dry starch and 3% of magnesia), and fired first at 1450° C. and then at 2200° C., were found to be almost impervious and to resist a temperature of over 2200° C. in the vacuum electric furnace. They were successfully employed in determining the boiling point of pure iron, etc., and for fusing tungsten alloys, according to Ruff, Leiferheld and Bruschke, *Zeit. anorg. Chem.*, p. 389, 1911.

Assaying Cobalt Ores

According to C. St. G. Campbell, of Cobalt, Ont., th all-fire scorification assay is now used exclusively by th Campbell-Dyell mill (*Bull.* Can. Min. Inst., February 1911), the assay being corrected in nearly the same manner as a bullion assay. It has been found that this correction offsets the losses by slag and cupel absorption, anc by volatilization, and allows for impurities in the resulting silver bead. In this way the assay is made mor standard than is the case when direct methods are used It is usual to obtain a commercial result by deducting a fixed percentage from this corrected or actual assay, this percentage being acceptable to both buyer and seller.

In the pulp assay, 0.1 a.t. of pulp is scorified in a 2¾-in. scorifier with 50 to 60 grams of test lead, resulting in a lead button of about 20 to 30 grams. One assay is made on each of the four packets of each sample sent from the sample room, making sixteen pulp assays for each shipment (four to each of four samples). The lead buttons are brought to a uniform weight with lead foil and cupelled at a medium temperature. The cupels are made of bone ash, strengthened with a little pearl ash water.

For the metallics assay, when possible, four charges of 0.1 a.t. are taken; often, however, there is not sufficien quantity for this. Whatever the amount, it is divided into at least two charges, scorified and cupelled in the same manner as pulp.

Correction to Assays

A pilot is first run using 0.1 a.t. plus 100 mg. of pulp. This results in a bead which is calculated to represent about the same amount of silver as is actually in the 0.1-a.t. charge. Similar weights of proof silver are then weighed out, one for two assays.

These "proofs," as they are called, are then scorified and cupelled at the same time in the same muffle as the assays which they control. The losses and increments which the proof bead suffers being practically the same as in the assay bead. The difference between the weight of the proof silver taken and the weight of the resultant proof bead is added to the weight of the assay bead as a correction, resulting in the corrected pulp assay. The metallics are corrected in the same manner.

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New Method of Determinin Potassium

The solution containing only the alkalis as chlorides (about 0.05 gram of K_2O) is evaporated on the water-bath, the residue dissolved in the smallest possible quantity of water, and the solution treated in the cold with an excess (20 c.c.) of a 2% alcoholic solution of tartaric acid, which has been stirred at intervals for several days with solid potassium bitartrate and then filtered (*Chem. Zeit.*, pp. 585 and 615, 1911). After the precipitation from 10 to 20 c.c. of 96% alcohol saturated with potassium bitartrate are added, and the liquid boiled for about 10 min. on the water-bath. It is then left (with frequent stirring) for 24 hr., after which the precipitate is collected in a weighed gooch crucible, washed first with the saturated alcohol and then with pure 96% alcohol, dried at 80° C. and weighed as potassium bitartrate. The results are in close agreement with those given by the platinum-chloride method.

The Men and Machinery of the Comstock

By G. W. Dickie

SYNOPSIS—The "Bonanza" days of the Comstock lode, in the '70s, produced a demand for heavy mining machinery, usually wanted at very short notice. The men who produced this machinery and who were instrumental in the development of the vast orebodies, are interesting figures in the history of machine building. Their machines, many of which have never been surpassed as to size, are monuments to the skill and courage of those pioneer designers. The author was intimately connected with a works making this machinery and his personal experience, together with anecdotes of the men he met and worked with and recollections of the mechanical difficulties to be overcome, give a vivid picture of the life of the day. This article will be followed by others giving more detailed descriptions of the work.

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During the past 20 years, I have often been asked to write about the men and machinery of the Comstock during the decade from 1870 to 1880, which period embraces the "Bonanza" times. At the close of my connection with the Union Iron Works, in 1905, I began to arrange my notes bearing upon the work done during the exciting times of the '70s and had prepared the skeleton of such a history. The notes collected at that time were lost in the great disaster that overtook San Francisco in 1906. This calamity not only deprived me of the means of doing justice to this subject, but deprived me of so much else besides that the leisure I had hoped to devote to this and kindred matters was just as effectively destroyed as the other things.

It was a notable group of men who were doing the engineering work for the mines, the steamships, and such other work as had to be done in San Francisco when I first saw the Golden Gate and the city that lay beyond it. The manner in which I first came in touch with these men may be of interest. I had been about two months in San Francisco, having come direct from Scotland with little beyond good health and a fair training in marine-engineering work. Times were rather dull and I was seeking for something better than working in the shop, so I kept watching for something that I could use as a stepping stone to reach what I was after. One day I noticed an advertisement in the papers for an expert engineer on gas works to take charge of the construction of the new city gas works, for which the Risdon Iron Works had the contract. If there was such a man in San Francisco, he was invited to interview Mr. Joseph Moore, the superintendent of these works.

Somehow I got the idea that I was the man they wanted, but before showing myself, I went to the Mechanics' Institute Library, got all the works they had on the construction and operation of gas works, studied the subject enough to be familiar with the names and usage of the various parts that entered into the construction of a modern gas plant of that day, and on the third day, with my head full of gas and the names of all the things necessary for its manufacture from coal, I presented myself at Mr. Moore's office and told him that I was the gas expert he had advertised for. He asked me what I knew about gas works? Then I started from the setting of retorts, the hydraulic main with its dip pipes, the scrubbers, the purifiers and all the things between them, and, when I got through, he was convinced of his good fortune in meeting just the man to carry out their contract.

Getting Too Good a Reputation

The work was carried out successfully, in fact the reputation I made as a gas engineer became somewhat embarrassing, as about the time the gas works was completed, the Pacific Mail Steamship Co. decided to fit their steamers with surface condensers. Mr. Waddell, their superintending engineer, was talking the matter over in the Risdon Iron Works office with Mr. Moore and both were wondering where they could possibly find a man familiar with surface condensers to take charge of this work for them. When Mr. Waddell had departed, I suggested to Mr. Moore that they put the work in my hands. "That would never do," said he, "you're a gas engineer. We must get a marine engineer who has had experience in designing surface condensers."

Feeling that I had reached the end of my career as a gas engineer, I made a complete confession of the trick I had played upon them and at once took charge of their marine work.

This has nothing to do with the men and machinery of the Comstock Lode, excepting that it was part of the way by which I was drifting into connection with the men who were designing such mining machinery as was then being built in San Francisco for the gold and silver mines on the Pacific Coast.

Here I think it proper to take a look at the iron works in operation at San Francisco in 1870 and what facilities they had in brains and tools for the work they were to be called upon to accomplish within the next five or six years. The Union Iron Works, under the firm name of H. J. Booth & Co., later Prescott, Scott & Co., had their works on the corner of First and Mission Streets. This was the oldest iron works in the city. The original owners, James and Peter Donahue, began business in a blacksmith and machine shop in a tent on the beach, where Montgomery Street now is, in 1853. The Donahues were men who saw beyond their little shop and soon began to be a factor in all the activities of the city and its harbor. They built the first gas works the city had. Their business soon required permanent quarters and they built substantial shops on the corner of First and Mission Sts.

The Newer Union Iron Works

First James and then Peter Donahue retired from the works to attend to their individual interests, which had become quite extensive. At this time new blood came into the Union Iron Works. George W. Prescott, who had been operating a foundry in Marysville furnishing

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Note—Published simultaneously with the "American Machinist."

machinery for the mines of that district, became the head of the works on First and Mission St. He had as his leading men Irving M. Scott and his younger brother, Henry T. Scott, and, on the retirement of H. J. Booth, the firm became Prescott, Scott & Co. These three men were a splendid working team, the real engineer being Irving M. Scott.

In the big things that were soon to be done on the Comstock Lode, I. M. Scott, in conjunction with W. R. Eckart, whom he had associated with him in designing the machinery required to meet the new problems which were arising, took, from the first, a leading position. The ability of these men was not only known but keenly felt by me, for whatever skill I had soon came to be set up against theirs, in deciding what was to be done and who should do it. While these battles were sometimes hard enough, the friendship we had for each other was never wounded, and, after the Comstock work was all over, Mr. Scott did not rest until I had become associated with him in other big things that the Union Iron Works had to do. I. M. Scott was not only an able engineer; he was a big man, a fine citizen and San Francisco owes much to him, both in material and moral advancement.

The Risdon Iron Works in 1870 was on Howard St., extending from Beale to Main St., and at that time was engaged in the building of mining machinery. It also had the most of the marine work, not only in repairs, but engining the vessels built by the Dickie Brothers. I have already narrated how I became attached to the Risdon as their engineer, which position I held until 1883, a period covering the Bonanza times on the Comstock. Joseph Moore, the general manager, was a master in mechanics, a man of strong will and untiring energy. He had gathered about him the best mechanics in San Francisco at this time.

Making Iron Pipe to Carry 900-Lb. Pressure

Mr. Moore had given much study to the manufacture of the riveted piping required for the hydraulic mines, which were then in full blast where high-pressure water was available. Pipes had sometimes to be constructed to work under a 2000-ft. head where deep ravines had to be crossed. In the case of the Cherokee pipe line, some 14 miles in length, under construction when I joined the Risdon Works, the diameter of the pipe was 30 in. At one place this pipe had to stand a head of 2100 ft., say 900 lb. per sq.in., and at this place the pipe was of ⅝-in. plate.

At that time no high-grade steel was available and the plate iron used had a tensile strength of 46,000 lb., so that the working load was considerably over 23,000 lb. and the factor of safety less than two to one, yet no breaks occurred in this pipe line during the 10 years it was in operation. A large proportion of the pipe lines of the Spring Valley Water Co., which supplies San Francisco with water, consist of riveted pipe supplied by the Risdon Iron Works.

Mr. Moore designed special tools for the manufacture of this wrought-iron pipe, consisting of automatic punching machines that punched both edges and both ends of the plates at the same time, the movement of the table carrying the plate being effected by a cam. The table was fed a little beyond the pitch, while a weight attached by a chain and controlled by a rack at each side of the table brought it back to the correct pitch.

The racks were carefully made for each size of pipe and for the inside and outside courses, so that many racks had to be carried in stock. Usually five or six holes were punched on each side or each end of the plate at each movement of the table. The accuracy of the punching by this method was a wonder to me, until I found an old Scotch draftsman in the drawing room, whose business it was to see that the racks were properly made and accurately computed for the work they had to do. When I became acquainted with Mr. Blackie and watched his method of figuring, my wonder ceased.

Hydraulic riveting machines were designed to meet the capacity of the punching machine and the rolls, whether the rivets were driven hot or cold; they were fed automatically. The wrought-iron pipe was finished in lengths of 28 ft., so as to be readily shipped on the railroad cars. The lengths were dipped in hot asphaltum before being shipped.

The Rival Firms

These two establishments, the Union Iron Works and the Risdon Iron Works, built most of the machinery for the Comstock Lode. There were, however, other firms that were all more or less doing work for the mines. Among these was the Golden Gate & Miners' Foundry on First St. Mr. Angel and Mr. Palmer were at that time the owners of this concern. They did a safe, conservative business and were both leading men and officers in the Presbyterian church on Howard St. Notwithstanding their safe methods of doing business, they once made a mistake that hurt both themselves and their church. Having built a quartz mill for a customer, who thought he had a great mine and was able to make Messrs. Angel and Palmer think the same, stock in the mine was taken in payment. Their church, at that time, was in need of help and the two foundrymen elders, hoping to do something handsome for the institution, presented it with a lot of this stock, but even with the blessing and prayers of the church, nothing worth milling came out of the mine. The stockholders had to pay assessment after assessment and the church was almost ruined by the benevolence of the Golden Gate & Miners' Foundry, and no one regretted it more than Mr. Angel and Mr. Palmer, who were both fine men.

The Fulton Iron Works, on Howard at Fremont St., at the time of which I am now writing, was also doing considerable work for the mines. The proprietors of this establishment were Messrs. Hinkley, Spears and Hayes. Mr. Spears was the engineer of the firm, a Scotchman and an able mechanic. After the death of Mr. Spears, the business of the Fulton Works did not prosper and it was finally closed.

The Pacific Iron Works, on First St., was also doing a good deal of mining work and, during the Comstock days, did work as subcontractors for the Union Iron Works, when their orders were too numerous to handle. The Pacific Works, however, did no original designing for any of the big machines on the Comstock. That was all done either by the Union Iron Works or the Risdon, and these two establishments were credited by those who knew something of the conditions prevailing at the time, as being the engineers in fact for the two groups of financiers that controlled the mines on the Comstock.

The Union Iron Works had the first chance on any new machinery required by the quartet known as the

"Bonanza Kings," Mackey, Fair, Flood and O'Brien, while the Risdon Iron Works had first chance with what was known as the "Bank of California Crowd," Sharon, Ralston, Harmon and Requa. The Bonanza crowd usually had control of the mines on the north end of the Comstock Lode, while the Bank of California Crowd usually had control of the south end mines.

The two men at Virginia City who were supposed to be the engineers responsible for the machinery installed in the various mines were W. H. Patten, for the work done for the Bonanza crowd; and I. F. Thompson, for the work done for the Bank of California Crowd. These two men became prominent factors in the installation of the heavy machinery built for the Comstock between the years 1872 and 1878. When developments took place in any of the south end mines requiring something in the way of hoisting or pumping works beyond what had been done before, Mr. Thompson would be at the Risdon Iron Works next day with the problem that had to be solved, and we would at once get all our thinking capacity centered upon its solution. Plans would be started at once, showing in a general way the direction our thoughts were taking.

Specifications would be prepared as the plans became visible and, by working far into the night, in a few days plans, specifications and estimates would be ready, the estimate being liberal enough to provide for all contingencies. Then, without loss of time, the directors of the mining company interested would meet, Mr. Thompson would present the plans as his solution of the problem to be met, with the specification and estimate from the Risdon Iron Works, which he would recommend as reasonable under the circumstances, and, as time and stockholders were pressing, the usual course was to order the work. Next morning we would be busy with the details and the cylinders and bed plates would be in the pattern shop before final details of valve gear and connections were decided upon. Should the problem be at the other end of the Lode, Mr. Patten would have gone through the same program with the Union Iron Works.

Close Rivalry for a Contract

Sometimes the securing of a contract was not such a sure thing. An outside mine might be ambitious to have a big plant like those on the Comstock Lode, then there would be competition of brains as well as of influence. Toward the close of the Bonanza period, the Eureka Consolidated of Nevada people had an idea that if they could reach the depth of the Comstock mines there would be a chance of opening up a great body of ore. So the directors determined to reach the 2000-ft. level and that as soon as possible. New and large pumping and hoisting works would be necessary, as the plant they already had would reach its limit at 1200 ft. They invited the Union and Risdon Iron Works to present plans and specifications of what they should have and they stipulated that these plans should be presented to their board of directors at 10 o'clock in the morning on the sixth day from the date of their invitation. Next morning, Irving M. Scott and myself were on the train bound for Eureka, Nev., and, as luck would have it, we had the same section in the sleeper. All the way up we chatted pleasantly together for we were good friends, even during the time we had to fight each other. At Eureka we went over the mine together, taking notes of all the conditions, but neither of us by word or sign giving any hint to those in charge of the mine or to each other what we thought of the problem. On the way home we talked of everything except what we were thinking of.

I had, however, telegraphed from Eureka, to have our chief draftsman, a Mr. Sherholtz, one of the quickest men I ever knew at getting an idea on paper in presentable form, to be at my house on the evening of my arrival at 6 o'clock with plenty of paper and his instruments. We arrived on Friday evening at 5 o'clock and the directors of the Eureka Consolidated were to meet at 10 o'clock on Saturday morning in the Nevada Bank building. I had been thinking it over on the train and before reaching home had my plan decided upon. Mr. Scott was, no doubt, equally prepared. At about 7 o'clock in the evening my man and I went to work. While he worked on the plans, I worked both on the specifications and the estimate. At seven o'clock in the morning we were both ready for business.

Dodging the Other Fellow

Just before 10 o'clock I walked leisurely down Pine St. and turning the corner at Montgomery, my eye caught George W. Prescott's back as he walked in front of the main entrance of the Nevada Bank building. This convinced me that Scott was not ready and that Mr. Prescott was watching for me to enter that he might ask for a delay till Mr. Scott appeared. Turning back to Kearney St., I went from there through the old California Market to the rear door of the Nevada Bank building and got into the building that way. I found the directors of the Eureka Consolidated already in session and, as they were ready to take the matter up, I at once unfolded to them my plans and specifications, explaining the advantages of the hydraulic system I had adopted, and by 11 o'clock they were ready to consider the cost. This I was ready for and I had a contract which I handed to Judge Hydenfeldt, president of the company. He pronounced it satisfactory and remarked that as the Union Iron Works had not put in an appearance, he would consider a motion to either adjourn or award the contract to the Risdon. They decided to award the contract, which was duly signed, and, as I was folding up my papers, I. M. Scott came rushing in with his plans, just five minutes late. That was the only time I got the better of Mr. Scott—it was generally the other way.

Mining Reconnaissance of Northern Brazil

By Henry C. Carr*

There is, at the present time, no country so thoroughly unknown as the northern part of Brazil, especially that part north of the parallel 15° S. It is more of a *terra incognita* than darkest Africa. I have had the good fortune to make a trip of about six months' duration in the northern states of Ceara, Piauhy and Maranhao, and this article is written regarding those three states.

With the exception of a few insignificant mountain ranges (the highest point in northern Brazil being 3000 ft.), these three states are one large plateau with an average elevation of 70 m. above sea level and with the highest part of the plateau 470 m. This plateau contains absolutely none of the precious metals, although at a place called Borracho Fonda, about 100 miles east of Therezina, in the state of Piauhy, there is an extinct crater, with numerous fumaroles, and in the district small diamonds may be found by panning. Probably if shafts were sunk in this crater, commercial diamonds would be found.

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*Mining engineer, care of Lindon Bates, 71 Broadway, New York.

On the Atlantic coast of the state of Piauhy, I was shown samples of galena. It was high grade so far as lead content was concerned, but low in silver, 5 to 10 oz. This ore occurs in the Devonian limestones of that region and is worthy of investigation. On the boundary line between the state of Maranhao and Para, are some low-lying mountains, or rather hills of schist. There are three rivers flowing from south to north in this region, called the Turyassu, Guajahu and Gurupy. Ever since the first colonists arrived in Maranhao (San Luiz), some hundreds of years ago, they have been receiving gold from the Turyassu; this gold comes from the Indians there, and what I saw was comparatively coarse and not rounded. I should judge that the Indians pound up these schists and small quartz veins, and pan the gold. It is high grade, running $19 per oz. Up to date it has been impossible to go into this Turyassu country on account of the hostility and savagery of the Indians, but if the receipts of gold at Maranhao and Para from this region are any criterion, then there must be considerable deposits there, but whether commercial or not, I do not know. The only way to explore that region would be for an armed party to go there with the consent of the Brazilian Government.

Transportation in Brazil is the simplest problem. It contains more navigable rivers than any other country on the globe. To go to the districts mentioned, the traveler takes a Booth line boat to Para. From there he can get a first-class boat of the Lloyd Braziliero to Maranhao, and then return to Turyassu by schooner (90 miles), or he can wait at Para and get a regular coasting steamer which stops at all these places along the coast. Food is hard to procure in the interior, and the traveler should make up his mind to be content with beef, rice, beans and farina solely. Bread and vegetables are an unknown quantity. The climate is perfectly healthy half a mile away from any river, and it is only in the Amazon region that the jungle is continuous. In the rest of Brazil, the country is entirely similar to our plains country in the western part of the United States, but with many more shade trees. Away from the rivers, also, there are no mosquitos, and even on the rivers they cannot compare for quantity and viciousness with those in the mining district of Canada and British Columbia. Neither did I see a snake of any kind, nor a poisonous insect. There possibly may be the same insect life in Brazil as there is in Mexico, but I did not see it.

In conclusion, I will say that northern Brazil, in my estimation, does not hold out any inducements to the prospector, with the possible exception of the Turyassu and the limestone hills in northern Piauhy. The Piauhy natives are obliging and courteous, also exceedingly lazy, and no dependence can be placed on them from the labor standpoint for any length of time. Possibly the climate militates against continuous hard labor. Steamboat fares up the rivers and along the coast are high, but what food can be bought in the interior is ridiculously cheap. The advantages to come from northern Brazil are from rubber, hardwood, cattle and cocoa, and anyone with a small amount of capital and a large amount of industry can easily accumulate a fortune there. I might say also, that these three states produce the finest cotton in the world. Trees are planted every seven years and produce a very fine long staple cotton, which is shipped to Portugal and Liverpool.

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Pig Iron Production in 1914

The Bureau of Statistics of the American Iron & Steel Association has collected and published the statistics of production of pig iron in the United States for the half-year ended June 30, 1914. The statement is as follows, compared with the two previous years, the figures being in long tons:

	1912	1913	1914
First halfyear.	14,072,274	16,488,602	12,536,094
Second half-year	15,654,663	14,477,550	....
Year	29,726,937	30,966,152	

The production for the first half of 1914 shows a decrease of 1,941,456 tons, or 13.4% from that of the second half of 1913; and of 3,952,508 tons, or 23.6%, as compared with the first half. The make for the half year was the smallest since the second half of 1911. The maximum production reached in any one year was in the 12 months from July 1, 1912, to June 30, 1913, when 32,143,265 tons were made.

Classed by fuels used in the first half of this year, 12,260,020 tons of iron were made with coke; 74,800 tons with coke and raw bituminous coal mixed; 55,612 tons with coke and anthracite mixed; 1895 tons with anthracite alone; 145,767 tons with charcoal. The charcoal iron includes a small quantity of iron and ferroalloys made in the electric furnace.

The production of pig iron by grades is reported as below, in long tons:

	1913		1914
	First Half	Second Half	First Half
Basic	6,510,011	6,026,682	5,010,647
Bessemer	6,127,048	5,146,247	4,247,464
Low-phosphorous	158,918	157,900	130,634
Foundry	2,834,821	2,279,807	2,377,610
Ferrosilicon	46,181	59,534	76,930
Malleable	482,702	510,834	383,139
Forge pig	182,877	141,536	197,483
Spiegeleisen	56,856	53,482	36,939
Ferromanganese	54,387	65,108	49,215
Miscellaneous	34,607	36,420	26,033
Total	16,488,602	14,477,550	12,536,094

Miscellaneous includes white and mottled iron, direct castings, ferrovanadium, ferrotitanium and other alloys. Basic pig in 1914 was about 40%; bessemer and low phosphorus, 35%; and foundry 19.5% of the total.

The forms in which the pig iron made in the first half of 1914 was delivered is given in the following table, comparison being made with the first half of 1913:

	1913		1914	
	Tons	%	Tons	%
To steel furnaces, molten	9,069,845	55.0	6,536,668	52.1
Sand cast	3,685,512	22.3	2,734,975	21.9
Machine cast	3,246,964	19.7	2,862,674	22.8
Chill cast	480,503	2.9	38,247	3.1
Direct castings	5,778	0.1	7,530	0.1
Total	16,488,602	100.0	12,536,094	100.0

Of the pig iron made in 1914, a total of 8,468,388 tons, or 67.6%, was made for the consumption of the manufacturers in conversion into steel or other forms; while 4,067,756 tons, or 32.4%, were made by merchant and other furnaces for sale. A comparison will show that 77.2% of the steel furnace pig was delivered in molten form to mixers, converters or openhearth furnaces.

In the half-year there were 275 stacks in blast for all or a part of the six months. The number in blast on June 30, 1914, was 208, of which 189 used coke or bituminous coal, 5 anthracite and 14 charcoal. The total number of completed furnaces on the same date was 457; there were three new furnaces in course of erection and 13 being rebuilt. These furnaces will have a capacity when finished of 505,000 tons of iron yearly. During the half-year five furnaces were abandoned or dismantled, their total capacity being 200,500 tons yearly. This shows a net gain of 304,500 tons in producing capacity.

⁂

"Radium Starvation"

The New York *Evening Sun* prints the following sane comment on the radium situation:

> There is some talk now of pressing the Foster radium bill through Congress as an emergency measure. The war in Europe is apparently to be used as the final and conclusive argument, and we are warned that if the bill fails to pass the whole world will suffer horribly for want of radium. The British railways were taken over by the Government as soon as war was declared, so why, argues one disinterested enthusiast, why in the world should not our Government take over the whole radium industry and nationalize it? People are dying by the thousand of cancer and Congress has hitherto done nothing at all to help them. Now if only it make haste, pass the Foster bill and put the whole business in the hands of Government officials think what wonders they could work in the way of saving lives!
>
> "Radium for the people" is an inspiring cry, if only we knew exactly what it meant. We hear a great deal about the country facing "radium starvation," about the impossibility of securing radium at any price on account of the great foreign demand; but what bearing the war has on all this it is not easy to see except that it is manifest that the exportation which the enthusiasts are so fond of lamenting will be checked while the war lasts. Nor is it by any means obvious that the Government would work the business more economically than it is worked to-day. It is true that Mr. Lane last year delivered himself of a great deal of rhetoric, but he failed to show any deep knowledge of the subject and his arguments gave the unfortunate impression that he had been coached by persons not quite so thoroughly disinterested as himself.
>
> Why the Government should take over this particular industry more than another it is very hard to tell. We can readily understand why some deserving persons would be glad to see a Government radium bureau established, and we have no doubt that it would supply plenty of welcome jobs. But apart from that there is no apparent reason why the Government should meddle in the matter at all. If it were not that popular excitement had been industriously and skillfully worked up and the merits of radium grossly exaggerated by interested persons no one would ever have dreamed of supporting so preposterous a measure.

⁂

Orsk Goldfields, Ltd.

At the annual meeting of the Orsk Goldfields, Ltd., in London, recently, the chairman reported that the total gold output for the 1913 season amounted to £48,933, of which £3740 was produced by tributers. The operating cost for the two dredges, including payment to tributers and winter upkeep of the plant, amounted to £15,109, leaving a gross working profit of £33,823; but the Russian administration charges, royalty, depreciation and interest on loans brought the net profit down to £679, according to the London *Financial Times*. This company operates two dredges in eastern Siberia. One, the Kolchan, is an 8-cu.ft. Empire all-steel dredge, electrically operated, power being supplied from the Lake Chla plant, which uses wood for fuel; the other dredge, now known as the Pokrovsky, has 3½-cu.ft. buckets and is operated by steam.

The conversion of the Pokrovsky dredge was one of the interesting features of this company's operations. Digging was originally begun with a drag-line excavator, which delivered into a sluice. Washing in this way proved unsatisfactory and the so called "stacker-scow" plant was then built, the drag-line excavator delivering into washing equipment erected on a scow, which was also equipped with a swinging stacker so that tailings could be delivered as from an ordinary dredge. The stacker-scow plant was found expensive to operate, and was shut down on Oct. 8, 1912, to be remodeled into the steam-driven dredge, known as the Pokrovsky.

The expenditure of about £13,000 in the conversion of the stacker-scow plant into a 3½-cu.ft. dredge was considered justified by the reduced operating expense of the new Pokrovsky dredge. The total cost of operating the dredge in 1913 was £4243, while that of the stacker-scow during the previous season was £4268, the yardage handled being 117,500 and 68,645 cu.yd., respectively. Thus the working cost of the dredge was 17.5c., as against 30c. per cu.yd. for the stacker-scow plant.

The converted Pokrovsky dredge began operation on June 28, 1913, and continued until Nov. 13, a period of 139 days, during which time 117,500 cu.yd. of gravel were washed, which yielded gold to the value of £15,464, an average of 63.8c. per cubic yard.

The Kolchan dredge commenced operating on May 8, 1913, and continued until Nov. 13, a period of 190 days, as against 174 days in 1912. During the 1913 season, 382,800 cu.yd. of gravel were treated, recovering gold to the value of £29,727, an average of 38c. per cu.yd. as against 32c. in 1912. Tributers were allowed to work portions of Kolchan and Pavlovsky creeks, where the ground was inaccessible to dredging and not rich enough or extensive enough to warrant a company in undertaking independent operations.

On account of the financial position of the company, the directors reduced their fees by £125 (the remuneration according to the articles of association being £250 per annum) and a further saving of £150 per annum was effected through obtaining the consent of the technical adviser of the company to cancel his contract; office rent has been reduced £200 and the company's responsible agent in Russia has reduced his fee by £100 per annum. The question of dispensing with the imported staff altogether during the winter months, when the dredges are shut down, was considered, but it was found that it would be more costly to bring the men in again at the beginning of the following season than to retain them on the property during the winter months doing necessary repair work. Moreover, owing to difficulties of transport in the early spring, the staff would not be able to reach the mine in time to commence dredging operations at the opening of the reason, and this would curtail an already too short dredging season.

As regards the current season's work, the chairman announced that the two dredges began work about the end of April and up to the middle of July had dug 256,200 cu.yd., yielding gold to the value of £13,490. More tributers are at work this season. While the dredges are working in lower-grade ground in 1914, a much greater yardage is expected to be handled. W. H. Lanagan is in charge of the Siberian operations.

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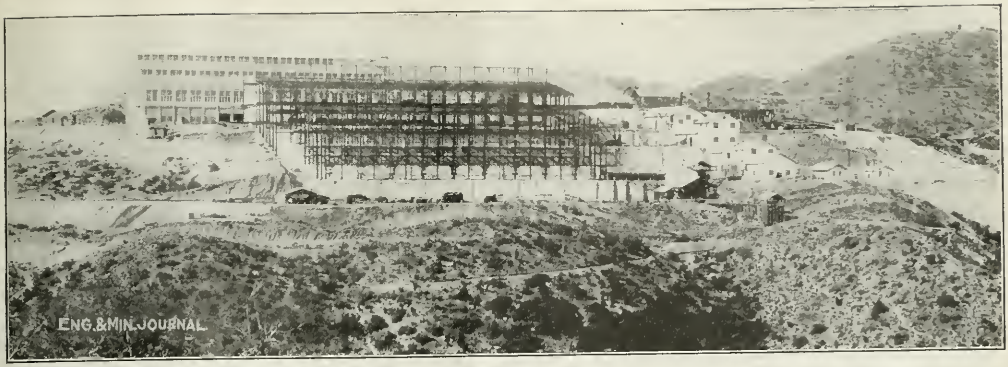
The Phosphate Rock Marketed in 1913 was 3,111,221 tons, according to the U. S. Geological Survey, of which 2,055,482 tons was pebble rock from Florida, 489,79[illegible] tons Florida hard rock, and 451,559 tons Tennessee rock.

Photographs from the Field

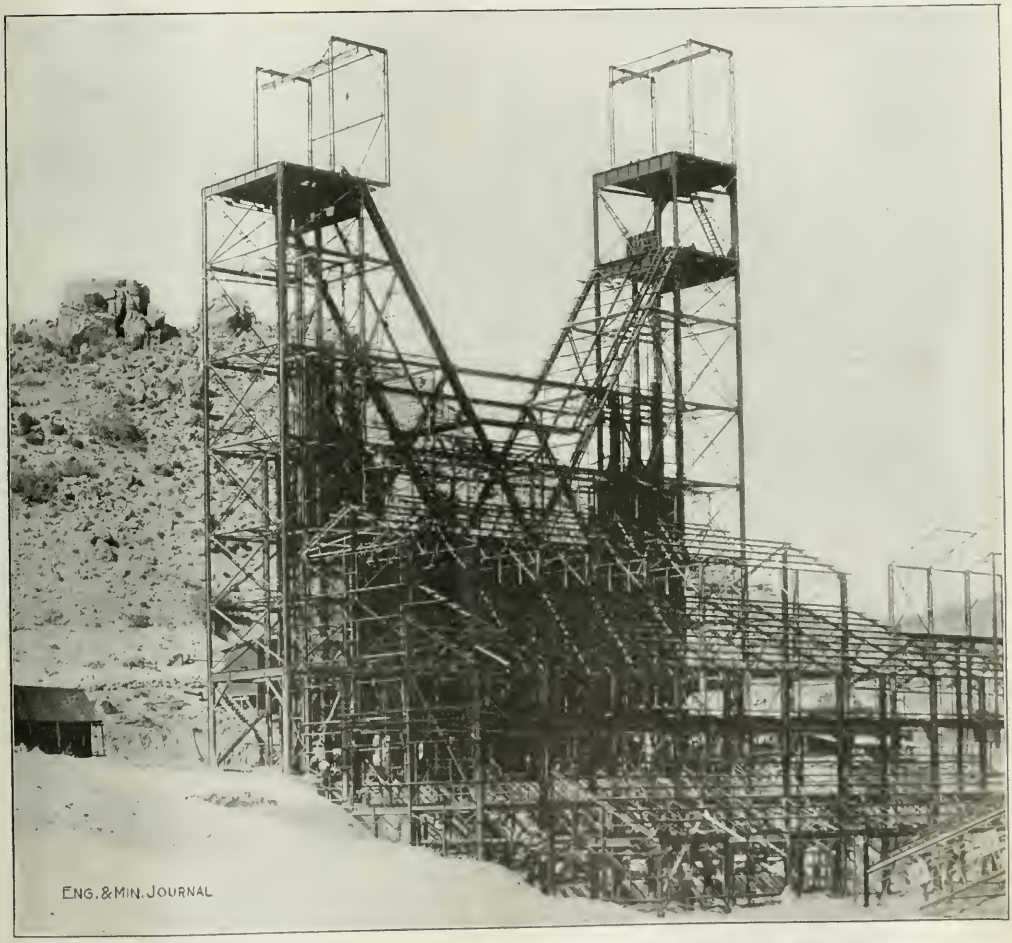
The Golden Cycle Mill, Colorado City, Colo.

Portal of the Newhouse Tunnel, Idaho Springs, Colo.



CONCENTRATOR, TEST MILL AND SHOPS OF INSPIRATION COPPER CO., MIAMI, ARIZ., FROM BELOW

In point of tonnage developed Inspiration is the sixth largest copper mine in the world, and the fifth largest in this country



THE TWO MAIN HEADFRAMES AND CRUSHING PLANT, INSPIRATION COPPER CO.

These two shafts will be operated from the same hoist house, but will be independent units, capable of raising 7500 tons per 14-hr. day

Correspondence and Discussion

A Comparison of the Huntington-Heberlein and Dwight-Lloyd Processes

In view of Mr. Norton's many favorable words for the Dwight-Lloyd process in general, I hope it may not seem ungracious if I question some of his arguments. I am particularly interested in his comments on the smelting of the two classes of product, because his views do not seem to coincide with those generally held by metallurgists who have had experience in this special line. I shall therefore give more attention to the smelting of the sinter than to the sintering operation itself, though I shall add a few brief comments on that subject too.

As Mr. Norton very truly says, there have been many preconceived notions as to what the Dwight-Lloyd process could or could not do, some of which have been proved to be erroneous by later developments in practice. This is probably true of all new processes. In this present case, the limitations of the process have been found to be wider and its flexibility actually greater than its sponsors ever allowed themselves to claim for it.

Mr. Norton and his assistants have worked out their own special sintering problem in an admirable manner, and the same may be said of many other plants, each with some local feature that gives the problem an individual interest. Through all these variations, however, the same general rules hold true, which if followed will yield good results, or quickly show the desirable limitations, while if transgressed or ignored, will surely defeat the purpose in view. These general principles have been discussed before and will not be repeated here.

I am at somewhat of a disadvantage in this discussion by reason of the evident impropriety of my publishing operating data of any of the Dwight-Lloyd licensees without having previously obtained permission, so that the facts I may present must be more or less impersonal. Perhaps the metallurgists themselves may be interested to tell their own story. Mr. Norton's chief argument is directed against the idea that the Dwight-Lloyd sinter is any better material for the blast furnace than the Huntington-Heberlein product. He supports this by citing two experimental furnace runs, as follows:

(a) Record of one five days' run of the Murray furnaces in August, 1912, wherein a single furnace, smelting Dwight-Lloyd sinter, showed slightly poorer reduction than the other four furnaces smelting Huntington-Heberlein product.

(b) Record of another run of two days in the same month and year, which showed that three furnaces smelting Huntington-Heberlein product developed an average speed of seven tons per furnace day (2½%) higher than the two furnaces smelting Dwight-Lloyd sinter.

Mr. Norton evidently does not take much stock in the arguments based on theoretical advantages of Dwight-Lloyd sinter, due to its physical condition, open structure, large surface of contact with the reducing gases, intimate mixture of slag-forming ingredients, etc., so I shall not attempt to rehearse any of them. Instead, I will advance some facts selected as typical from a wide field of practice which has come under my observation, with some suggestions and explanations.

Reducibility

(a) To discuss a furnace record like that quoted by Mr. Norton for the five days' run in August, 1912, is manifestly difficult for an outsider, but a possible explanation for the poor reduction on Furnace No. 5, smelting Dwight-Lloyd sinter, may lie in the fact that both sets of furnaces carried the same fuel charges. Other things being equal, if 11½% coke was right for the furnaces smelting Huntington-Heberlein product, it was too much for the furnace smelting Dwight-Lloyd product, as I shall endeavor to show later, and incipient overfire, accompanied by higher lead in slag and matte, was induced. It may sound like a paradox to say that excessive fuel sometimes produces poor reduction, but it is a sad fact.

In certain plants where practically the entire charge to the blast furnaces receives a preliminary treatment by being sintered on the Dwight-Lloyd machines, the peculiarities of this problem have had to be carefully studied, for serious metallurgical difficulties presented themselves when the charge was first made up of Dwight-Lloyd sinter in large quantities. Some of these plants had blast-pots before they had Dwight-Lloyd machines, and many opportunities were afforded for comparative study of this point. There is reason to believe that, due to the long period of blowing and the higher temperatures developed in the pots from greater mass action, the iron in the Huntington-Heberlein product is present chiefly as Fe_2O_3, perhaps in the form of ferrites, while in the Dwight-Lloyd product the iron is present as FeO. The fuel charge in the blast furnace must be so proportioned as to meet exactly the chemical and thermic requirements of reduction and melting. If any of these functions have been performed before the material enters the furnace, a corresponding allowance should be made or the fuel balance will be disturbed, and bad work will result.

One of the functions of the coke is to reduce enough metallic Fe for the matte requirements, leaving the remainder of the iron as FeO to go into the slag. In smelting almost any other material than Dwight & Lloyd sinter, the iron must be reduced from the higher oxides, Fe_2O_3 or Fe_3O_4 to the protoxide, FeO, before a true comparative basis is reached. Experience has shown that with about one-half Dwight-Lloyd sinter on the charge, the coke should be cut about 10%. This figure has been

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Note—This is a discussion of W. W. Norton's comparison of the Dwight-Lloyd and Huntington-Heberlein processes, read at the Salt Lake meeting of the A. I. M. E., and it has also been sent to the Institute.

reached by experiment, but the following calculation explains its reasonableness: As a fairly average case, let us assume 100 tons of blast furnace charge, of which 50% is Dwight-Lloyd sinter carrying 16% Fe, present as FeO instead of Fe_2O_3. 16% of 50 tons = 8 tons Fe as FeO. To reduce this 8 tons Fe from Fe_2O_3 to FeO would require 0.857 ton fixed carbon or practically one ton good coke, assuming the reduction is accomplished by the agency of CO gases (an assumption that is probably not realized in lead-smelting practice). However, on that assumption, the saving in coke will be close to 1 ton of coke in 10, or 10% of the coke required for smelting ordinary ore, or Huntington-Heberlein product.

This theoretical benefit is borne out by the practical blast-furnace results on a large scale in numerous plants. In fact, wherever this important factor is ignored the evil symptoms of excessive fuel will be indicated, one of which symptoms is a diminished furnace speed with tendency to over-fire, and as every metallurgist knows, this is likely to be accompanied by poor reduction in slags and mattes, especially if the mechanical features of the problem, such as size of lumps and distribution in the furnace, have not been correctly adjusted. This general fact has been quite convincingly proved, at least to my own satisfaction, by the numerous cases where I have been called upon to observe difficulties and recommend remedies in connection with the growing use of Dwight-Lloyd sinter in smelting operations. It may be confidently stated that some changes in furnace adjustment are necessary to get the best results out of Dwight-Lloyd sinter in the blast furnace, but an intelligent study of the problem will yield fruitful and economical results.

To put the matter tersely, and emphasize the important point I wish to make, the successful smelting of Dwight-Lloyd sinter not only *permits* of economy of coke, but actually *demands* it.

FURNACE SPEED

(b) In the furnace record of Aug. 12 and 13, 1912, when the furnaces smelting Dwight-Lloyd sinter ran a trifle slower than those with Huntington-Heberlein product, it is to be noted that the former carried 580 lb. iron ore on the charge, while the latter required 1140 lb. iron ore, indicating that the Dwight-Lloyd sinter was itself high in iron. It is well established that a basic sinter does not smelt as fast as one in which the proper proportion of SiO_2 and FeO for the slag is approximately maintained. This may or may not be the reason in this case, but it is worth mentioning.

The following figures were furnished me some time ago as giving the comparison of average furnace speeds in a certain plant where the character of the charge sent to the blast furnace was gradually improved by the introduction of modern methods of preliminary treatment. The furnaces in question were 48x162 in. (54 sq.ft.) at the tuyeres, and the averages were taken over considerable periods of time:

	Average Tons Smelted per Furnace Day	Tons per Sq.Ft. Hearth Area per Day
(1) With Brückner roaster product....	180	3.3
(2) With Huntington Heberlein product	200	3.7
(3) With H. & H. product and ore fines largely removed by screening...	227	4.2
(4) With Dwight & Lloyd product and ore fines largely removed by screening	285	5.3

Case 4 shows a gain of 25% over Case 3.

In another Western plant, the addition of Dwight-Lloyd sinter to the charge increased the furnace speed from 140 tons per day to 175 tons per furnace day, a gain of 25%. In still another case, the increase was from 180 tons to 210 tons, an increase of 17%.

Mr. Norton expresses his belief "that a partly fused" or "predigested" combination may tend to poor results rather than good results when smelted, for the reason that such substances fuse at too low a temperature in the furnace. I fully recognize this as a possibility and indeed a probability, when Dwight-Lloyd sinter is treated without due regard to its properties, but I positively assert that such tendency can be quickly and easily met with no change from ordinary standard furnace equipment, and with distinct fuel economy, as has already been pointed out.

A pertinent citation on this point is the experience of a smeltery superintendent who had to carry a considerable amount of leady converter slag on his charge. He was much troubled by premature fusion of this ingredient until he discovered recently that by crushing it and adding it to the charge of his Dwight-Lloyd sintering machines he was able fully to control this tendency, and is now regularly following this practice.

SULPHUR RANGE AND ELIMINATION

The general experience has been that higher initial sulphurs can be handled by the Dwight-Lloyd than by the pots. This is to be expected from the smaller mass under treatment at one time and the mechanical means for rapidly abstracting the heat as it is developed by the oxidation of the sulphur. As an example, one plant figures its Dwight-Lloyd charges between 12 and 14% sulphur, and its Huntington-Heberlein charges for direct conversion at 10 to 11% sulphur.

There are many data available to indicate that the Dwight-Lloyd is at least as thorough in sulphur elimination as the pots, with a far greater efficiency per unit area of plant.*

The Huntington-Heberlein plant at Murray has about double the capacity of the Dwight-Lloyd plant. The operating cost per ton is necessarily influenced by this fact. If the costs were corrected to an equivalent basis, the small difference in favor of the large Huntington-Heberlein plant would probably be more than wiped out. Without going into details, it may also be said that a true comparison should include all the peritinent items, such as interest on investment, depreciation, etc., which would unquestionably throw the balance in favor of the Dwight-Lloyd. In this connection, I wish to say that the Dwight-Lloyd process is most distinctly on its mettle at Murray, for Mr. Norton has worked out the Huntington-Heberlein process to an extraordinary degree of perfection, and his practice in that department justly ranks among the best.

As Mr. Norton says, the Dwight-Lloyd machines have to handle the very fine material that the pots cannot treat. In many plants, this includes also the fines from the pots. In other words, the machines have to do the dirty work, because they can; but it is only fair to ask how the figures would be affected if the Huntington-Heberlein pots had to take their share of the very fine material.

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*"Efficiency in ore roasting," A. S. Dwight, "School of Mines Quarterly," Nov., 1911.

Lead Losses

Mr. Norton does not attempt to present any conclusive data on this point. As the volatilization is influenced largely by the temperature, and the time the charge is subjected to the heat and air currents, the advantage ought theoretically to be with the Dwight-Lloyd, for in that process a given particle is undergoing the heat treatment about as many minutes as it is hours in the Huntington-Heberlein pot. Investigations of lead losses have been made by various plants, some of which will probably be published some day; meantime, it can be stated that while it is possible to establish conditions which will make a Dwight-Lloyd machine into an efficient lead burner, it is not *necessary* so to do, and the lead losses should be less than with the pots. As an example, in one plant under my direct observation where pots have been entirely superseded by Dwight-Lloyd machines, the lead loss was about 3% in the pots and is now about 0.75% as the average over a period of two years with the machines.

Arthur S. Dwight.

New York, Aug. 21, 1914.

Erroneous Results from Angle-Hole Drilling

In the Journal, July 4, 1914, Frank A. Glass writes on "Erroneous Results from Angle-Hole Drilling," referring the reader to diamond- and churn-drilling operations in the Cuyuna iron-ore district of Minnesota. Mr. Glass states that angle-hole drilling has no place in a large part of the Cuyuna district. His citation of a case involving what he claims a loss of nearly $100,000 I know is what prompted him to write the article. He makes of it a case of the tail wags the dog. His article also contains some serious mis-statements and important conditions are omitted, which, if duly considered, would modify his conclusions. Inasmuch as I have been responsible for the drilling of at least 90% of all the angle holes drilled in the district, I feel disposed to make a few brief statements to clarify the situation.

From the article as written, readers have difficulty in following Mr. Glass' distinctions and in determining whether he is arguing for or against all diamond drilling, or angle-hole drilling in general, or diamond-angle-hole drilling in ore, especially in their wider application. The three are involved in his article and citation. I maintain they are all important and desirable, each in its place, and are not always beset by constant dangers and risks, as he maintains.

In the money loss cited by Mr. Glass, the question of the real value of the ore enters, and his loss should not be charged against the drilling. In addition, better judgment should have been displayed by the original lessees drilling the angle holes on that property when they saw that their first angle holes recovered little or no samples. I am familiar with the property for I subsequently directed the later drilling for the new lessees.

In discussing Cuyuna ores and orebodies, it is necessary to consider separately the northerly and southerly portions of the district. Locally, these portions are known as North and South Ranges. Conditions are materially different from several standpoints, enough so to influence the plan of explorations. Mr. Glass' deductions are based on the drilling of a North Range property. Probably 95% of all the angle holes in the district are on the South Range. Everywhere drilling operations are now at low tide, and little drilling has been done on the South Range for two years, although it embraces twice as much, or more, explorable land than the North Range. These being the facts, because the boilers are cold and the drills off, Mr. Glass curiously enough concludes and states that "angle-hole drilling has been practically abandoned in favor of vertical drilling." There is a large amount of drilling to be done on the South Range, and there the structural conditions alone virtually demand angle-hole drilling, diamond or churn.

On the South Range, the ore formation is narrow, finely bedded and steeply inclined, dipping at an average of 80° or more, and apparently has little cross-folding. In many deposits there is a southward dip of 80° at one end and a northward dip of 80° at the other end, passing through the vertical at about the middle. Under these conditions, angle holes are decidedly preferable. Disintegrated chert is absent, and quartz veins are relatively immaterial, hence present obstacles neither in sampling nor in drilling. Vertical holes are here likely to follow a single bed, and even where they do cut across several beds they can be but few in number, and such a hole cannot give the amount of information that one angle hole would which necessarily cuts across nearly all of the many beds. Further, angle holes involve a smaller expense in the long run.

On the North Range there are also steep dips but the prevailing dip of the formation averages about 60°, and much less in individual deposits, due to greater amounts of folding in a wider formation than on the South Range, and cross-folding. In flatter deposits vertical drilling is proper, but its application does not bar angle-hole drilling from all other places, nor even make it undesirable. Mr. Glass failed to make even these few distinctions and overlooked the relative amounts of exploration areas applicable to different drilling methods.

His statement that "the orebodies frequently contain vugs and seams of pulverulent disintegrated quartz" requires modification; for it applies only to parts of the North Range and not at all to the South Range. His main point as to this material is its contamination of drill samples, but he overemphasizes this feature because he ignores the fact that this material is absent in most places in the district, being purely local. Further, since the drillers have learned how to explore such ground, this powdery chert has been causing them but little trouble. I know of properties on which even vertical churn-drill holes had trouble in such ground.

Mr. Glass should not condemn diamond drilling *in toto*. Hard seams, generally the lower-grade ores, must be diamond drilled. If diamond drilling is otherwise objectionable, it should be used only for hard seams. Too often the drill runner continues with the diamonds after the hard seam is cut, because of the ease of the drill operation, regardless of the difference resulting later in the chemistry.

I fully recognize the fact that some angle holes have had difficulty in treacherous ground, but so have vertical holes, churn or diamond, and there have been more of the vertical than the angle holes in trouble.

Carl Zapffe.

Brainerd, Minn., July 17, 1914.

Editorials

Mine Accident Prevention

There is in the United States Senate at the present time a legislative situation which, from the standpoint of the mine operators, needs attention. If strong men from the Western mining states would address personal letters to their Senators on this subject, undoubtedly much good would be accomplished. The situation is as follows:

Last March there passed the House a bill (H. R. 10,735) creating a new safety labor bureau under the Secretary of Labor (W. B. Wilson), the language of which is such that that bureau can take over practically all of the safety work of the Bureau of Mines in relation to the mining, metallurgical and other mineral industries. It was not expected that this bill would be reported favorably by the Senate Committee on Education and Labor, but it was recently reported favorably, and is now on the Senate calendar for final passage, and if it passes the Senate will undoubtedly become a law. What makes the matter still more serious is the fact that into the bill making this year's regular appropriations for the Bureau of Mines, the following clause was introduced just before its final passage, viz:

"Nor shall any part thereof (of the $100,000 appropriation for metal-mining work) be used for work authorized or required by law to be done by any other branch of the public service."

This item in the appropriation act, together with the broad general inclusive wording of the act establishing the new Bureau of Labor Safety, taken together, would make it impossible for the Bureau of Mines to hold the safety work in metal mines and metallurgical works; and the result would be that all that work would soon be turned over to a bureau which is not interested broadly in the mining industry, but only in labor matters.

If the men of the mining industry feel that they would like to coöperate in holding this safety work of the mining, metallurgical and mineral industries in the Bureau of Mines, they can contribute materially toward the accomplishment of this purpose by writing individual letters to the senators from the Western mining states, stating to these senators that they deem it wise that this work should remain with the Bureau of Mines, and that if the Bureau of Labor Safety bill passes, it should pass with an amendment that will insure the continuance of such work in the Bureau of Mines.

The most important work of the Bureau of Mines up to this time has been in its study of safety questions. Let it be noted that all that the Bureau of Mines, or any other Washington bureau, can accomplish is educational results. The actual enforcement of safety rules is a matter for the individual states and will remain so until there is a change in the Federal constitution. The function of the Bureau of Mines is to furnish technical data that will be a guide to the several states in enacting their legislation. In the studies of the staff of the bureau, there are continually being developed questions of technical practice respecting which existing knowledge is found to be inadequate. In such cases it is the duty of the bureau to fill the gap, and as rapidly as possible it is doing so. To deprive the Bureau of Mines from attending to such studies and to transfer them to another bureau would make a mess of things.

The advocates of H. R. bill 10,735 apparently think that the measures to be taken to promote safety in mining are purely the formulation and enactment of such rules as the men employed in mines may think proper. They are wrong. To be right it would have to be assumed that the drill runners, muckers, etc., who work underground in the mines know more than the engineers who direct them. We may say authoritatively that a committee of engineers of the Bureau of Mines, which has been studying this problem for many years, has found itself constantly baffled by the imperfection of knowledge respecting many important branches of its subject. The fact is that modern methods of mining have introduced many new conditions, leading to new hazards, the nature of which is not yet fully understood by anybody. The Bureau of Mines is studying these and while it is doing so it should be let alone.

*

Henry Pauly

The U. S. Commission on Industrial Relations, which is touring the country to learn the causes of industrial unrest, or more specifically the grievances of the workingmen, is hearing a lot of nonsense, but now and then something illuminating and refreshing, such as Cornelius F. Kelley, vice-president of the Anaconda Copper Mining Co., told it in Butte a few days ago. Mr. Kelley is now a learned lawyer, a brilliant executive and a polished and accomplished man of the world, but this was all of his own doing, he having begun life as a plain miner. The commission certainly should have recognized his competency as a witness.

In Seattle a few days ago, the commission appears to have had to listen to an uncommon stream of wild opinion, diluted with piffle, but it brought to light a remarkable character in the form of Henry Pauly, which made its session well worth while. We will tell the story of Henry Pauly in the words of the special correspondent of the New York *Evening Post*:

> Pauly is an unskilled, itinerant laborer. He has worked in lumber camps and on railroad construction. He told of some of his experiences, which he said were typical of what the itinerant laborer faces as a regular thing. . . .
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> Last winter, when unemployment was at its worst in Seattle, Pauly organized the unemployed into "The Itinerants' Labor Union" or "The Hoboes' Union of America." He secured an old hospital building, for which the Central Labor Council agreed to pay the rent, and opened it up as a lodging house for the unemployed. The scheme was ridiculed and the building facetiously dubbed "The Hotel de Gink." Pauly was determined, however, in spite of opposition, that he would find a way of tiding these men over. He advertised for work. He sent squads of men out to clean up vacant lots. For others he got work at the commission houses, where they sorted potatoes and took in payment "seconds," which the men carried back to their lodgings. He sent out squads of men

to clean up butcher shops and markets, whenever he found opportunity, and took second cuts of meat in payment.

In the same way he got the bakeries to supply him with stale bread. Where an old building was being torn down, he got an opportunity to cart off the lumber that was not usable. In this way he supplied the house with fuel during the winter. As soon as it was possible, he began to get contracts for clearing stump land. People said that the unemployed did not want work. Pauly sent a gang of men out to clear some land, who worked more than a month in the rainy season, absolutely without shelter. Pauly would not admit to the place any man who was unwilling to work, and yet he cared for more than 2000 men during the winter.

Pauly has visions now of getting his men permanently on to the land. He hopes to get a contract for clearing land, where plots of land may be taken in payment. "That's the thing that will settle this employment question," said Pauly, "and settle it for all time."

We take off our hat to Henry Pauly and wish him more power to his elbow. May his field of usefulness be broadened and may he be honored as a constructive citizen who has set an example.

Successful Failures

It is a well recognized fact that one learns as much or more through failures as through successes. In spite of the thousands of mistakes that are being made every day in the engineering profession, we hear little or nothing of them, and consequently lose wonderful opportunities to acquire valuable information. It is an easy matter to make mistakes, but it is by no means easy to derive the maximum benefit from them. An engineering mistake which will cost thousands of dollars may easily be made by a careless person, whose first impulse is to cover up both the error and its results, thereby hiding from himself and the world at large a lesson from which much benefit might have been derived.

Large sums of money have been sunk in underground exploration and so called development work. It is easy to bury money and mistakes underground where no one can ever find them. Most of the big mistakes have been effectually covered up, so that even if the maker learned a profitable lesson through them, the world at large lost it. The same is true in metallurgical processes, although these are so open and the processes are so clearly defined that a disastrous mistake will be discovered and announced unless a combination of all the wise ones can be maintained to promote secrecy. The latter contingency is by no means unknown, and contemporary operators may easily remember a great error in mill operations which concerned not only one plant, but a large number of them operating in the same locality, and which wound up in a large loss of money and great disappointment to those financially interested in the properties. A union of the operators succeeded in keeping the basis of the loss secret, so that although they profited by the mistake themselves, the rest of the world did not, and still might, at any moment, fall into the same error.

It takes a large amount of moral courage to make public the reason and results of a mistake in engineering, and we may hardly expect engineers in general to show it, although it would be the most informing and conclusive method of information open to operators of the present day. If some famous engineer would describe a serious mistake he had made, giving the facts, the reasons leading up to the step, and its eventual results, he would deserve a monument to his bravery; and in addition, he would have contributed more to the successful solving of future problems than all the men who write only of successes, saying nothing of the failures that naturally occur in everybody's career. It would be, in fact, a successful failure. We have no great hope that the desire for this sort of information will be satisfied, but we have the desire, nevertheless.

Gold Production in 1914

At the present time, when there is an extraordinary demand for gold throughout the commercial world, it is of interest to consider what new supplies are likely to be available. The accompanying table shows the production for the first half of 1914 in those countries from which accurate figures are attainable.

	1913	1914	Changes
Transvaal	$95,917,502	$84,475,127	D. $11,442,575
Rhodesia	6,950 549	8,222,877	I. 2,272,328
West Africa	4,216,577	4.048.261	D. 168 316
Total Africa	$107,084,628	$96,746,265	D. $10.338,363
Australasia	25 027,758	24,581.274	D. 446,484
British India	5,943,845	6,108,171	I. 164,326
Total	$138,056,231	$127,435,710	D. $10,620.521

These countries from which we have regular and reliable monthly returns produced in 1913 about 58% of the entire gold output of the world. For the half year their total loss has been 7.7%, which was chiefly due to the heavy decrease in the Transvaal. For the remaining gold producers, which furnish no periodical returns, such indications as we have do not point to any considerable changes except in Mexico, where the output must have been light. Allowing for this and also taking into account the fact that no new producing districts of any importance have been opened during the year, it appears probable that the world's output of gold in the first half of 1913 was somewhere between $215,000,000 and $220,000,000, probably at least $15,000,000 less than in the first half of last year.

The prospect is that this loss will hardly be made up in the second half of the year. While none of the great producing regions—even in Russia—are directly affected by the war conditions now prevailing in Europe, there will be much indirect influence exerted. Thus in the Transvaal and Rhodesia there may be difficulties in the way of securing supplies and new machinery needed; as for instance, the supply of cyanide, to which some reference was made in our columns last week. Other reasons may be found in a diversion of men from the mining industry and the general disarrangement of business.

It appears probable therefore, so far as can now be foreseen, that the current year's gold production will be appreciably below that of its predecessor—quite possibly the smallest for several years.

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A noteworthy feature of the last month has been the complete disappearance of the friction between Washington and the business interests of the country and also of the criticism that Washington by preference sought incompetent advice. The problems which heretofore have divided us have been those which economists treat in their chapters on the distribution of wealth. Since the calamity, the questions of distribution have faded into insignificance, the one great problem having become the creation and preservation of wealth.

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Some of the articles that we are now publishing read rather strangely in view of recent events, which have changed all thoughts, all conditions, and have had a far-reaching effect upon the mining industry. Of course, they were written before there was any suspicion of the catastrophe that was coming. We are confident, however, that a restoration of the conditions of civilization is coming in due course of time, and in the meanwhile it will be best for everybody in this country to continue to think about the things concerned with constructive industry that were previously engaging their attention.

BY THE WAY

The luxury of war is about the only one that will be indulged in for some time to come. Diamonds will not be so valuable as food to many people, and the South African diamond-mining companies are seeing the light. A. Reuter's agency cables from the Kimberley says: "It is officially announced that owing to the financial collapse in London, the De Beers company is closing down the local mines for the time being. The company is making arrangements for supplying all white employees with rations until operations are resumed, while steps are being taken for the immediate repatriation of the natives." Similar announcements in respect of the New Jagersfontein and the Premier diamond mines are expected.

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The decision of the directors of some of the Rand mines to postpone *sine die* the payment of dividends, has brought forth a flood of letters from stockholders, some plaintive, some abusive and some merely indicating bewilderment. One correspondent imagined that the reason for withholding dividends was the impossibility of remitting them to Continental shareholders. As a matter of fact, the chief reason, according to the London *Financial Times* is the moratorium. The directors of all the companies concerned are absolutely in the hands of their bankers, and without the consent or assistance of the latter it is obviously impossible for dividends to be paid. In some cases tens of thousands of pounds are on deposit with the banks, the necessary proportion of which was due to be transferred to current account in time for the cashing of the dividend warrants. But in the ordinary course the banks have lent out this money, and as clients claim the benefit of the moratorium to postpone repayment, the banks have obviously had to do the same thing. In other cases the gold has been sold to banks in South Africa against drafts on London which will under the moratorium not be honored until the bullion arrives in England, or until special arrangements can be made. Company directors who had been indolent enough or careless enough to leave money on deposit where it was not earning interest for shareholders, might easily be at an advantage just now over their more energetic or careful rivals in being able to render available sooner the money necessary to pay out dividends. Directors are doing their utmost to render the delay in payment as short as possible. With the banks now reopened it is quite conceivable that when the new currency arrangements are found to be working smoothly facilities may be granted for the paying of dividends.

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The following letter from our regular correspondent in Germany is interesting in several ways. It was dated July 30, and reached us on Aug. 24. We had instructed Mr. X to go to Cologne to obtain information about a new roasting furnace of which we had received some interesting reports. Mr. X wrote: "The weather being distressingly wet and cold, forbidding any excursions, I left Clausthal-Zellerfeld yesterday at 1:08 p.m., reaching Goslar in a drenching rain at 3:26 p.m. There I took the 4:07 express train for Cologne, arriving here punctually at 10:17 p.m. This morning I proceeded to the office of the . . . gesellschaft m. b. H., and sent in my card to the manager. I was admitted into the presence of this august personage, who, on learning my business, informed me that he had no authority to impart any information about the . . . roaster for publication and that the only person who had discretion to do so was the technical manager who was just off on his summer vacation. He, himself, was only managing commercial matters and was not conversant with the technical part of the business. After some conversation, he showed me a prospectus of the roaster. I asked him if he would not let me have that, as it was evidently intended for distribution among interested persons. He replied that it was printed for private circulation and distributed confidentially only. After some hesitation, he consented, however, to let me have a copy on the promise not to publish anything that would benefit the competitors of this roaster. Contrary to German custom, he did not tell me his name, and that of his technical coordinate I did not catch as it was mumbled in a low voice."

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Will the Government Purchase Silver?

The Washington correspondent of the *Journal of Commerce* reports that the Smoot bill, directing the Secretary of the Treasury to purchase 15,000,000 oz. of silver passed the Senate Aug. 22 by a vote of 29 to 11. Senators Burton, of Ohio, Norris, of Nebraska and Weeks, of Massachusetts, protested. Senator Burton characterized it as the worst form of "special interest" legislation. As introduced the bill required the Secretary to purchase 25,000,000 oz. of the metal. The finance committee cut the amount to 15,000,000 oz.

Senators from silver-producing states insisted that the European war had made it impossible for them to sell silver abroad and that unless the Government purchased the product of the mines it would be necessary for most of them to shut down, which would affect not only the mines which produced silver but those in which lead and copper are the chief products and in which silver is a by-product.

The bill provides that the Secretary shall purchase and hold the silver bullion for the subsidiary coinage and that he shall buy at a price not exceeding the average price at which silver sold between Jan. 15 and July 15 of the present year.

At a conference between Secretary McAdoo and Senator Smoot of Utah, Mr. Smoot learned that the Dutch government had applied to the Treasury Department about the purchase of a large quantity of silver bullion. Secretary McAdoo referred the Dutch government to the American Smelting & Refining Co. The bill has yet to go to the House.

PERSONALS

G. A. Joslin, of Los Angeles, is making examinations of mining property in San Bernardino County, Calif.

C. R. Corning has been in Chile. He expects to arrive home in New York in about two weeks from this time.

Henry H. Armstead has returned to New York from Mexico, where he has been on a business trip for six weeks.

Ludwig Vogelstein, of L. Vogelstein & Co., who has been for some weeks past in Germany, has returned to New York by way of England and Canada.

D. L. H. Forbes, Toronto, Ont., has been appointed chief construction engineer of the Chile Exploration Co. After Sept. 1 his address will be at Chuquicamata, Chile.

Ralph Arnold, of Los Angeles, Calif., has been examining lands in the Flathead country, southeast Kootenay, owned by a British Columbia company, and believed to be oil bearing.

Prof. Alexander MacPhail, of the Queen's School of Mining, Kingston, who is Major in command of the Queens Engineering Corps, has volunteered for service in the European war.

C. S. Verrill, of Vancouver, B. C., has been assisting A. G. Larson, who was employed by the Department of Mines of British Columbia to make an investigation of the ore production probabilities of Franklin camp.

Dr. C. W. Drysdale, of the Geological Survey of Canada, has completed his work in Rossland camp, British Columbia, and has gone to Ymir, in Nelson mining division of West Kootenay, to study the ore deposits of that camp.

Sir William Mackenzie, president of the Canadian Northern Ry., has returned to Toronto from England, where he was arranging for a loan to be guaranteed by the Canadian Government, negotiations being terminated by the outbreak of the war.

A. B. Emery, recently at Zacatecas, Mexico, has been appointed general manager of the Messina (Transvaal) Development Co., Ltd., and will have charge of the copper mines at Messina, Northern Transvaal. He is now on his way to his new charge.

Frank E. Pearce, formerly of Baker City, Ore., who was last year in charge of development work at the Inland Empire mine, in the western part of Trail Creek mining division, B. C., is now directing development work on the Pingree, in Nelson division.

N. H. Emmons, 2d, has recently been examining mines in Taos County, N. M., for some Seattle people. Mr. Emmons, who was until recently Superintendent of Mines of the North Butte Mining Co., is visiting his brother, Dr. Arthur B. Emmons, 2d, at Knollwood, Dover, Mass.

J. D. MacKenzie, of the Geological Survey of Canada, and Prof. V. Dolmage, of Columbian College, New Westminster, B. C., are reported to have been injured by an explosion of gas at an old coal prospect at the southern end of Graham Island of the Queen Charlotte group, British Columbia. Prof. Dolmage was spending a vacation with Mr. MacKenzie, who was studying the coal deposits of Graham Island.

Thomas Graham, of Victoria, chief inspector of mines for British Columbia, while attending the mine-rescue and first-aid demonstration held at Seattle, Wash., on July 22 and 23, under the auspices of the United States Bureau of Mines, acted as judge of the contests in the mine-rescue events. At the request of the committee, E. Jacobs, who was also a visitor from Victoria, was official scorer throughout the two days' meeting, which was attended by more than 50 competitors in the various events and numerous friends from different parts of the state.

SOCIETIES

American Peat Society—From 75 to 90 delegates met at Duluth, Minn., Aug. 20, for a three-day convention. In the absence of President George N. Hoff, New York, Vice-President Carl G. Kleinstuck presided. A number of delegates from various European countries were scheduled for addresses, but none was able to be present. A large display of peat and peat products was assembled in the rooms of the Duluth Commercial Club, where the convention met.

On Aug. 21, as guests of the railroads, the delegates made a trip over the Mesabi iron range by special train, at t same time inspecting various peat deposits in the vicini In the course of an address, the vice-president of the socie Mr. Kleinstuck, of Kalamazoo, Mich., stated that the G man Government has long recognized the value of peat connection with the tempering of steel, and that the Krup use nothing but peat coke for tempering armor plate. Pr Peter Christiansen, of the University of Minnesota, spoke "The Possibilities of Peat in the Beneficiation and Smelti of Iron Ores," wherein he favored locating the power pla at the peat deposit, generating electrical current for tran mission and thereby eliminating the transportation cost. discussed the recently perfected process of burning peat powdered form, as it is now being used for locomotive firi in Sweden, and stated that such material is easily adaptab to the firing of cylindrical furnaces used for drying, roas ing or calcining. He stated that if peat could be made in a coke of sufficient hardness, there appeared to be no reas why the composition of such coke would preclude its u for smelting purposes. In such an event, the Minnesota ir ranges would have their own fuel supply right at their do in many instances even on their own property. Much tin was given to papers relating to briquetting problems ar to the agricultural possibilities of peat bogs.

TRADE CATALOGS

National Transit Co., Oil City Penn., Bulletin No. 10 and 1 16 pp. Illus. 9x6 inches.

E. E. White, Ishpeming, Mich. Price list of the Maa Patent Drill Hole Compass.

Electric Weighing Co., New York, N. Y., Bulletin No. Messiter Conveyor Scales. 18 pp. Ills. 9x6 in.

Titan Storage Battery Co., Newark, New Jersey. Catalog Titan Storage Batteries. 32 pp. Illus. 11x8¼ inches.

The John Simmons Co., 110 Center St., New York, Catalog The Klein Boiler Circulator "Kebec." 8 pp. Illus. 6x3 inches

The National Tube Co., Pittsburgh, Penn. "National Bulletin No. 13A. Second Edition, 12 pp. Illus., 11x8 inches

Traylor Engineering & Mfg. Co., Allentown, Penn. Bulletin. Anaconda slime concentrator. 16 pp., Illus., 7x9 inches.

Chicago Pneumatic Tool Co., Chicago, Ill., Bull. No. 34 W Class A-O "Giant." Fuel Oil Engines. 16 pp. Illus. 9x inches.

The American Rolling Mill, Middletown, Ohio, Catalog Defeating Rust. The Story of Armco Iron. 44 pp. Illus. 9x inches.

The Marion Steam Shovel Co., Marion, Ohio. Catalog No 91. "Stripping Coal with Economy & Speed." 40 pp., Illus. 5x7 inches.

Sprague Electric Works, 527-31 W. 34th St., New York Bulletin No. 48901. Electric winches and winding drums. 1 pp., Illus., 8x10½ inches.

Colorado Iron Works Co., Denver, Colorado. Catalog 12-P. Some Details as to Smelting Practice and Equipments. 160 pp., Illus., 9x6 inches.

Chicago Pneumatic Tool Co., Chicago, Ill. Bulletin No. 34-N. Class N steam and power driven inclosed compressors, 16 pp., Illus., 6x9 inches.

The Denver Engineering Works, Denver, Colo., Bulletin 1063, Isbell Concentrator, 10 pp. Illus. 11x8 in. Bulletin 1069, Richards Pulsator Riffle, 8 pp. Illus. 11x8 inches.

The Electric Storage Battery Co., Philadelphia, Penn. Bulletin No. 146. The "Ironclad-Exide" Battery for Storage Battery Locomotives. 18 pp., Illus., 10½x8 inches.

National Tube Co., Frick Bldg., Pittsburgh, Penn. "National" Bulletin No. 10C. 24 pp. Illus. 11x8½ in. This is the fourth edition of bulletin 10 and contains four papers on the subject of corrosion.

INDUSTRIAL NEWS

The George D. Whitcomb Co. has taken over the storage battery locomotive business of the C. K. Davis Manufacturing Co. of Detroit.

The John Simmons Co., 110 Center St., New York, has taken over the manufacturing and selling rights of the Klein Boiler Circulator "Kebec" and has established a new department under the personal direction of Paul M. Klein.

The new illustrated catalog, No. 214, of the Hess Flume Co., 2166 15th St., Denver, describes the flumes, meters, gates, culverts, pipe, valves, etc., handled by this company. Illustrations of many flume installations are shown, and descriptions of approved types of wood and steel substructure, side hill construction and ditch lining are given. The book is attractive and instructive.

Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin. Catalogo ilustrado Nu. 100, 180 paginas, 10½x8 pulgadas; catalogo ilustrado, Nu. 103, 128 paginas, 10½x8 pulgadas. El Nu. 100 contiene descripciones de maquinaria para beneficiar metales como quebradoras, trituradores para muestras, elevadores, tambores o cribas giratorias, sacamuestras, baterias de mazos, concentra doras y aparato para la cyanuracion, incluyendo remoledores tubulares, aparato por sistema "Dorr," tanques agitadores, sistema "Parral," filtros-prensas, y notas de todas piezas refacciones. El Nu. 103, trata de toda maquinaria y accesorios para calcinar, fundir y convertir metales, especialmente minerales de plomo y de cobre.

INDUSTRIAL NEWS

Corrigan, McKinney & Co., of Cleveland, Ohio., have let a contract for building two additional blast furnaces to the Vanity Iron & Steel Works Co., of Cleveland.

The Terry Steam Turbine Co. announces that it has appointed Fidanque Bros. & Sons, of New York and Panama, with main office at 15 Whitehall St., New York, as its representatives for the Republic of Panama and the Canal Zone. On Aug. 1 its Cleveland office was moved to 503 Union Building.

The Westinghouse Electric & Manufacturing Co. reports the receipt of the orders from mining companies for the following machinery: An aggregate of 2715 hp. of motors; three 8-ton and one 4½-ton locomotives; one 75-kw. motor-generator set; 1756 kv.-a. of turbo-generators; four switchboards; 3726 kv.-a. of transformers; two 16-kw. motor-generator sets, and one 1001 kv.-a. waterwheel generator.

The Lyons Atlas Co., of Indianapolis, Ind., has recently completed and shipped the largest Diesel engine constructed to date in this country. This is a four-cylinder engine, 21-in. bore by 30-in. stroke, of the vertical, four-cycle type, rated at 600 brake horse power with an overload capacity of 15%, or 690 horse power maximum. It was sold to the Hawaiian Commercial & Sugar Co., and is intended to supersede one of its steam plants for irrigation purposes, to be direct-connected to a two-stage turbine pump of 15,000,000 gal. capacity at 200 ft. head. The conditions covering the acceptance of the engine were: The engine must operate continually 710 hr. out of each 720 hr. per month at rated load, using the ordinary 14° to 18° asphaltum-base California fuel oil, which is the only grade available on the Islands. The engine was given a preliminary, continuous run of 48 hr. with eastern paraffin-base fuel, after which it was subjected to a 144-hr. continuous run at full load with California oil. At the completion of this run the combustion chambers were examined, and as there was no evidence of deposit on the heads, valves or pistons, the engine was accepted.

The Traylor Engineering & Manufacturing Co., of Allenown, Penn., has recently furnished for J. Buckland a large slag-crushing plant having a capacity of 300 tons per hour. This plant will crush iron-blast furnace slag from the Bethlehem Steel Co.'s dump, and will supply crushed slag for ballast and concrete work, in place of the customary stone. One of the special features of the plant is an extra heavy 54x36-in. set of rolls, having corrugated faces. The slag will be loaded by steam shovels and taken to the crushing plant in special cars. The Traylor company has also shipped a set of heavy-duty "AA" 42x16-in. crushing rolls and accessories to the Royal Basin Mining Co., of Montana; a 60x30-in. all-steel jaw crusher, three sets of 42x18-in. "AA" rolls, screens, conveyors, etc., for the St. Louis Smelting & Refining Co.; a 60x30-in. all-steel crusher, 48-in. and 60-in. trommels, 20 ft. long, and miscellaneous equipment for Mine La Motte; a gyratory crusher for the Piedmont Construction Co.; Blake crushers and "A" rolls for the Park City Milling Co.; rolls for the Honduras Trading Co.; a 1600-ton crushing plant for the Quebec Brick Co.; a 60-in. Blake crusher and overhead cableway for the Amalgamated Asbestos Corporation; a set of crushing rolls for the Sulphur Mining & Railroad Co.; also an 84x60-in. Blake crusher for the Johns-Manville Co.; this is one of the largest crushers ever built and weighs over 500,000 lb.; it will be used in the Quebec asbestos quarries.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ARSENIC AND ANTIMONY—Extraction of Arsenic or Antimony from Ores Containing the Same. Harold Allman Lewis and Frederick Glyn Price, Cobalt, Ont.; said Price assignor to said Lewis, Oruro, Bolivia. (U. S. No. 1,104,810; July 28, 1914.)

ASSAY BALANCES—Base for Assay Balances and the Like. Wilfrid Heusser, Salt Lake City, Utah. (U. S. No. 1,104,969; July 28, 1914.)

BALANCE. Wilfred Heusser, Salt Lake City, Utah. (U. S. No. 1,104,892; July 28, 1914.)

BLAST FURNACES—Device for Utilizing the Off Gases from Blast Furnaces for Preheating the Blast. Joseph Etienne Prégardien, Cologne, Germany, assignor to Fritz Neumann, Aachen, Germany. (U. S. No. 1,105,158; July 28, 1914.)

CLASSIFIER—Hydraulic Classifier for Separating Sand and Slime. Wilton E. Darrow, Sutter Creek, Calif. (U. S. No. 1,106,630; Aug. 11, 1914.)

CONCENTRATING TABLE. Edmund B. Kirby, St. Louis, Mo. (U. S. No. 1,105,912; Aug. 4, 1914.)

CONCENTRATOR—Dry Concentrator. Lewis A. W. Johnson, Los Angeles, Calif. (U. S. No. 1,105,977; Aug. 4, 1914.)

CONCENTRATORS—Process of Operating Ore Concentrating Tables. Edmund B. Kirby, St. Louis, Mo. (U. S. No. 1,105,799; Aug. 4, 1914.)

CRUSHER—Gyratory Crusher. John McInrue, Chicago Heights, Ill., assignor to Chalmers & Williams, Inc., Chicago Heights, Ill. (U. S. No. 1,106,333; Aug. 4, 1914.)

CUPROUS CHLORIDE—Process of Reducing Cuprous Chloride. Frederick Laist, Anaconda, Mont. (U. S. No. 1,104,907; July 28, 1914.)

CYANIDING—Process and Apparatus for the Extraction of Pregnant Cyanide Solutions from Pulp. Edson S. Pettis, San Francisco, Calif. (U. S. No. 1,106,836; Aug. 11, 1914.)

DRILL—Percussive Drill. John George Leyner, Denver, Col. (U. S. No. 1,106,332; Aug. 4, 1914.)

ELECTRIC FURNACE. Ernesto Stassano, Turin, Italy. (U. S. No. 1,105,859; Aug. 4, 1914.)

ELECTRIC-FURNACE PROCESS AND ELECTRIC FURNACE. Carl Hering, Philadelphia, Penn. (U. S. No. 1,105,656; Aug. 4, 1914.)

GAS FROM OIL, Process of Making. William A. Hall, New York, N. Y. (U. S. No. 1,105,772; Aug. 4, 1914.)

GRAPHITE—Improvements in and Relating to the Treatment of Graphites. E. N. Laine, Paris, France. (Brit. No. 5798, of 1914.)

HOISTING—Balancing Means for Hoisting Apparatus. Letson Balliet, Tonopah, Nev. (U. S. No. 1,107,191; Aug. 11, 1914.)

LAMP—Acetylene Lamp. Meyer Stein, Springfield, Ill. (U. S. No. 1,106,062; Aug. 4, 1914.)

LEACHING—Process of Ore Treatment. Cyrus Robinson, Mount Vernon, N. Y., assignor to Metallurgical Engineering & Process Corporation, New York. (U. S. No. 1,105,102; July 28, 1914.)

LEAD REFINING—Apparatus for Refining and Desilverizing Lead. William Thum, Hammond, Ind. (U. S. No. 1,106,480; Aug. 11, 1914.)

MAGNETIC SEPARATOR. Harry Johan Hjalmar Nathorst, Malmberget, Sweden. (U. S. No. 1,105,293; July 28, 1914.)

MINE-CAR LUBRICATION. Jasper A. McCaskell, Salt Lake City, Utah. (U. S. No. 1,105,363; July 28, 1914.)

ORE REDUCTION—Reduction of Ores by Means of Peat. Per Anderson, Arvika, and Erik E: son Odelstierna, Stocksund, Sweden. (U. S. No. 1,105,870; Aug. 4, 1914.)

ORE TREATMENT—Process of Treating Ores. Nils C. Christensen, Jr., and Theodore P. Holt, Salt Lake City, Utah; said Christensen assignor to George H. Dern, Salt Lake City, Utah. (U. S. No. 1,107,240; Aug. 11, 1914.)

PHOSPHATES—Process of Rendering Soluble Insoluble Phosphates. Walter S. Landis, Niagara Falls, Ontario, Canada, assignor to American Cyanamid Co., Nashville, Tenn. (U. S. No. 1,103,059; July 14, 1914.)

SEPARATION—Apparatus for Recovering Valuable Constituents from Ores. Frederick H. Prentiss, San Francisco, Calif., assignor of one-half to Leda B. Prentiss, San Francisco, Calif., and one-half to Robert C. Lane, Berkeley, Calif (U. S. No. 1,104,132; July 21, 1914.)

SULPHURIC ACID—Manufacture of Sulphuric Acid. Utley Wedge, Ardmore, Penn. (U. S. No. 1,104,590; July 21, 1914, and No. 1,106,999; Aug. 11, 1914.)

TITANIUM—Metallurgical Method. Auguste J. Rossi Niagara Falls, N. Y., assignor to The Titanium Alloy Manufacturing Co., New York, N. Y (U. S. No. 1,104,317; July 21 1914.)

WASHING AND COLLECTING APPARATUS—Robert Hazlehurst Wright, Nashville, Tenn., assignor to Charleston S. C. Mining & Manufacturing Co., Mount Pleasant, Tenn (U. S. No. 1,103,390; July 14, 1914.)

ZINC—Condenser for Zinc Vapors. Moses Appel, Johnstown, Penn. (U. S. No. 1,103,123; July 14, 1914.)

ZINC—Improvements in or Relating to the Separation of Zinc Blende and other Metalliferous Constituents from Ore Concentrates and Slimes by Flotation or Granulation. E. J. Horwood, Broken Hill, N. S. W. (Brit. No. 28,604)

ZINC—Process and Apparatus for the Extraction of Metallic Zinc from Its Ores. E. F. Cote and P. R. Pierron, Lyons, France. (Brit. No. 17,874 of 1913.)

Editorial Correspondence

SAN FRANCISCO—Aug. 20

Plan of Reorganization of Natomas Consolidated of California has become operative, according to announcement of the reorganization committee at San Francisco, on Aug. 17. More than 85% of the first-mortgage bonds have been deposited. It is estimated by Frank B. Anderson, chairman of the committee, that the amount will reach 90%, as a number of holders have requested further time for depositing, which has been granted. Ninety per cent. is equal to $12,712,500. Of the second-mortgage bonds, 90% have been deposited, amounting to $2,224,000. There are 163,390 shares of stock outstanding, of which 144,175½ have been deposited. The plan contemplates the incorporation of a California company, with following capitalization: Non-cumulative preference shares (non-assessable) 6%, $7,250,000; common stock (non-assessable), $9,250,000; 20-year 6% first-mortgage bonds, $16,500,000. For the purpose of raising new money required, the California company will create 5-year 6% notes in the amount of $3,000,000, secured by California company bonds and such irrigation and reclamation bonds as the California company may own or acquire. Natomas Syndicate will agree to subscribe for these notes at 90%, and receive as consideration 312,000 fully paid shares of the new English company to be formed with £600,000 capital for the purpose of acquiring and holding the shares of common stock of the California company. After the 5-year notes have been redeemed, 80% of the net proceeds of all land sales will be applied to redemption of bonds. Provision will be made for the exchange of existing shares and securities of the Natomas Consolidated of California.

A Reduction in the Price of Crude Oil of 5c. has been made by the Standard Oil Co. to the producers, for all grades except fuel oil. Oil in Ventura field is cut 10c. This price does not affect oil already under contract, but will apply to all renewals of contracts and to oil sold in the open market. It is estimated that at present there are shut in a sufficient number of wells in several of the fields of the state to increase the daily output of the state by 20,000 bbl. The new schedule in the Midway-Sunset field varies from 40 to 65c. per bbl. for 14 to 31 gravity oil; Coalinga field, 40 to 75c. for 14 to 35 gravity oil; Lost Hill and Belridge, 42 to 75c. for 21 to 35 gravity oil; Ventura County, 55 to 65c. for 22 to 32 gravity oil; Kern River field, 40c. minimum for 14 gravity oil; Whittier-Fullerton, 50 to 70c. for 22 to 28 gravity oil.

Dividends of Two Per Cent., recently declared by the Union Oil Co. of California, has been recalled and the contract for sale of $15,000,000 of treasury stock to the British Union Oil Co. has been extended to Apr. 1, 1915. A special meeting of the boards of directors of Union Oil, Union Provident and United Petroleum, on Aug. 11, adopted resolutions setting forth as reasons for recalling dividend and extending contract, the demoralization of international business by the European war; and stating that about 20% of the business of Union Oil is foreign trade, which, in all probability, will be liable to serious interruptions for several months. The statement further declares that the position of the company is exceptionally strong. That the company has approximately $10,000,000 of quick assets, of which more than $1,000,000 is cash on hand and in banks against floating liabilities of about $3,500,000.

Gypsum Locations on Land Containing Oil are made valid by a decision of the Department of the Interior in the case of Roust vs. Jameson, on appeal from the General Land Office. The case involved seven gypsum locations near Taft, Kern County. The local land office decided in favor of Jameson, who claimed the land under gypsum locations. The General Land Office reversed the decision on the ground that gypsum was not shown either in quality or quantity to entitle for the gypsum contained, and further that it was the evident purpose of the claimant to get title for the oil contained in the land. This ruling reverses the policy followed by the commissioner for several years and conforms to the policy of the Department of the Interior under the Ballinger regime that location on land shown to contain gypsum in quality and quantity is not invalid because of possible oil value of the land.

Reopening of San Francisco Stock Exchange, mining and oil department, on Aug. 19, after being closed for 20 days, was confined to Comstocks, and but little business was transacted. Only a few of the leading stocks received attention and prices were at low level. Favorable advices came from Belcher, Union and other mines, but had little effect on prices of shares. Prominent oil shares sustained losses. Delinquencies on all Comstock assessments being collected have been postponed. Similar action has been taken by many southern Nevada companies, which sent out calls for funds shortly before the exchange closed.

BUTTE—Aug. 20

The Butte miners are still far apart in any effort to harmonize local differences, and the attempt of the Western Federation of Miners to bring the rebels back into the federation fold will probably fail. A committee from the federation came to Butte to inaugurate a reign of harmony, and began by procuring the resignations of all the old officers of the local union and then invited the rebels to come back and help to elect a new set of officers. The reply generally was that unless President Moyer was absolutely and permanently eliminated from the Western Federation the seceders would not return, and as Moyer seems determined to stick, there will be no peace movement in Butte. The new Butte Mine Workers' Union has not yet made definite demands on the mining companies, although at the last meeting of the union a resolution was seriously considered to ask the companies to reopen all its mines and give employment to the several thousand miners who were laid off, and to pay them half in cash and half in scrip, as was being done by the Butte-Duluth Co., but after discussion the majority members of the union voted it down because, as they thought, it would set a bad precedent and would look as though the union was asking a favor of the companies. What the new union did practically decide on, although no definite action was taken, was to make a move for recognition of the union on the part of the Anaconda company. It was proposed to go to the Moonlight mine, at sometime within a month, and demand that no miner be allowed to work unless he wore the white button of the new union. When that demand is made it will put up to the companies squarely the question whether they will recognize the new union or the Western Federation union. In view of the fact that the companies are not anxious to operate their mines at present, such a demand by the new union might come opportunely for the companies and inopportunely for the union.

MARQUETTE—Aug. 21

Predictions that the war in Europe would be beneficial to the American iron and steel trade, this on the theory that a monopoly of the world's markets would be lodged with manufacturers in this country, have as yet had no fruition in the Lake Superior mining region. The demand for ore has shown no increase traceable to business originating as a result of the clash of the battling nations. On the contrary, due to added unsettlement in trade circles, a development for which the European conflict is held responsible, some producers with large stockpiles on hand have scaled down outputs still further. At the head of Lake Superior all construction work at the Minnesota plant of the United States Steel Corporation has been suspended for an indefinite period, the shutdown throwing 600 men out of work. It is possible, perhaps probable, there will be a more liberal use of American manganese iron ores, of which commodity the only important supplies in the Lake Superior country are in the Cuyuna range; it is possible also that the demand for the bessemer and nonbessemer product will expand more than ordinarily would be the case, but the immediate effect of the mighty martial struggle across the Atlantic cannot be said to be helpful.

Pickands, Mather & Co. of Cleveland is making an energetic search for ore in the Felch Mountain district, northeast of Iron Mountain, Menominee range. A diamond drill is running day and night in the vicinity of the Calumet mine, now inactive. The exploration in the field heretofore has been shallow. Deep holes will now be bored.

The New Process Metols Co., which is erecting at Marquette a John T. Jones step-process furnace, a plant designed to treat iron ores of low grade and make of them a valuable commodity, expects to have the stack in blast by the middle of September or the first of October at the latest. Practically all of the heavy machinery is in position. The installation of the smaller equipment is going forward rapidly. The stack is finished. It is 60 ft. from the base to the top; the heavy brickwork at the base is 24 ft. high. The steel part of the stack is lined with fire brick. The part of the plant that particularly attracts attention is the large preheating tube, 6 ft. in diameter and 60 ft. long, in which the electromagnetic process perfected by Mr. Jones takes place. The tube rests on concrete pillars. It will be rotated by electrically-driven machinery. The tube will be lined with brick of special quality. At the lower end of the tube, which is inclined a few degrees from the horizontal, is the upright reducing furnace, 35 ft. high and approximately 12 ft. in diameter, narrowing toward the top. This also will be lined with brick of special quality. No blowing machine or artificial draft will be required. Wood will be used in the metallizing process. Following the treating of the ore in the preheating tube and the reducing furnace, it will be conveyed to a crusher and thence to "jigs" which will remove from the metallized product the charcoal. silica and other impurities.

HOUGHTON—Aug. 26

Further exploratory operations at the Wyandot continue to show promising results. While the work is carried forward under handicap and only in a most limited way, the lateral openings are in 45 ft. and a total of 100 ft. of openings now is made in this new lode. The results compare favorably with the showing when first opened. In fact, there is no disguising the fact that in all of the exploration work which the Wyandot has carried forward at different times the present showing is unquestionably the most promising. The formation has been exposed in three different places, at the seventh, eighth and ninth levels. In the upper level there was no copper at all. In the eighth it showed in commercial quantities and in the ninth it is very rich. There is no identity to the lode yet. It differs in every important detail from all other lodes in this district. It is an amygdaloidal formation, but full of crystals. In addition to showing a leached condition, it showed a bleached result of igneous action, and the shot copper occurs in crystals, something very unusual in any of the lodes of the Michigan district. In fact the lode is almost white. The general characteristics are healthy. The lode is reasonably wide with an even distribution of the copper. Wyandot's treasury is in reasonably good condition and operating expenses are small under existing conditions. The management would like to explore the present operating lode at greater depth and plans have been made with that in view, but such a move would be costly and as long as the lateral openings continue to show such good results, the openings in both directions from the winze will be pushed.

The Double Tax on Mineral Products of Michigan, copper, iron and coal, will have to be fought out before the electorate of the state in the near future. Every fight on the tonnage-tax issue, as brought up in this state to date, has been confined to the legislature and the injustice of the proposition has been shown to the members of that body, with the result that no proposed tonnage tax ever has reached the governor. But now the issue goes before the whole people of the state by the action of the Michigan state grange, the organization of farmers, who have invoked the initiative for this proposed legislation.

Operating Costs at the Wolverine for July were under 8c. per lb. In June the costs were 8.13c. per lb. and in May just under 9c. This gradual reduction has come about through managerial economies and cutting off of expenses, which were brought on by the strike. At this writing the Wolverine continues to operate full tilt.

The Shaft at the Keweenaw is down 700 ft. and the rock that is being hoisted continues to show good values in copper. Machinery from the Mandan shafts is being installed to do the hoisting. Additional drills were put to work this week. A force of carpenters is at work renovating and repairing the residences for employees. The management has funds enough to continue operations at the present rate during the winter.

SILVER CITY—Aug. 3

Preparations for New Mexico's Mineral Exhibit at the San Diego Exposition in 1915 are under way. The exhibit promises to be the largest display of its kind ever shown by the state. Fayette A. Jones, president of the State School of Mines at Socorro, has charge of the assembling of the minerals and is touring the state in the interest of the exhibition.

JOPLIN—Aug. 22

Zinc Smelters Obtained Much Zinc-Carbonate Ore from Leadville during 1911, 1912 and 1913, and some even from California and Nevada, which was used in a mixed charge with blende ores, especially in the zinc smelters in the Kansas gas belt, where gas was getting scarce and roasting was avoided as far as possible. The fact that the Colorado Leadville zinc-oxide plant is now buying a very large part of the carbonate output of the Leadville camp, even taking as low as 14% zinc ores, is stated to be one of the reasons why zinc silicate ores in the Joplin district have been so greatly in demand the last six months. So great has been this demand as compared with that for blende that the relative prices for zinc silicate ores have been much higher than blende and have stimulated prospecting for the ore throughout the camps south of Joplin. Among the tracts prospected were the E. A. Rose land, where a prospecting campaign by Baldry & Co. has resulted in the opening of a large deposit of calamine. Two shafts are now being sunk and some very excellent ore found in one of them. East of this land, the same company has been opening up some promising calamine following the mining of lead ground.

Grigg & Co. have been prospecting farther east and south all spring and summer, and have sunk a large number of shafts into ore, the ore being found practically at the water level. Following this campaign, it will be possible for a large output to be made when a general pumping station is put in. The prospecting continues southward to Tipton Ford, where a number of prospects have bee noened up on the Goodrich land, there being zinc carbonate and "dry bone" or lead carbonate. Buxton & Etter have just taken a lease on a part of this land and are now engaged in putting a tunnel into a hill to tap the ore deposit, which has already been developed by other prospectors in the same vicinity. At least five producers are now turning out ore from this tract.

Frank B. Wilcox and Associates have reopened the old White Oak mine at Tipton Ford and are said to be turning out a good showing of ore after a long period of development. Within a few weeks the mill will be operated to capacity. The advent of $50 ore prices has already resulted in a general resumption of operations at a number of mines, and the mines that have been running with a minimum capacity are asking for more laborers preparatory to increasing their output. Among the mines resuming operation to capacity are the Mattes Bros., Hartford, Oronogo Circle, White Dog, Continental, Comanche, Bertha A., Wingfield, Mercantile and C. & S. mines. From these will come a considerable addition to the weekly output. The entire Miami camp will be speeded up and a very much larger output will be obtained.

O. W. Sparks Has Completed Drilling on a lease just east of his Yellow Pup property, and out of seven holes, five proved good ones. A shaft that had been sunk to 135 ft. near one of the best holes will be used and drifting started from the 120-ft. level to catch the ore deposit discovered at that depth in the drill holes. If the drifting shows as good ore as the drilling indicated, a mill will be started at once. The Calumet Mining Co., on a lease of 20 acres southeast of Joplin, has developed a property upon which a mill will be erected immediately. After sinking 17 drill holes in an effort to thoroughly test the ground, two shafts have been put down and drifting sufficient to open up the ground completed. The ore is in soft timbering ground at the 120-ft. level.

DAWSON, Y. T.—July 15

The Season's Gold Yield is now being estimated at $4,000,000 to $6,000,000. Over $250,000 in gold was sent out as an initial shipment a few days ago. Practically all the mining is being done by dredging, and in no place has this system been so highly perfected as in the Dawson camp. Twelve of the largest dredges in operation are now at work within sight of the city. While many of the big operators are giving their entire attention to dredge work, Treadgold, the premier Yukon mining organizer, is being watched with great interest by miners in all sections of Alaska. He has already met with considerable success in the use of the steam shovel. The shovels are lighter and less costly than the large dredges, and on account of their size they can work many of the streams that are too small to warrant operation by dredges. His tryouts mean much to the miner of small means. There is no way for the small operator to work ground which is commonly called dredge ground on account of the depth at which gold is found on the bedrock and only workable so far with a dredge. If steam-shovel work is perfected so that the small miner can operate them profitably, his field of operations will be greatly enlarged. The quartz prospects near Dawson are as promising or more so now than ever.

The Mining News

ARIZONA

Yuma County

EMPIRE MINE (Parker)—Will resume work in about 30 days. Mine has been closed since February, 1913, on account litigation. Will employ about 50 miners. On Carnation claim a small mountain is said to assay about $20 copper and gold on surface.

Santa Cruz County

OLD RED MOUNTAIN (Patagonia)—Johnson & Hanson struck good body lead-silver ore at 700-ft. station in tunnel on Elevation claim.

CONNECTICUT—This group in the Josephine Cañon in the Santa Ritas has been bonded to Tate, Hudson & Gartley, of Bisbee, by R. R. Richardson, and they are taking out silver ore at present, leaving the copper ore to more settled times. This property has sent out a good deal of ore.

COBRE—Group, two miles north of Alto, now being worked by Brown & Co. under lease from Josiah Bond. Ore is copper-lead-silver, netting about $30. El Paso offering to make advances on ore shipped and balance after market is again opened with regular quotations, but is discouraging shipments for present.

BRADFORD—A. L. Harroun, of Lucky Tiger fame, has formed the Sonoita Copper Co. to work this old mine, recently bought by him from the Ferry estate. The mine has formerly sent out some good ore. It is two miles from Bloxton station, on the Nogales-Benson R.R.

GLOVE—This group has been bonded by Sheehy Brothers to a syndicate organized by Thomas Park, recently of the Elephant's Head mine. About 30 men are at work on the group, sinking on good lead-zinc showings along a limestone contact.

JOPLIN—It is understood that the Joplin Mining Co. will give a lease on its group to Chris Rasmussen, who has been working on the Three Stars mine, extracting silver-lead ore. The Joplin was a shipper some years ago, but has been idle since then.

LEE—This mine, in Mansfield Cañon, east of Alto, reports good copper ore at the 450-ft. level, which can be shipped at about 8% copper, and the silver contents besides. It cannot be handled on the present lack of market, and is being piled on the dump for future use; there is some talk of a mill to utilize a large amount of lower grade siliceous ore. A new compressor has been installed and is giving satisfaction. The season has been dry, and this property as well as others is suffering. It has been the hottest August ever experienced in this county.

SHIPPERS—Work has been suspended on several properties owing to war conditions prevailing. Among them are reported the Royal Blue, World's Fair and the R. R. R. The latter is the largest shipper in the county; many small operators are put out of commission also for the same reason. Some ore is being piled up at Patagonia, though it cannot be shipped to advantage now.

Yuma County

KING OF ARIZONA (Yuma)—Operations are again under way at King of Arizona. Felix Mayhew has thirty men at work. Mill has been rehabilitated.

CALIFORNIA

Amador County

PLYMOUTH CONSOLIDATED (Plymouth)—Mine and mill in steady operation. Though property is operated by Bewick, Moreing & Co., of London, operation will not be disturbed by financial situation in Europe, as property has passed the development stage and is now a producer. Town of Plymouth is making improvements made possible by the reopening of the mine.

SOUTH EUREKA (Sutter Creek)—Sixty stamps dropping on good ore and quantity of ore blocked out reported sufficient to guarantee long uninterrupted run. Recent repairs placed shaft in good condition.

HARDENBERG (Jackson)—Operation reduced, but mine and mill kept in shape for early resumption of regular work.

FIVE-TON POPE HARTFORD auto truck purchased by S. Thompson, of Jackson, to be employed hauling lagging and other timbers to Argonaut and other mines. Initial trip made with 1200 pieces lagging

Butte County

CLAY DEPOSITS five miles north of Oroville, recently exploited by L. A. Jenks, to be developed by local company. If development warrants, a plant will be installed and a spur track built by the Northern Electric.

Calaveras County

ROYAL CONSOLIDATED (San Andreas)—Property recently examined and reopening contemplated. Large amount of low-grade ore reported

THORPE (Fourth Crossing)—Reported that mine will be reopened. Men now employed preparing for development. Formerly a producer

Eldorado County

CRUSADER (Eldorado)—Good ore reported on 100-ft. level and crosscutting in progress. Mine recently bonded to Lloyd Tevis and P. D. Burt, of San Francisco.

LIMESTONE DEPOSITS near Shingle Springs are being developed by Bonnefoy Bros., of Placerville. Kiln and aerial tram installation is contemplated. Shipment of rock to Berkeley via Southern Pacific at Bullard station already in progress.

SOAPSTONE DEPOSIT near Latrobe being developed by Charles Swift. Preparations being made for shipping product.

MOUNTAIN QUARRIES CO. (Flint)—One thousand tons of rock per day being shipped over Mountain Quarries R.R. to Auburn, thence by Southern Pacific to Cement, Solano County, used in manufacture of portland cement; 135 men employed at quarries.

RISING HOPE (Placerville)—Number of miners increased for extensive development.

Inyo County

CERRO GORDO MINING CO. (Keeler)—Articles of incorporation filed with county clerk. Principal place of business, Phoenix, Ariz. Directors are A. L. Dornberger, F. J. Hambly, John E. Richards, of San José; F. J. Hagenbarth, of Salt Lake; Louis D. Gordon, of Keeler.

CASA DIABLO—Repair of pipe line completed. Rebuilding cyanide plant begun. Several thousand tons of low-grade tailings will be treated.

CLOUDBURST IN CERRO GORDO CAÑON, Aug. 8, washed out the road to Cerro Gordo mine, carried two drums of gasoline through the cañon, damaged streets in mining camp. Before reaching Keeler, water divided into three streams, preventing damage to Keeler property.

WILSHIRE BISHOP CREEK (Bishop)—Sawing lumber and other work necessary to installation of cyanide plant in progress, but underground work discontinued temporarily.

Kern County

BIG BLUE (Kernville)—William G. Long, superintendent; Crayton Long and William Wharton, Stanford students visiting the mine, died from suffocation while fighting fire in the mine Aug. 12. The body of W. G. Long was recovered by citizens of Kernville, but the other bodies could not be reached at the time on account of smoke and fume. Experienced firemen were then called from Bakersfield, 65 miles southwest.

GOLDEN (Caliente)—New mill is under construction. Large amount of ore blocked out.

San Bernardino County

ATOLIA (Atolia)—Leasers at the tungsten mines have been notified that their leases will expire Aug. 30. The cleanups by the leasers in July aggregated about $12,000.

Shasta County

MOUNTAIN COPPER CO. (Redding)—Iron Mountain mine, which in 18 years had produced ore valued at $27,000,000, was closed Aug. 6; 350 men were laid off and company's output reduced 80%. Smelter at Martinez will also be closed.

COLORADO

Lake County

LEADVILLE—Uncertain silver market and depression in lead and zinc prices have made uncertain continuance of operations in majority of Leadville's mines. So far as possible, work being kept up. The gold mines will continue at normal production, and if the Mint authorities maintain the purchase of a million ounces of silver per week, according to present hopes, most silver mines will continue. Zinc-smelting plant of the Western Mining & Reducing Co. closed indefinitely. Managers of several large mining companies, such as Western, Iron-Silver, Col. Sellers, New Monarch and Yak, assert that they are running as usual. At many mines, during this enforced suspension, it is planned to make surface improvements and extend development.

Ouray County

WANAKAH SMELTERY (Ouray)—This department of the Wahakah Mines Co. is undergoing alterations and improvements to reduce costs in handling ore and products. New capacity is to be 200 tons and plant is expected ready for service in October. Manager John T. Roberts, Jr., is considering erection of sintering furnace for flue dust.

San Juan County

OCCIDENTAL (Silverton)—H. G. Green has installed compressor plant to drive ahead in main adit.

WILFLEY-MEARS MILL (Silverton)—New plant to recover concentrate from old dump at Silver Lake mine, on a special type of Wilfley table, is started up. Material is flushed from the edge of the lake, over a cliff, and into wooden flume that conveys to the mill, two miles distant.

Clear Creek County

MINT (Empire)—Milling ore is being opened by development work now in progress. The mill is being enlarged and new equipment will be added. Jigs, Wilfley tables and a canvas sliming table are being installed.

MINNESOTA

Cuyuna Range

HAWKINS (Nashwauk)—Work was to be resumed Aug. 10 with two shovels in ore and one in the overburden; 100 men are employed and daily output is 100 cars.

MICHIGAN

Marquette County

AMERICAN (Diorite)—This property has been closed down for repairs. Shaft will be lined with steel and concrete from top to bottom, which will greatly improve outlet, which has been giving some trouble of late. Company has been shipping steadily for some time to Algoma Steel Co. at Canadian Soo.

TAXATION OF MINERAL RESERVATIONS—County board of equalization of Crow Wing County, in which county bulk of Cuyuna range is, at its annual meeting decided on a valuation of $2 per acre, regardless of location of such reservations in county. Recent decisions of state supreme court have held such action to be lawful Heretofore all assessments have been levied against surface rights only, and as mineral rights are frequently held separately, owners of such rights have been tax free Weyerhauser and Northern Pacific Ry. interests will be most affected, as their lands have for some years been sold with mineral reservation.

MONTANA

Broadwater County

COMBINATION-KEATING MINING CO. VS. ROBERT L. CLINTON AND H. GYSBERT KLENZE—Suit was instituted by this company against defendants to quiet title to four mining claims and for accounting of sale to the Cactus Mining Co. through Mr. Clinton. Plaintiffs claim title to Combination-Keating and Helena claims, situated in Cedar Plains district, and allege that, while acting as company's manager, Mr. Klenze located Combination and the Minneapolis claims in his own name, whereas he was holding them in trust for company. Subsequently, all four claims were sold to the Cactus company, which made payment of $2652, and then failed to pay balance of $40,950. Through vendors' lien company again secured title to property and judgment for $41,597. Plaintiffs ask for sheriff's sale of property, sheriff's deed with a clear title and accounting of the transaction.

Deer Lodge County

WASHOE WORKS (Anaconda)—General Manager E. P. Mathewson made announcement to the effect that during the curtailment of work, married men would be given preference in the operating department.

Madison County

WYROUCK MINE (Bear Gulch)—With new crusher in place, cyanide plant will hereafter be able to treat 50 tons per day and make net profit from $4 to $6 a ton. Crusher has maximum capacity of 480 tons in 24 hrs., which will permit increasing capacity of plant by installing additional tanks. This, Manager A. R. Jones announces, will be done in near future, as property and orebodies fully warrant expenditure.

Park County

COOK CITY MINING DISTRICT—With prospect that the smelting plant at Cook City will soon be ready for treating gold, silver, lead and copper ores from mines in district, activity in the camp has materially increased. Many of the old mines are being developed by original owners and outside interests. It is general belief that with smelters in operation, the transportation problem which has been the stumbling block for profitable operation in the past will be overcome.

Powell County

ELLISTON COPPER MINING CO. (Elliston)—A creditors' petition in bankruptcy was filed in federal court Aug. 17, in which company is alleged to be bankrupt. Petitioners aver that company committed act of bankruptcy by permitting William Rawlings, a creditor, to attach property for a debt of $1982. Company is operating a group of claims near Elliston. Amount due to creditors who filed petition is $743.

Silver Bow County

ANACONDA COPPER MINING CO. (Butte)—During present curtailment of output, which caused the closing of seven of the company's mines, the following working schedule has been adopted for the mines which remain active: Leonard, Tramway, East and West Colusa and Berkeley will be closed down on Sundays and Mondays; the Anaconda, St. Lawrence, Original, Stewart, West Gray Rock and J. I. C. will close down on Saturdays and Sundays. By this arrangement, all the mines will be closed on Sundays, but there will be mines working every other day, thus keeping the ore supply for the Washoe smelter more uniform.

BULLWHACKER COPPER CO. (Butte)—Judgment against company and in favor of Clark Bros. & Klein, of Spokane, Wash., for $123,426, money advanced ,and $1000 attorney fee, ordered entered Aug. 10, in Judge McClernan's court, company confessing the indebtedness on the promissory notes. This puts Clark interests practically in control of company's property.

BUTTE MINE WORKERS' UNION (Butte)—At the first annual election of new union, held Aug. 10, Muckie McDonald, who led revolt of miners against Western Federation, and who had been temporary president of new union, was elected president. There were also elected a vice-president, secretary, treasurer and five directors for the executive board.

NEVADA

Churchill County

CAÑON POWER CO. (Lahonton)—Company has been awarded power rights at Lahontan dam, by reclamation service, for period 10 years.

Elko County

RAILROAD SURVEY TO BULLION from Raine's Siding on Eureka & Palisade R.R. is being made.

DOME MINING & REDUCTION CO. (Bullion)—This company now operating Elk lease. Other properties shipping from this district are Sweepstakes and Sylvania; five cars per week are shipped.

EASTERN STAR MINING CO. (Gold Circle)—A 50-ton mill will be built, it is stated. Shipment will be made to California Ore Testing Co., of San Francisco, to determine best process. Mine has been opened to 240 ft. and large tonnage of milling-grade ore and some shipping-grade ore developed.

Esmeralda County

BOOTH (Goldfield)—Sinking winze below 500-ft. level has been resumed; winze is 145 ft. deep and will be sunk to 700-ft. level. Pump with capacity of 50 gal. per min. is installed and used in sinking.

BLACK BUTTE (Goldfield)—Development work has been done on tunnel 50- and 100-ft. levels. Shoot of good grade ore has been opened on 100-ft. level and further work will be done.

GOLDFIELD ORO (Goldfield)—Satisfactory progress is being made on 700-ft. level in development work; 810-ft. level is being retimbered preparatory to further development work.

SILVER PICK (Goldfield)—Force greatly reduced on account unsettled financial conditions.

Eureka County

UNION MINING CO. (Palisade)—A 50-ton concentrating plant will be built, it is stated, at this silver-lead property, 35 miles south of Palisade; plant to have crushers, rolls, jigs and vanners. Shipments have been made until recently; this has been stopped and development work only done until mill is completed.

Humboldt County

PACKARD (Rochester)—This lease will not close, it is stated. Large tonnage of good grade silver ore is being developed. When new short line is finished, shipments will be increased.

FLUNKEY (Rochester)—Blacksmith shop and storehouse have been built and tunnel will be driven below upper workings.

BUCK & CHARLIE (Rochester)—Good grade lead-silver oreshoot has been struck in lower tunnel.

BLOWBACK (Rochester)—High-grade ore is being mined from this claim on Lincoln Hill. Recent shipment, it is stated, assayed $250 per ton, nearly all gold.

KENNEDY (Kennedy)—Option on three claims, Virginia, Hazel Bell and Ida, of Kennedy property has been secured. Tests on ore being made to determine necessary changes in Jenkin mill, which has been purchased. Large tonnage of milling-grade ore has been developed in this district, especially in Virginia mine.

Lincoln County

AMALGAMATED PIOCHE (Pioche)—Work at No. 1 shaft is progressing satisfactory. Driving west drift on 14th level has been stopped until water is pumped out of Black Ledge winze, then connection will be made. Flow of water is large, and was formerly pumped to 12th level, from where it flowed off through old Raymond & Ely mine; will now be pumped to surface. Good-grade oreshoot has been opened on 14th level. Shipment of lead-zinc ore was made from 12th level recently.

Lyon County

CONSTANTINE (Yerington)—A 6-ft. shoot high-grade copper ore struck at 182 ft. in shaft. Shaft will be sunk to 200-ft. level and drifting will then be done.

WHEELER (Yerington)—Two leases have recently been let at this property on Mount Grant, one in mine, from which shipping-grade ore is being taken; and other on old mill tailings, which will be re-treated by concentration.

Mineral County

SILVER STATE—Small mill at this mine in Lappan Cañon is being run. Development work is progressing satisfactorily.

Nye County

COMMERCIAL MINES CO. (Manhattan)—Negotiations with Jumping Jack Merger Mines Co. for lease or option under way. War Eagle mill purchased recently and increased from 10 to 20 stamps. Company will increase holdings in district.

WEST END CONSOLIDATED (Tonopah)—New oreshoots on fourth and fifth levels opened. July mill cleanup stored in Tonopah, pending reopening of silver market.

CLOUDBURST AT MANHATTAN, on Aug. 7, did much damage to placer mines in west end of town, and damage to upper end of town is estimated to be $2000.

GOLDEN ARROW DEVELOPMENT CO. (Golden Arrow)—Grading for new 10-stamp mill commenced. Process includes Huntington mills and cyanide. Electric power used. Compressor pumps and machine drills will be installed.

TONOPAH MINING CO. (Tonopah)—Considerable new development under way in Silver Top and Red Plume sections of property.

MacNAMARA (Tonopah)—Operations temporarily suspended in mine and mill, account market price of silver.

NEVADA CINNABAR CO. (Ione)—Shipment of 400 flasks of quicksilver will soon be made.

Storey County

COMSTOCK PUMPING ASSOCIATION (Virginia City)—Ventilation improvements being made on 1600-ft. level; second concrete bulkhead will be built in north lateral of Sutro tunnel. Pumps operating satisfactorily and water held at usual level.

UNION CONSOLIDATED (Virginia City)—West crosscut started from 2650-ft station of winze. New level will be opened.

MEXICAN (Virginia City)—Hoist is being installed at winze that will be pumped out, and sump will be sunk below 2650-ft. level before station is cut. Development in south drift in Union-Mexican crosscut on 2500-ft. level is progressing satisfactorily

COMSTOCK-PHOENIX (Virginia City)—Development work is being done on 650-ft. level.

BUTTERS MILL (Virginia City)—This mill, in Six Mile cañon, is under lease to Charles Duval, who is treating ore from Chollar croppings

White Pine County

ELY CALUMET (Ely)—Sinking in Gladys shaft resumed. Shaft is 300 ft. deep and will be sunk to water level.

CONSOLIDATED COPPER MINES CO. (Ely)—It is stated that 21,624,000 tons of 1.153% copper ore are developed and additional tonnages being added as development progresses. It has been decided that 40,000,000 tons is minimum upon which to base construction of mill. Large tonnage of ore mined on Giroux ground by a Nevada Consolidated steam shovel that is opening a road to Liberty Pit.

NEW MEXICO

Grant County

PHELPS, DODGE & CO. (Fierro)—Development work on Emma and other mines stopped. Pumps being pulled. Properties not producers.

CHINO COPPER CO. (Hurley)—Steel structural work for new addition to power plant being raised.

SILVER CELL MINE (Pinos Altos)—Mine equipment being put in workable order. Development work on vein recently encountered shows good grade silver ore. One 50-lb. nugget was taken out recently averaging about 75% silver. Gudger & McSherry, of Silver City, are operating mine.

GOLDEN GIANT MINING & MILLING CO. (Pinos Altos)—Mill and mine will be reopened under management of R. H. Perry and Robert Michel.

EIGHTY-FIVE MINING CO. (Lordsburg)—Company temporarily discontinued operations with other copper mines in Southwest, due to demoralization of copper market.

Santa Fé County

SANTA FÉ COPPER CO. (San Pedro)—Company employing 40 men on development work. Reported company struck large body of good copper ore, chalcopyrite with garnet and quartz gangue.

Taos County

HAMM MINING & MILLING CO. (South Forks)—At trustee's sale, Aug. 1, Edwin Singleton, of Dallas, was successful bidder. Sale included valuable mill. Property is in Rio Hondo mining district.

Socorro County

MINING COMPANIES IN MOGOLLON DISTRICT are curtailing production owing to stringent money market. However, all continue to operate, none affecting complete close-down. Road conditions improved owing to end of rainy season. Plans under way to build new road from Gila over Saccatone flat if coöperation of Silver City business men can be secured. Three new auto trucks added to Mogollon transportation service.

BURRO MOUNTAIN COPPER CO. (Tyrone)—Forces have been slightly increased. Power-plant construction work continues.

C. F. & I. CO. (Fierro)—Company continues daily shipments iron ore from Bessemer and Brockman properties to Pueblo, Col., smelter. Only large company in section now operating.

GILCHRIST & DAWSON (Fierro)—Fifty-three sacks high-grade gold ore on dumps. J. B. Gilchrist working 18-in. vein recently discovered in Fierro basin.

SOUTH DAKOTA

Lawrence County

DEADWOOD-STANDARD (Ragged Top)—Cyanide plant being operated by lessees, Hodges and associates, of Terry, at partial capacity. Recently oreshoot discovered which gives promise of developing into considerable importance; if so, mill roof will be repaired and other work done to enable plant to work full capacity during coming winter.

KALEVA (Roubaix)—Company recently reorganized by Lead parties, who plan to erect small mill.

TROJAN (Trojan)—Mike Stabblo, a miner, was killed by fall of roof in stope, which, according to Supt. H. Slaughter, employees had been warned not to enter until it had been timbered. Timbering had been ordered, but had not started.

WASP NO. 2 (Flatiron)—Regular monthly dividend of 1c. per share was declared on 15th. Property running at full capacity, but grade of ore below normal for past 60 days

HEIDELBERG (Two Bit)—Shaft has been started in main adit, using windlass. Raise to surface, about 100 ft., will be made directly over shaft and connection thus made with machinery which will be housed on surface. South Dakota "blue-sky" commission recently gave company permission to sell treasury stock

NO SHORTAGE OF CYANIDE IS ANTICIPATED in Black Hills, notwithstanding reports of sensational nature which have been circulated. Kirk G. Phillips Estate, sole South Dakota agents for Roessler & Hasslacher Co., have nearly a full carload on hand, sufficient for two months' operations of all plants aside from Homestake, and have promise of another carload in 60 days. Homestake is not experiencing any difficulty in securing a supply

GOLDEN REWARD (Deadwood)—Reports at annual meeting of company say operations have been more profitable during past two years, under system adopted of leasing the various properties, than they were previous to that time. At present time, more than half of mill supply comes from lessees on company's property; shipments of smelting grade are also regularly going forward

BISMARCK (Flatiron)—Everything about plant running smoothly; mill handling 200 tons daily.

RATTLESNAKE JACK (Galena)—Mill construction partially curtailed, certain changes of plans are under consideration. Work in mine proceeding rapidly.

HOMESTAKE (Lead)—Recreation Hall practically completed, and will be open in a few days to the public in all departments. Bowling alleys opened recently, and on Aug. 31 the first performance will be given in the theatre. It is announced that the schedule of prices will be $1 to 25c. for shows, and a tax of 5c. a head for the "movies," which will afford entertainment on nights when the stage is not otherwise occupied.

GEMINI (Eureka)—Operation of lessees will not be curtailed in any manner, according to General Manager McChrystal. Management will continue to make settlements with the smelteries as it has in the past. Provisional settlements have recently been made on 1000 tons of lead-silver ore. About 100 lessees working at present.

UTAH

Summit County

PARK CITY SHIPMENTS of ore and concentrates during July amounted to 6041 tons; for week ended Aug. 14 shipments amounted to 1083 tons; those for preceding week were 1276 tons.

SILVER KING COALITION (Park City)—Work on 500-ft. level of Silver King shaft has opened shipping ore. Company operating mine and mill about as usual. There are 400 men on the payroll.

DALY-JUDGE (Park City)—Working forces have been reduced, as property is not in position to mine and store ores, and under present conditions it is not known exactly whether operations would be at profit or loss on account final adjustment or settlement in price of silver. First-class shipping and milling ores are mined together, and storage of mill ores would be impracticable. Work on Snake Creek tunnel will not be slackened, and daily progress of 14 ft. being made. The face is in 8600 ft. It is understood some experimental work will be done at the mill and main shaft will be repaired.

DALY-JUDGE (Park City)—Good ore opened in Daly vein at higher levels than heretofore. Drifting being done on 300 level to reach this ore.

THOMPSON-QUINCY (Park City)—Work suspended on account unsettled condition of metal market.

DALY-WEST (Park City)—Equipment for new mill and hoist is arriving and being installed. The mill will be slightly below the old site. Foundations are in. Electric power used entirely. Lessees on the upper levels working and sending out ore through the 1200-ft. level tunnel.

MINES OPERATING (Park City)—Shipment of 18 bars silver bullion made recently to the National Copper Bank, Salt Lake City. This represented mill run for the latter half July and amounted to 16,000 oz. The total output for the month was about 33,000 oz. Ore from which this was produced was mined from the Ontario tunnel level and above, from a block of ground under lease to this company. It carried 9 or 10 oz. of silver per ton. Mill has been making extraction of 80% or better, and when new Holt-Dern furnaces are installed a larger recovery will be made and operating expenses reduced. Final papers in the patents for the processes employed by this company were received in Salt Lake Aug. 18. The company employs 100 men in mine and mill.

SILVER KING CONSOLIDATED (Park City)—This company is shipping 25 to 30 tons first-class ore daily, coming from development. During July, 1045 tons were shipped. Much new ore being developed, and it has been necessary to continue shipments on account of lack of storage facilities. The Utah Light & Power Co. is extending a line to this property, and electric power will be used.

Salt Lake County

UTAH APEX (Bingham)—New mill, which was designed for 350 tons a day, has been treating up to 425 tons, and is doing excellent work. Problem of tailings disposal has been solved by the purchase of land jointly with the Bingham-New Haven Co., which will accommodate tailings for a number of years. Earnings have been fairly good in spite of low price of lead.

BINGHAM MINES (Bingham)—Leases recently been granted on some old workings, including the Dalton & Lark mine, to men who have recently lost employment through curtailment at other properties.

CANADA

Ontario

CITY OF COBALT (Cobalt)—Shareholders have approved resolution providing for voluntary winding up of company. Mine becomes property of Mining Corporation of Canada, and shareholders will receive shares in the new company for present holdings.

NIPISSING (Cobalt)—During July, this company mined ore of estimated net value of $211,596, and shipped bullion from Nipissing and customs ore of a net value of $231,858.

McINTYRE (Schumacher)—Negotiations are under way for the purchase of control of this property by the Nipissing.

DOME (Porcupine)—During July, treated 19,780 tons and recovered $82,981 in bullion. The mill ran 91% of the possible running time.

FOLEY O'BRIEN (Porcupine)—Power house was burned in bush fires which menaced Porcupine.

BELL ASBESTOS MINES (Quebec)—These mines have been closed owing to inability to ship asbestos to London.

TOUGH-OAKES (Swastika)—Underground work has been stopped on account of failure of electric power plant at Charlton. It may be two months before underground work is resumed. Excavations for new mill have been started.

MICHAELSON ORE REDUCTION WORKS (Sault Ste Marie)—Mill and concentrating plant is being rearranged to embody a greater variety of operations and is expected to be in working order by Sept. 1, 1914.

The Market Report

METAL MARKETS

NEW YORK—Aug. 26

The metal markets are still disorganized owing to conditions abroad. Spelter continues extraordinarily strong and active. There have been great advances in several of the minor metals.

Copper, Tin, Lead and Zinc

Copper—The situation remains unchanged. Consumers are supplied with what they want but producers make no effort to sell. Copper continues to be exported under old contracts.

Base price of sheet copper was reduced ½c. on Aug. 18, and is now 18c. per lb. for hot rolled and 19c. for cold rolled. The usual extras are charged, and higher prices for small quantities. The price for tinning sheets has been advanced to 3½c. per sq.ft. on account of the high price of tin.

Exports of copper from New York for the week were 5804 long tons. Our special correspondent gives the exports from Baltimore for the week at 327 tons.

Tin—Supplies are becoming a little more plentiful, as is indicated by the disappearance of the fancy prices of a few days ago, but the business is still chiefly in one- to five-ton lots, and there is not yet a broad, wholesale market.

Lead—A rather large business has been done and the tone of the market is firmer. However, the desire to liquidate holdings has prevented any material advance in price as yet. If the export movement obtains more headway, a further improvement in the market may result. During the last week a considerable tonnage of lead for export was reported sold. This is going out through numerous ports, wherever space may be secured. Some lead has gone out through Montreal. The muddle over foreign exchange and the troubles of cable communication render the export business more or less difficult.

Exports from Baltimore for the week included 112,087 lb. lead to Liverpool.

Spelter—This market has been curious in that while there has been a crazy demand from abroad there has been scarcely any from domestic quarters, and while producers have obtained high prices for export, they have been willing to sell at home for less money. Speculative operations seem to have been playing a considerable part. On certain days of the week, sales have been reported at wide ranges and it is difficult to quote the average of the market. On Aug. 24 there were sales from 5.80 to 6c. On Aug. 25, one lot fetched 6.10c., St. Louis, with more wanted at the same price, but on the same day sales were made at 5.85c. Brass specials and intermediate grades of spelter have realized all kinds of fancy prices, ranging upward from 6c. The aggregate of the sales for export is again large. At the close the market seems to be halting, some producers figuring that England has overbought its near-by requirements. Others, however, take a different view. It is certain that between their large sales at low prices previous to July 31 and their subsequent sales for export producers have greatly relieved themselves of the load they were carrying.

All quotations on zinc sheets were withdrawn on Aug. 20 by the makers, on account of the existing conditions in the zinc ore and spelter market. Sales are made on private terms.

Other Metals

Aluminum—The market continues quiet and there is not much business doing. Imports are stopped for the time and domestic shipments are chiefly on contract. Quotations are rather nominal at 20@20½c. per lb. for No. 1 ingots.

Antimony—A fair business is being done and prices are a little easier, but still rather nominal. Ordinary brands are 14@15.50c. per lb. For Cookson's 17@18c. per lb. is asked, and 16@16.50c. for other special brands.

Quicksilver—The market here continues very strong, the metal being held at $90@100 per flask of 75 lb., New York. All business in London is stopped and exports are prohibited.

Gold, Silver and Platinum

Silver—Messrs. Handy & Harman make the following statement on Aug. 26, regarding the silver-market situation: During the past week the spot quotation for silver in London was established as follows: Aug. 19, 26½d.; 20, 26d.; 21, 26d.; 22, 25⅞d.; 24, 25 9/16d.; 25, 24⅞d.; 26, 25d. These were prices at which spot silver or silver for immediate delivery in London could be sold on the days mentioned.

Owing to delays in cables and uncertainty in the matter of shipment on account of war risks and the sale of foreign exchange, no New York official quotation, however, was made until Aug. 22, when the New York official price was established at 56c., based on the London price of Aug. 21, of 26d., at which large sales were made. On Aug. 24, the New York official price was quoted at 55¾c., based on the London quotation of Aug. 22, of 25⅞d. On Aug. 25, however, owing to the more prompt deliveries of cables, the New York official price was established at 53⅝c., based on the London quotation of the same date of 24⅞d., and today at 54⅜c., based on London quotation of 25d. of same date.

As the general situation has cleared up somewhat and shipments of silver in large quantities to London are being made and sales of silver have been effected in London at the official quotation, it was deemed advisable by various interests, to issue a New York official price based on actual transactions in London, after taking into consideration the extra expense of shipments, owing to war risks for freight and insurance.

The London market for silver is very sensitive and uncertain and is subject to wide fluctuations, owing to financial conditions. At present the demand for silver in London for export to the Far East is nil, owing to the risks of shipment and also the high price for silver, at which price the Eastern Exchanges do not warrant purchases of silver for the present. The present demand for silver in London is for coinage purposes and already the English Mint has bought largely and there have also been executed large orders for Continental demands. It is likely that such a demand from various countries will continue, but these orders are very uncertain, and with the large arrival of silver by American shipments and silver being pressed for sale, the price has been forced down. It is probable that there will be consid-

DAILY PRICES OF METALS

NEW YORK

			Copper	Tin	Lead		Zinc	
Aug.	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
20	*	*	*	†46	3 87½ @3 90	3 70 @3 75	5 85 @5 90	5 70 @5 75
21	*	*	*	†42	3 90	3.70 @3 75	5 85 @5 95	5 70 @5 80
22	*	56	*	†42	3 90	3 70 @3 75	5 85 @5 95	5 70 @5.80
24	*	55¾	*	†40	3 90	3 70 @3 75	5 95 @6 15	5.80 @6.00
25	*	53⅝	*	†39	3 90	3 70 @3 75	6 00 @6 25	5 85 @6 10
26	*	54⅜	*	†39	3 90	3 70 @3 75	6 00 @6 25	5 85 @6 10

*No quotations †Nominal.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St Louis is given as the basing point. St Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

erable curtailment in the production of silver, owing to the closing down [illegible] copper silver bearing mines, and also owing to the difficulty of obtaining certain material necessary for smelting and refining operations.

During the last week refiners have been shipping silver to Europe in large quantity in American ships and have been selling almost entirely to the foreign mints. These shipments apparently overstocked the London market, wherefore the sharp decline on Tuesday. As yet there is no Indian demand. The first shipments to Europe were on consignment. Later the London market opened to the extent of dealings in the ordinary contracts for prompt, or two-weeks' deliveries, but there are not yet any dealings in futures. The wild fluctuations in exchange render the international business very much of a gamble. Handy & Harman are computing the New York official price on the basis of exchange at 4.90.

Shipments of silver from London to the East, Jan. 1 to Aug. 13, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£4,393,500	£4,454,500	I. £61,000
China	507,000	42,000	D. 465,000
Total	£4,900,500	£4,496,500	D. £404,000

The stocks in London when shipments were interrupted by war were close to 5,000,000 oz., but are now considerably reduced.

Platinum—So far as the foreign market is concerned, there is no change, and no quotations are available. The prices here have been advanced to cover war risks, insurance and uncertainty of supplies. Dealers are quoting prices only for immediate delivery, at $50 per oz. for refined platinum, and $57.50 for hard metal, 15% iridium.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Aug. 22

The base price paid this week for 60% zinc ore was $45@46 per ton. The base price paid for 80% lead ore was $46 per ton.

SHIPMENTS WEEK ENDED AUG. 22

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,236,200	....	169,600
Year	98,698,050	3,520,500	23,844,570

Shipped during week to separating plants, 2,982,390 lb. zinc ore.

JOPLIN, MO.—Aug. 22

The high price of blende advanced to $51, and the assay base ranges $45@49.50, with the metal base $44@46 per ton of 60% zinc. Calamine sold $23.50@25 per ton of 40% zinc. The average selling price of all grades of zinc is $43.48, an increaseof $4.58 per ton over the previous week. Sellers are generally controlling the market, withholding ore from sale until a suitable advance is made. The high price of lead ore is $47.75, and the base continues at $46 per ton of 80% metal content. The average selling price of all grades of lead is $45.80 per ton.

SHIPMENTS WEEK ENDED AUG. 22

	Blende	Calamine	Lead	Values
Total this week..	9,376,440	1,111,200	1,518,460	$253,800
Total this year...	345,869,660	25,553,020	58,762,490	8,465,180

Blende value, the week, $204,740; 34 weeks, $6,675,220.
Calamine value, the week, $14,285; 34 weeks, $291,090.
Lead value, the week, $34,775; 34 weeks, $1,398,870.

IRON TRADE REVIEW

NEW YORK—Aug. 26

The iron and steel trades are still in uncertain condition. New orders are not plentiful, but specifications on contracts are coming in more freely.

The ferromanganese situation is easier, and supplies are not to be as restricted as was expected. Manganese ore from Brazil is expected to come here more freely, and it is proobable that both spiegel and ferro of domestic make will be available before any actual scarcity is felt.

Export trade is likely to increase, English firms having already contracted for some tonnage of billets and sheet bars. They have been taking good quantities of this kind of material from Germany and Belgium, and those supplies are entirely cut off.

Imports at Baltimore for the week included 1350 tons ferromanganese from Middlesboro, England.

PITTSBURGH—Aug. 25

While the changes in the actual situation have not been strongly marked, there is a more optimistic feeling and the disposition generally is to look for improvement in the trade. Inquiries for material are increasing, and many promise to develop into orders; while specifications on contracts are heavier. Buyers are still rather conservative, but are evidently feeling the effect of the improving financial conditions and the gradual settlement of uncertainties.

Fears of a shortage of ferromanganese are less prominent than they were, and it is now believed that surplus will be availablet, though prices will remain high.

There has been much talk of export trade, but the only inquiries actually received so far are for some quantities of steel billets. It is now believed that arrangements for shipment can be made without difficulty, though freight rates are likely to be high for some time to come.

The steel mills continue to run at about 70% of capacity, and some report even a higher rate. Operations seem likely to increase.

Pig Iron—The market remains extremely quiet, though with prices holding steadily. Shipments are at about the former rate, but all consumers are conservative. We continue to quote: Bessemer, $14; basic., $13; malleable, $13@13.25; No. 2 foundry, $13@13.25; forge, $12.50@12.75, f.o.b. Valley furnaces, 90c. high delivered Pittsburgh.

Ferromangnnese—There has been a few more resales at varying prices, and it is believed that the market has passed its high point, and that supplies will soon be available.

Steel—There is nothing new, and the market remains quotable at $20 for billets and $21 for sheet bars at mill, Pittsburgh or Youngstown.

COPPER SMELTERS' REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, d in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments.	2,069,960	1,279,537	585,387	1,114,758	2,879,396
Anaconda.... .	23,800,000	22,900,000	23,500,000	23,800,000	
Arizona, Ltd...	3,286,000	3,570,000	3,092,000	3,742,000	3,300,000
Copper Queen. ..	7,637,042	7,562,723	8,388,203	7,613,719	7,817,318
Calumet & Ariz..	5,875,000	5,450,000	5,495,000	4,630,000	5,940,000
Chino......	5,399,814	5,926,591	5,496,875	5,486,119	. .
Detroit. .	1,973,725	1,790,926	2,105,034	2,129,100	1,966,526
East Butte.	1,546,180	1,178,000	1,179,762	1,215,323	....
Giroux. ..	287,980	45,948	429,553	425,000	....
Mason Valley	1,250,000	862,000	916,000	950,000	....
Mammoth.	1,800,000	1,850,000	1,750,000	1,725,000	1,950,000
Nevada Con.	5,218,257	4,880,043	4,959,589	4,483,175	. . . . ..
Ohio.....	597,520	610,518	625,000	605,000	. ....
Old Dominion.	2,997,000	2,779,000	3,302,000	2,937,000	2,962,000
Ray.	6,036,908	6,089,362	6,300,847	5,941,567	....
Shannon	1,082,000	1,012,000	1,056,000	1,049,227	.. ..
South Utah	406,381	247,641	55,394	84,000	. . .
Tennessee.... ...	1,262,184	1,370,800	1,336,950	. . ..	...
United Verde*	3,100,000	3,000,000	3,100,000	2,900,000	. ..
Utah Copper Co	12,323,493	12,759,757	13,208,483	12,870,063	.. ..
Lake Superior*. ..	11,000,000	13,000,000	12,500,000	16,000,000	....
Non-rep. mines*..	8,200,000	8,000,000	8,200,000	8,000,000	....
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	. .. .
Total prod. . .	109,649,444	108,644,846	110,082,077		..
Imp., bars, etc.	22,676,605	17,043,191	19,081,487	23,885,521	... ..
Total blister..	132,326,049	125,688,037	129,163,564	...	. . . .
Imp. ore & matte.	7,029,646	10,400,122	10,586,506	9,157,540	....
Total Amer...	139,355,695	136,088,159	139,750,070	.....	....
Arrivals-Europe†	17,572,800	17,299,520	13,558,720	19,040,000	....

† Does not include the arrivals from the United States.

Assessments

Company	Delinq.	Sale	Amt.
Alta, Nev.	Aug. 18	Sept. 11	$0 03
Aurora-Sampson, Ida. (post)	July 18	Sept 18	0 002
Buffalo, Mont. ..	Aug. 2	Sept. 2	0.004
C. & R., Ida	Aug. 18	Sept. 8	0 001
Cons. Imperial, Nev.	Aug. 18	Sept. 10	0 01
Con. Virginia, Nev.	Sept. 3	Sept. 24	0 10
Eagle Mountain, Ida.	Aug. 22	Sept. 22	0.001
Emerald, Utah.....	Aug. 15	Sept. 12	0 0033
Exchequer, Nev.	Aug. 13	Sept 3	0 02
Huron, Mich (Iron).	...	....	3%
Hypotheek, Ida	Aug. 17	Sept. 15	0 01
Idaho & Los Angeles, Ida	Sept 7	Sept. 25	0.005
Laclede, Ida. . ..	Aug 21	Sept. 14	0.005
Lehi Tintic, Utah. .	Aug 12	Sept. 17	0 0025
Lower Mammoth, Utah	Aug. 14	Sept. 7	0 01
Lucky Calumet, Ida.	Aug. 21	Sept 21	0 005
Maryland, Ida .	Aug 5	Sept. 5	0.003
Monarch-Pittsburgh, Nev	Aug. 17	Sept. 21	0 01
Mullan, Ida	Aug. 8	Sept. 8	0 002
New Hope, Ida (post)	July 13	Sept. 11	0 002
North Star, Ida .	Aug. 8	Sept. 10	0 0015
O. K., Utah	Aug. 17	Sept. 2	0 005
Ophir, Nev .	Aug. 21	Sept. 14	0 10
Plutus, Utah..	Aug. 28	Sept. 15	0 002
Providence, Utah	Aug. 3	Sept. 2	0 00125
Rockford, Ida.... .	Aug. 14	Sept. 4	0 0015
Sandstorm-Kendall, Nev.	Aug. 10	Sept. 14	0.01
Sierra Nevada, Nev.......	Aug. 18	Sept. 8	0.010
Tintic Standard, Utah.	Aug. 10	Sept. 14	0.005
Torino, Ida..	Aug. 10	Sept. 10	0.001
Tuscumbia . .	July 10	Sept. 8	0 003

The Engineering and Mining Journal

VOLUME 98 SEPTEMBER 5, 1914 NUMBER 10

Zinc Mining in Tennessee

By A. H. Purdue*

SYNOPSIS—Ores, consisting of smithsonite, calamine and sphalerite, sometimes with galena and pyrite, are found deposited upon "pinnacles" and in pockets and in residual clays from Knox dolomite. Principal commercial deposits are worked by the Grasselli Chemical Co. and American Zinc Co. of Tennessee.

* * *

The zinc ores of Tennessee that occur in commercial quantities are found in the valley of East Tennessee, and mining has been confined to that part of the valley lying northeast of Knoxville. The westernmost points where commercial ores have been found are on Powell River, in Union and Claiborne Counties, and the easternmost at Embreeville, Washington County. The extreme width of the zinc area is perhaps 40 miles, and the length 80 miles.

New Prospect Mine

Showing inner end of open cut

A Brecciated Pinnacle

Common to zinc pits of eastern Tennessee

Ores Occur in Dolomite

With the exception of those at Embreeville, the ores occur in Knox dolomite, a formation which, according to Arthur Keith, exceeds 3000 ft. in thickness, and which, according to the same authority, is of Cambrian age in its lower and Ordovician in its upper part. The deposits along Powell River, in the western part of the area, and those on Straight Creek, in Claiborne County, occur near the base of the formation, and most of those in the eastern part of the area, not far from the top. Those at Embreeville occur in what Keith calls the Shady limestone, a formation older than the Knox dolomite.

The wide area over which the ores occur is due to the great thickness of the formations containing them, to their occurrence at different horizons, and to the comparatively small amount of folding the ore-bearing formations have suffered. But while the folding has been small as compared with other parts of the Appalachian area, actually it has been considerable, and accompanying the folding there was much faulting and shearing. In places, as at New Prospect mine on Powell River, the shearing was sufficient to polish and slickenside the bed that forms the floor of the mine. The folding, faulting and shearing resulted in profound fracturing of the brittle rock beds and the promiscuous rotation of the pieces. These were subsequently cemented into breccia by calcite and dolomite, whether the one or the other, apparently depending upon the nature of the beds in which the cementation took place. The general direction of the faults is that of the strike of the rocks, namely, northeast and southwest.

Faults as Guides in Prospecting

The area, as a rule, is covered with a thick mantle of soil, which renders prospecting difficult. There is good reason to believe that this heavy soil mantle has many valuable ore deposits hidden in and beneath it. As guides in seeking them, the prospector should make use of the maps of the several folios of the area, published by the U. S. Geological Survey. For the prospector, the most important feature of these maps is the faults, for along and near them brecciation is greatest; but his work should not be confined to the faults that are mapped, for doubtless there are numerous others of smaller size that have to the present escaped the geologist, and which may bear ore. Of course, it must be understood that all the faulted areas will be barren of ore in most parts and some of them in all parts, and that failure to find ore at one point on a fault is no ground for condemning it throughout. Other criteria for the prospector are outcrops of breccia, whether ore bearing or not, in stream beds, and on hillsides, and the occurrence of smithsonite in the soil of hill slopes. The detection of the latter will require the closest observation.

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*State geologist, Nashville, Tenn.

The commercial ores of the area consist of sphalerite, smithsonite and calamine. As would be expected, the first named occurs in the breccia, and the others in the residual clays and on or near the surface of the limestone beneath. The sphalerite ores near the base of the Knox dolomite are associated with pyrite and galena, while those from near the top of the formation are usually free from both of these minerals.

Description of Ore Occurrence

In the weathering of the limestones, their surfaces have taken the usual form produced by solution, namely, that of numerous "pinnacles" and their complementary pockets, as shown in Fig. 1. The smithsonite or calamine, as the case may be, occurs mainly in the clay of the pockets, but the tops of the pinnacles may be crusted over with ore, and even the sides may contain some. It must not be understood that all the pinnacles or pockets of any mine are productive. On the contrary, many of both contain none at all. The presence or absence of ore is thought to be due mainly to the difference in underground flowage conditions over the different pinnacles and through the different pockets, but as one looks at these ores in the mines, he is impressed with the suggestion that there is some connection between the rate of limestone weathering and deposition of the oxidized ores. The crusts of ore adhering to the pinnacles are as a rule on more or less disintegrated parts of the rock.

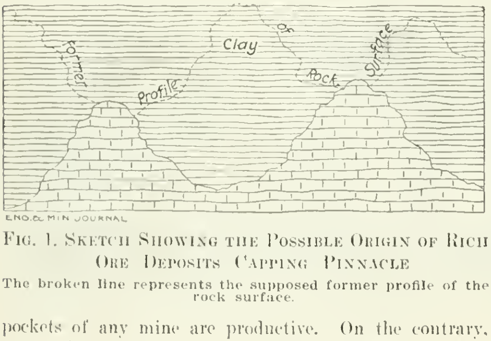


Fig. 1. Sketch Showing the Possible Origin of Rich Ore Deposits Capping Pinnacle

The broken line represents the supposed former profile of the rock surface.

A striking feature of these oxidized ores is their frequent occurrence on the tops of the pinnacles. These are the parts that now are reached by the smallest amount of ground-water, and the parts where such water lingers the shortest time. The ore could not have been deposited from super-saturation after the pinnacles were formed, and most of them are out of reach of surface evaporation, thus eliminating that process as a possible means of precipitation. The upper parts of the pinnacles are frequently lithologically like those below, so that the chemical reactions between rocks and solutions are the same in both parts. I cannot account for these deposits under present rock surface conditions. The explanation that has been offered is that the ore now constituting the caps was deposited in pockets, and being less soluble than the limestone beneath, protected it chemically, while the adjacent pinnacles were converted by solution into pockets. The supposed process is analogous to the manner in which a boulder on clay will protect the material beneath from the mechanical beating of the rain drops, thus forming a stone-capped column.

Zinc Mining Began 30 Years Ago

Northeastern Tennessee began to attract the zinc miner at least 30 years ago. One of the first if not the first mine to be worked was New Prospect mine, on Powell River, in Union County. This was opened in 1883 and worked at different times till 1901, since which time it has been idle, with the exception of three weeks in 1903. The ore was recovered from brecciated limestone, apparently magnesian, most parts of which were very rich. The ores are sphalerite and galena, with their oxidized products, smithsonite and cerussite. The accompanying minerals are dolomite and iron sulphide. Incidentally, it should be said that prospects in this locality are reported to have been worked for lead during the Civil War.

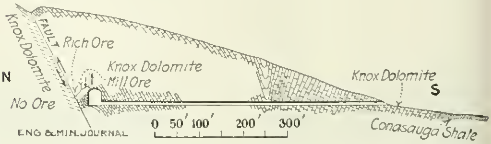


Fig. 2. Section of the Straight Creek Mine

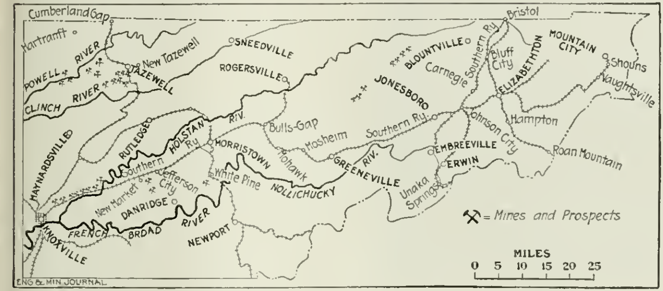
Subsequent to the opening of New Prospect mine, others were opened in the Holston River area, near Mascot, New Market, Jefferson City and other places, as well as in the Straight Creek area in Claiborne County. The mines of the Holston River area were mainly smithsonite producers, most of the ore having been recovered from the residual clay of the Knox dolomite. In the Straight Creek area, the ores were recovered from the brecciated rocks along a fault. The oxidized ores in this region are smithsonite and calamine, with hydrozincite in small amount. Greenockite is not infrequently found as a yellow stain on the magnesian limestone.

At present there are three zinc mines operating in Tennessee, one at New Market, in Jefferson County; one at Mascot, in Knox County, and one at Embreeville, in Washington County. The one at New Market is operated by the Grasselli Chemical Co., and produces smithsonite. The ore is recovered from the residual clay of the Knox dolomite and from the surface of the underlying rocks. It is taken from open pits, where the expense of removing the overburden will permit; elsewhere, from shafts and drifts. The material as it comes from the mine is first run through a log washer, then over the sorting belts, thence in order to the crusher, jigs and tables. The success of the mine is due to the efficiency of the mining and the milling. In less skillful hands, it would be a money loser instead of a money maker.

Operations at Mascot on a Large Scale

The property at Mascot is operated by the American Zinc Co. of Tennessee, a subsidiary of the American Zinc, Lead & Smelting Co., and which, since 1911, has expended much money in prospecting and development work. All the ore now being mined by this company is sphalerite. It is claimed that a large tonnage of rock that carries 3½% of ore has been blocked out. The company is now operating a mill of 1000 tons daily capacity, but intends to enlarge it later. As this company is one of wide experience, and as the prospecting work was done carefully and systematically, it appears that the zinc mine at Mascot can be classed among the important ones of the country.

From the historic point of view, the mine at Embreeville is most interesting. For something like 70 years, this property has been operated more or less of the time, for iron. The ore, which is limonite, occurs in residual clay overlying limestone. The surface of this limestone contains the usual pockets and pinnacles common to such rock when it is the surface formation. From many acres the soil has been removed, the bare pinnacles presenting a scene of desolation. In December, 1912, it was discovered that, hugging the limestone pinnacles and pockets, there are large quantities of calamine. At present, this is mined by removing the overburden, picking the lumps out by hand and sacking the fine material. The ore now being taken out is shipped without milling. There is no doubt but that during all the years that this mine has been operated, large quantities of zinc ore have been dumped into the blast furnace with the iron ore and the zinc volatilized. While I have not spent the time at the mine necessary to enable me to speak with confidence, I am of the opinion that there yet remains a large amount of zinc, and that the property will hereafter be operated as a zinc mine, with iron as a byproduct. A more complete description of this mine will be the subject of a subsequent article.



Map of Zinc Mines and Prospects in Eastern Tennessee

The 30 or more prospects and mines in northeastern Tennessee, the three mines now successfully operating, two of which appear to be of large size and to promise long life, together with other promising areas as yet unprospected, seem to establish the area as one of the important reserve zinc fields of the country. In its development many failures will be prevented if the public can know that as a rule the area will furnish few if any "poor man's camps." There may be places where the oxidized ores can be removed in a small way from the residual clay, but the prospecting for sphalerite and its subsequent mining will require large capital expended under the advice of the best geologists and the most experienced engineers.

Acts of Unregistered Company

Under the statutes of Idaho a nonresident corporation which has not filed a copy of its articles of incorporation with the secretary of state, and appointed an agent upon whom legal process may be served, is not only not entitled to transact business in the state, but a deed of mining or other property to it is void. (Idaho Supreme Court, Dickens-West Mining Co. vs. Crescent Mining & Milling Co., 141 *Pacific Reporter* 566.)

Raritan Copper Works Equipment*

The Raritan Copper Works is incorporated under the laws of New Jersey, with an authorized capital of $1,500,000. The International Smelting & Refining Co. owns 60,000 shares, being all of the issued stock, 40,000 common, and 20,000 six per cent. preferred, of the par value of $25 per share. The Raritan Copper Works in turn owns the entire capital stock of the Raritan Terminal & Transportation Co., a New Jersey corporation, whose authorized capital is $40,000.

The Raritan Copper Works is located at Perth Amboy, N. J., on New York harbor; it was completed in 1899 and has since been enlarged to a capacity of 35,000,000 lb. of refined copper monthly.

The melting department consists of seven casting furnaces of a capacity of 1250 tons per day, the electrolytic refinery consists of two tank houses with their respective power houses; No. 1 tank house contains 1800 tanks, eight electric cranes, and is 210x582 ft.; No. 1 boiler room is 169x42 ft. 4 in. and contains 10 B. & W. boilers with a rated horsepower of 3600; the forced draft of the boilers is supplied by three fans driven by 50-hp. vertical engines.

There is a brick stack 175 ft. high, 8 ft. in diameter. No. 1 engine room contains six units, four 4-cylinder triple-expansion Nordberg engines and two Ball & Wood automatic vertical engines; the condensing plant contains four Allis-Chalmers condensers and two Buckley condensers; there are six switchboards with circuit-breakers and switches, and an 800-cu.ft. air compressor for emergency service.

There are also centrifugal pumps for the high- and low-pressure water system, and two underwriters' pumps; No. 2 tank house is 145x585 ft., and contains 1188 tanks, and two 10-ton cranes; No. 2 power house has a boiler room 260 ft. 4 in. long by 52 ft. 10 in. wide, equipped with nine 400-hp. B. & W. boilers and one Greene and one Stuyvesant economizer; there is a steel brick-lined stack 220 ft. high, 13½ ft. inside diameter; three forced-draft fans of 40,000-ft. capacity each.

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*From the application of the Anaconda Copper Mining Co. to list 330,000 shares of additional stock on the New York Stock Exchange.

New Butters Filtering Process

Some time ago Charles Butters patented a new filter leaf, which has already been described in the JOURNAL*. Butters has now extended the idea and devised a complete process of filtering, which he believes differs essentially from the one formerly used. He has found that internal pressure is not necessary to reliable cake dislodgment within an economical time, and that complete success can be obtained by saturation of the entire area of the filter medium. It appears desirable, however, to have the external and internal pressures equalized, and he accomplishes this by allowing communication between the external and internal water. The cake discharge under this system is made in a tank of water. The leaf already mentioned is used in the process, and with it no back pressure is attainable since the cover is open at the bottom. (U. S. pats. 1,100,221 and 1,100,223).

He has found by experiment that the difference in specific gravity of the dirty wash water in the tank and the relatively clean water used for dislodging the cake would be sufficient to maintain a column of the clean water inside several inches higher than the level of the tank wash water, so that the relief valve and inlet for the cake-discharge water may be several inches above the surface of the tank water without producing greater pressure inside the leaf than outside. This fact has been taken advantage of, since it gives considerable latitude between the level of the tank wash water and that of the entrance to the relief valve and that of the funnel valve through which the discharging water is supplied to the leaf, thus preventing the entrance of the tank wash water into the leaf, while at the same time preventing excess of internal pressure. It is quite possible with this type of leaf to saturate completely the entire filter surfaces during the dislodging step, because the air is permitted to escape through the relief valve. Since there is never any internal pressure, a lighter filtering cloth may be used and all means heretofore required to prevent distention may be dispersed with, and the filtering surface may be smooth, clear of bracing, stitching and other surface-roughening means which have formerly been used.

The process depends upon several steps, among which may be mentioned the step in slimes treatment which consists in running water through the filtering means, while submerged in the slime. The process of filtering slimes, which consists of running clean water through the filtering means while submerging it in the slimes, creating difference in pressure between the two sides of the filtering medium to form a cake, and subsequently filling that means with water to discharge the cake. The process of filtering slimes, which consists in running water through the filtering leaf while submerging it in the slimes, decreasing the internal pressure and then permitting the escape of air from the leaf while completely filling it with water to clean the filtering medium. The process of dislodging slimes cakes from filter media is by saturating the media, and while doing so equalizing the pressures on the cake and the media. The process of dislodging slimes cakes from filter media by saturating the media while the cake and the media are submerged and equalizing the hydrostatic pressures thereon. The process of submerging a filter medium in slimes, forming a cake on it, washing the cake while submerged, saturating the entire area of the medium and equalizing the hydrostatic pressures on the medium and cakes.

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*"Eng. and Min. Journal," Dec. 6, 1913.

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Canadian Iron in 1914

The make of pig iron in Canada in the first half of 1914 is reported by the American Iron & Steel Association, as below, in long tons. Comparisons are made with the first half of 1913:

	1913		1914		Changes
	Tons	%	Tons	%	Tons
Basic	292,625	53.6	197,806	44.7	D. 94,819
Bessemer	125,052	22.9	126,040	28.5	I. 988
Foundry	128,293	23.5	108,058	24.4	D. 20,235
Miscellaneous	11	....	10,526	2.4	I. 10,415
Totals	545,981	100.0	442,430	100.0	D. 103,551

Foundry iron includes a small quantity of ferrosilicon. Miscellaneous includes white and mottled iron and ferro-alloys. The total decrease from the second half of 1913 was 26,707 tons. Of the iron produced this year, 433,733 tons were made with coke and 8697 tons with charcoal or in the electric furnace.

Of the 442,430 tons of pig iron produced in the Dominion in the first six months of 1914, 281,030 tons were delivered to mixers, openhearth furnaces, foundries, etc., in a molten condition, 123,397 tons were sand cast, 37,994 tons were machine cast, and 9 tons were direct furnace castings. The iron made for consumption by the makers, in steel furnaces, forges, etc., was 323,855 tons, or 73.2%; for sale, 118,575 tons, or 26.8% of the total.

There were 11 furnaces active in 1914, running an average of 152.8 days. This gives an average of 263 tons per furnace a day. The total number of completed stacks in the Dominion is 22, of which 17 burn coke and 5 charcoal. Two electric plants are in use, making ferrosilicon and ferrophosphorus.

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Utilization of Copper-Nickel Ores

In the recent patents of George M. Colvocoresses (U. S. pats. 1,106,785 and 1,106,786), new methods of treatment of basic ores containing copper, nickel and iron are laid down. Such ores are those of Sudbury. In the first patent he specifies crushing to below 20-mesh, roasting off the sulphur to under 1%, then smelting to a ferro-copper-nickel, with suitable flux, and refining the ferro alloy in the electric furnace, producing a final alloy containing 1.5 to 12% of cupronickel, according to original tenor of the ore.

Examples of ores treated and alloys produced are given:

	Per Cent.					
	Fe	Ni	Cu	S	SiO_2	C
Ore No. 1	50	1.5	0.4	29	10	...
Metal No. 1	96.35	2.8	0.75	..	..	0.1
Ore No. 2	46	2.0	0.5	25	20	...
Metal No. 2	94.8	4.0	1.0	..	..	0.2
Ore No. 3	40	2.5	1.0	20	32	...
Metal No. 3	91.4	6.0	2.2	..	..	0.4

The alloys are said to be white, less corrodible than steel and of great strength.

The second scheme consists in smelting the Sudbury ores, as at present, for a copper-nickel matte, but producing as basic a slag as can be economically handled, and without attention to metal loss. This foul slag is then smelted to a low copper-nickel pig iron, which is then refined electrically.

Globe Consolidated Mill, Dedrick, Calif.

By H. A. Morrison*

SYNOPSIS—The first modern, all-slime cyanide mill in northern California. Motive power is from water wheels directly, no electrical transmission being used. Standard practice is followed absolutely in the mill, there being no novelties. Precipitate is shipped to smelter, instead of being melted and refined at the mill.

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Under the management of Wallace Macgregor, the new 100-ton cyanide mill of the Globe Consolidated Mining Co. was completed and commenced operations last November. There were many special problems to be solved, but under supervision of H. S. Payson, the plant has met all expectations and has been operating smoothly.

The mill site slopes at 36° toward Cañon Creek, and the lower floor is about 200 ft. from that stream. On account of the steep slope and heavy snow fall, a large amount of lumber was considered advisable and 300,000 ft. was used. In addition, it may be mentioned that the company's own saw mill is on the same site and the whole country is heavily timbered. The building is double-boarded and roofed with galvanized corrugated iron.

The least charge for hauling from Redding, 75 miles distant, the nearest railroad point, is 2c. per lb. Cement retaining walls for the many high banks were, therefore, not to be considered, and timber has been found a good substitute. The excavations are in hornblende schist and stand fairly well if only slightly supported. At the foot of the banks, double 2-in. plank lagging was placed behind the heavy posts of the regular framing plan. Whenever the planks begin to weaken, they can readily be replaced by the familiar methods of the mine timberman.

The Globe Consolidated Mill, Dedrick, Calif.

Power from Impact Water Wheels

All machinery is driven by Hendy impact water wheels. Seven wheels of from 10-100 hp. are used. Water is diverted from Cañon Creek one mile above the plant and carried in a flume along the opposite side of the cañon to a point across from the mill. Here the penstock is placed and from it, a 20-in., inverted siphon conveys the water across the deep cañon and up the other slope to the water wheels. In the bottom of the cañon the head is 600 ft. and at the battery water wheels the pressure is 175 pounds.

The flume is 6800 ft. long 2x4 ft. in cross-section, and laid with a grade of 3½ in. per 100 ft. Selected fir lumber was used for the boxes, which are each 12 ft. long. All material for this flume was delivered at the penstock over a single span cable-way, 2200 ft. long. A small double-drum hoist for this work was improvised from the parts of two derricks and worked splendidly, using water power. The method used in flume construction was carefully formulated before work started and gratifying results as to cost and time were obtained. Placing of trestles, stringers and ties was started at the penstock, the floor only being placed upon the ties as the work advanced toward the intake. This provided a good runway four feet wide upon which small, four-wheeled trucks, propelled by one man, carried lumber to the increasingly distant points of activity. Against the moderate grade, one man readily handled a stiff load. When the flooring reached the intake, construction of the sides was started and the carpenters worked back down to the penstock, completing the flume as they retreated. Floor and side cracks were battened as needed, and spillways were put in at frequent intervals. Water was admitted as soon as a spillway was left behind the carpenters, and allowed to overflow there until the flume was completed down to another. This practice, together with the use of freshly sawed, green lumber, obviated any serious leakage.

Aerial Tramway for Ore Transport

A double rope aërial tramway, made and installed by the Painter Tramway Co., of San Francisco, transports ore from the mines to the top floor of the mill. The terminals are 6000 ft. apart and the fall is 2500 ft. The longest single span is 702 ft. and in some places the grade is as much as one to one. Nineteen, 10-cu.ft. buckets are used, special care having been taken to so design the grips that they would be positive in action and exert constant pressure on the pulling rope and at the same time, be easily detached from or placed on the line. They have proved entirely satisfactory notwithstanding the heavy strain. Heavy snow fall had to be reckoned with, slides being not infrequent, and the 20 supporting towers were built of heavy fir timber and securely bolted together. Erection was in charge of W. S. Standish, and miracles of labor were performed in assembling and erecting the towers and placing the cables. All freight for the mine is carried up on the returning buckets. The loading terminal is peculiar in that it is well underground in one of the mine tunnels. Buckets are automatically detached at that point and pushed into the tunnel 160 ft. to the main ore chute where they are loaded. At the lower terminal, ore is dumped upon a grizzly and runs into the crusher ore bin. When operating at its rated capacity, 100 tons on 8 hr., this tram is expected to generate 40 horsepower.

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*Dedrick, Calif.

Ore Treated As Total Slime

Standard practice has been followed throughout in mill equipment. The Gates crusher is followed by twenty 1000-lb. stamps, crushing in cyanide solution through 16-mesh screens. Pulp from the batteries is classified by a Dorr classifier, coarse sand going to the 5x22-ft. Chalmers & Williams tube mill, and slime going to two Dorr thickeners. The tube mill operates in closed circuit and does excellent work although pebble consumption is rather high. Thickener overflow is practically clear solution, and goes direct to the zinc boxes. Underflow has a specific gravity of 1.45 and the stream is diluted with barren solution as it passes to the agitators. There are three of these, of Dorr make, and they are operated in series, the contained pulp having a gravity of 1.35. The method of transfer from one to the other is ingenious and original in this plant and there is no accumulation of heavy material, as might at first be expected. Transfer is effected as shown in the drawing, and further description seems unnecessary.

High-Pressure Pipe Trestle, 600 Ft. Head

After leaving the agitators, barren solution is again added to the stream entering the two lower thickeners. Solution overflow from the latter goes to the gold solution storage tank and the thickened pulp flows to an Oliver filter. All of the Dorr machines are doing excellent work, the agitators in particular. Recently the power flume was put out of commission by a small snow slide and a falling tree. No power was available for any of the mill machinery during a period of 72 hours. The air lifts were first started in the agitators and operated two hours, at the end of which time they were raising a moderately fluid stream—then the stirring arms were easily started at normal speed, and in another hour the charge was in perfect agitation. The thickeners were all started without trouble, meeting the severe test without a tremor.

Continuous Filtration of Residues

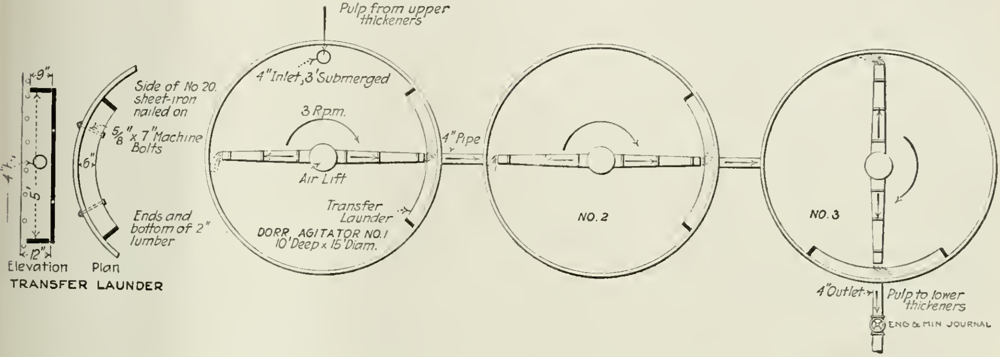
The large Oliver filter in this plant has justified its selection. Globe slimes are particularly fast settling and it has been difficult at times to keep the charge from accumulating in the filter tank. A system of air lifts will probably be put in with the object of overcoming this difficulty. Frequent scrubbing of the filter cloth with dilute hydrochloric acid is found necessary.

Close View of the Globe Mill

Zinc-Box Precipitate Shipped

Solution from the upper and lower thickeners and the filter is collected in a 12x26-ft. gold-storage tank placed on the filter floor. All solutions entering the gold tank are clarified by passing up through a filtering medium of burlap and excelsior which occupies 3 ft. in the bottom of the tank. From the gold tank all solutions gravitate to 8 steel zinc boxes where standard practice is followed. In cleaning up, the gold precipitate and short zinc are washed through metal-lined launders to a steel clean-up tank. A small triplex pump raises this material to a home-made vacuum filter, vacuum being supplied by the ejector on the Oliver filter. This does not interfere in any way with operation the of the Oliver, since the vacuum averages about 25 in. The product is dried and shipped to the Selby smelter. Acid treatment is not used largely because of high freight rates, but also because that method entails considerable additional consumption of zinc.

Solution effluent from the zinc boxes is collected in three steel sump tanks and from this, the lowest floor, is raised back to the battery tank by three 5x6-in. Deane triplex pumps, two being in operation constantly. Cyanide is added in the sumps to bring the strength to 1.4 lb. of sodium cyanide per ton, and in the central sump, to which the pumps are connected, an air lift secures uniform mixing of solution. 4-in. pipe forms the central column, and from the top of this column, 6 in. below the rim of the tank, two arms radiate to a point one foot from the sides of the tank. Air enters through a ½-in. pipe at the foot of the 4-in. column.



System of Continuous Agitation through Dorr Machines with Special Transfer Launders

Operations cover too short a period to give more than approximate figures at this time. The indicated recovery exceeds 94%, and 0.5 lb. of sodium cyanide, 5 lb. of lime, and 4-5 lb. of Danish pebbles are consumed per ton of ore treated.

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Removed Ore as a Part of Realty

By A. L. H. Street*

Where an owner of a mine removes ore and places it on a dump on the premises, preparatory to the removal of a better grade of ore, and the mining property is subsequently sold, does the ore so removed belong to him or to the purchaser of the mine? This question was lately passed upon by the Arizona Supreme Court in the case of Steinfeld vs. Omega Copper Co., 141 *Pacific Reporter* 847, and the decision is: "The vital fact to be determined is whether the ore was so annexed to the realty and remained so annexed thereto as to become a part and parcel thereof. If so, it passed with the conveyance of the mines. The intention with which the owner of the property extracted the ore from the ground and the purpose and intention of the owner with which it was placed on the dump is controlling in arriving at a solution of the question of whether the ore after having been extracted and placed on the dump was personalty or realty." The court finds that the grantor cannot retain title to the ore by mere mental reservation, and that mere extraction of ore without proof of intention presently to sever it from the realty does not change its character into personalty.

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Wedge Furnaces at Humboldt, Arizona

By G. M. Colvocoresses*

In January, 1914, the Consolidated Arizona Smelting Co., started to make over its plant at Humboldt, Ariz. The first unit of the renovated plant consisted of one circular roasting furnace and a reverberatory furnace 60x19-ft. hearth measurements.

The roaster was manufactured by the Wedge Mechanical Furnace Co., of Philadelphia, and has a diameter of 22 ft. 6 in., is fitted with seven hearths besides a drying hearth at the top. The arms of the furnace are air cooled. The air is supplied by a rotary blower, delivering about 3000 cu.ft. of air per min. through an 8-in. galvanized-iron pipe, at a pressure of 2 oz. The furnace is supported on a step bearing instead of the trunnion bearing with which Wedge furnaces have usually been supplied.

The steel work and radial brick, designed to line the circular central shaft, were shipped by the Wedge company from Pennsylvania. The brick for the hearths and for lining the outer shell were procured locally. The erection of the steel and brick work was done under contract by the Barker Construction Co., and through its courtesy I am able to submit the actual figures of the cost of erection, all the material required for this work being supplied by the smelting company and not included in these figures, but the tools and rigging being furnished by the contractors.

COST OF ERECTING ROASTING FURNACE

Erecting steel work	$782.88
Equipping arms	42.00
Erecting brick work	932.92
Carpenter work	146.00
Supervision	273.57
Total	$2177.37

The erection of the furnace was begun on Apr. 1. and the furnace put in operation the latter part of May.

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During the first four weeks the operators were being gradually trained to handle it in a proper manner, and the tonnage was slowly worked up to full capacity. Since that time the furnace has been roasting 110 tons of charge per day. The average charge sent to the roaster is approximately 30 tons of concentrates: Cu, 11%; Fe, 28%; insol., 20%; S, 30%; 55 tons of smelting ore, approximately, Cu, 1.5%; Fe, 20%; insol., 12%; S, 20%, and 25 tons of limestone, containing 52% CaO.

The concentrates above mentioned are produced from jigs, Wilfley tables, and flotation plant. All the concentrates will pass 4-mesh screen, while approximately 40%, representing the great bulk of the flotation concentrates, will pass 65-mesh, and a large proportion of this is composed of minus 200-mesh material. Such a condition makes for heavy dust loss in the calcines. Great care must be taken in getting these to the reverberatory furnace with as little agitation as possible, and all elevators and chutes through which they pass must be calked with asbestos. Owing to insufficient storage capacity a large proportion of the concentrates fed to the roaster are wet, containing approximately 15% moisture, and the average moisture of the charge may be estimated at 7%. The ore and limerock are crushed to pass a 4-mesh screen, and an intimate mixture of concentrates, ore and limerock is made in the charge cars, elevator and bins, so that the charge goes to the roaster containing an even proportion of the constituents above named, and analyzing approximately: Cu, 6%; Fe, 20%; insol., 31%; CaO, 12%; S, 20%. Both ore and concentrates carry gold and silver.

In starting the furnace, the hearths were heated by oil burners, of which two are placed in the lowest hearth, the ports for these oil burners having been designed in constructing the furnace. Additional oil burners were inserted in the doors as deemed necessary. For the first few weeks it was frequently necessary to use oil fuel in order to keep the charge evenly heated, but since that time, and more particularly since the roaster men became accustomed to their work, the furnace has been operating entirely without fuel, and, in fact, it is frequently advisable to open the side doors a trifle in order to prevent the heat from becoming too great, and the roasting from proceeding faster than desired.

The upper or drying hearth of the furnace is cool and moist. The charge passes to the first roasting hearth with probably 1 to 2% of moisture, and immediately begins heating up until the maximum temperature of about 1450° F. is reached on the fourth and fifth hearths. The calcine slightly cools on the sixth and seventh hearths before passing out of the furnace.

As stated above, the average charge contains approximately 20% sulphur, and over a period of six weeks the average sulphur in the calcine was 5.47%, this being just about the sulphur content desired in order to mix with the unroasted charge for the reverberatory, and to produce therein the most suitable grade of matte. Occasionally the sulphur in the calcine has been allowed to go as low as 4.20%, and it seems quite certain that we could, if desired, reduce the sulphur to 1%, always without the use of any fuel.

The operation of the furnace proper requires one man on each shift, although the wet and sticky nature of the charge has made it necessary to employ a second man on the charge elevators and hoppers. The direct charge against the roasting operations over a period of six weeks has been figured as follows:

Labor ($3 per 8-hr. shift)	8.18c. per ton of charge
Electric power (1½c. per kw.-hr.) ...	3.15c. per ton of charge
Total	11.33c. per ton of charge

No charges for repairs are included in the above figures, as the repairs to date have been quite negligible and give no clue to the actual repair cost taken over any extended period. I have figures from several other plants which seem to show a repair cost on roasting furnaces of Herreshoff, McDougall and Wedge types, or approximately 2c. per ton charge. Whether or not this figure will be attained here we have as yet no means of knowing.

Just in passing it might be of interest to state that for the White-Howell roasters formerly operated in this plant the cost for fuel alone amounted to $1.25 per ton of charge, while the sulphur in a charge averaging 25% was rarely reduced below 15% in the calcine, but it is only fair to say that these old White-Howell roasters were only 32 ft. long, and were in no sense adapted to the purpose to which they were put, having been purchased second hand from another plant, in which they were installed for handling an entirely different material.

There are a great many points which have not yet been entirely determined or adjusted concerning the Wedge furnace mentioned above. The dust loss has been considerable, owing to the fine nature of the concentrate charge, and careful regulation of the draft is necessary to minimize this as much as possible. We have not yet any accurate figures covering this dust loss, nor are we able to estimate the exact cost for repairs that will be chargeable to the roasting department. We believe that the operations can be considerably improved by certain slight alterations in the mechanical arrangement and particularly by thoroughly drying the concentrates and other materials which go to make up the charge before feeding them on to the drying hearth of the furnace. This last should enable us to treat a slightly increased tonnage, and thereby make a corresponding decrease in operating costs.

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Lessor's Liability for Lessee's Improvement

An owner of a mine who has leased it is not liable for work done or materials furnished in unwatering a mine under a contract made by the lessee with a third person, unless the owner "knew or had reason to believe that the persons so furnishing the materials and performing the labor were relying upon him for pay," according to the decision of the Colorado Supreme Court just handed down in the cast of Reynolds vs. Norman, 141 *Pacific Reporter*, 466.

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British Columbia Mineral Output in 1913

Final figures have been issued by Provincial Mineralogist William Fleet Robertson on the mineral output of British Columbia in 1913. They are, arranged in order of descending value: Coal, 2,137,483 long tons; copper, 46,460,305 lb.; gold, $6,137,490, of which $510,000 is placer; lead, 55,364,677 lb.; silver, 3,465,856 oz.; and zinc, 6,758,768 pounds.

Lake Superior Iron-Mine Ventilation

SYNOPSIS—Results of field work in connection with metal-mine investigation by Bureau of Mines here presented. Conditions in the mines summarized. Gases to be expected in mine air. Effects of high temperatures and humidity. Causes of heat and of air vitiation. To remedy bad conditions air must be more generously supplied and better distributed; and the production of noxious gases must be decreased. Permissible limits in heat, moisture and CO_2 content. Remedial measures include use of fan and of completely combustible explosive.

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This paper is based upon field work undertaken in connection with the investigation by the Bureau of Mines of ventilation in the metal mines of the United States. Visits were made to most of the iron mines in Michigan and Wisconsin and to some of those in Minnesota.

All the mines visited, with the exception of two, depended on natural ventilation. Of the two exceptions, one had a blower fan installed underground, and the other used compressed-air jets. In a few cases booster fans were found in use in dead ends, especially in those immediately under the timber mat. The amount of air entering the mines per man employed underground varied greatly, but in the majority of cases was between 50 and 100 cu.ft. per man per minute.

Gases, Temperature and Humidity

The analyses of many air samples showed that seldom in the main airways did the air contain any appreciable amount of noxious gases. The only exception to this statement might be said to be in reference to the "return" air issuing from the mine after use therein; this showed a minimum of 0.2% and a maximum of 0.8% of carbon dioxide. Invariably the heavily timbered mines showed a higher percentage of carbon dioxide in the return air, than did those mines in which little timber is used.

The fresh down-cast air varied in temperature with the season of the year. At all times its humidity is comparatively low. In the heavily timbered mines, the return air ranged in temperature from 75° to 90°, and in humidity usually from 95% to 100%. In mines where little timber is used the return air is from 10° to 15° cooler.

The working places near the main air courses were found to present no abnormal conditions. However, in the dead ends, such as are encountered in driving long crosscuts or drifts, or in sublevels immediately under the timber mat, severe conditions were noted in many cases. In the heavily timbered mines, temperatures in such working places were found to range from 75° to 100° humidity from 95% to 100%. Many air samples taken from such places showed from 0.5% to as high as 3% carbon dioxide. It was found that the gases produced by blasting gave a great deal of trouble. The expedient of turning on the compressed air after blasting was not always effective.

With the exception of the combustible hydrocarbon gases reported from time to time from some of the mines situated in the carbonaceous black slate area of the Menominee range, the only noxious gas that is encountered under ordinary operating conditions is carbon dioxide. No explosive gases occur.

In addition to carbon dioxide there are produced by the combustion of explosives, depending on the kind used, varying percentages of hydrogen, methane, oxides of nitrogen, carbon monoxide, water vapor and hydrogen sulphide. For the purpose of this paper it will suffice to say that extremely small percentages of either carbon monoxide, oxides of nitrogen or hydrogen sulphide have marked effects upon the human system; 0.1% of any of these gases has a serious effect upon the miner. Experiments by the Bureau of Mines indicate that the oxides of nitrogen and hydrogen sulphide are even more dangerous, in the same quantity, than carbon monoxide.

From timber fires the noxious gases produced are carbon dioxide and carbon monoxide. Carbon monoxide is a product of incomplete combustion of wood or other matter, and also of the explosion of various types of blasting powder or dynamite. The amount produced is enormously increased when the explosive burns instead of detonating. Carbon monoxide is more than likely to be encountered during a smoldering fire, such as would result in a damp or wet mine.

Effects of High Temperatures and Humidity

High temperatures in a comparatively dry air do not have an extremely severe effect on the miner. This fact was forcefully illustrated on a recent trip through the Comstock mines in Nevada. In one place the dry-bulb thermometer read 110° F., and the wet bulb 100°. This represents a humidity of 70%. While performing no work the place was not unbearably hot. Nearby, where the return-air current was encountered, the wet and dry bulbs both read 110°, representing a humidity of 100%, and the effect was distressing.

Frequent observations in Lake Superior iron mines show that miners working in temperatures above 75° wet bulb, relative humidity 100%, showed a marked falling off in energy. At wet-bulb temperatures of from 80° to 90°, relative humidity 90 to 100%, the average miner works only from one-half to one-third of his time. In one mine four miners produced the same tonnage of ore as was produced by nine miners in a similar place in the same mine where the temperature was 10° hotter. Many cases of this kind could be cited.

The great importance of proper ventilation has been recognized by some, and efforts are now being made to improve conditions in this respect. Good results have already been obtained in one or two cases. The management of one mine, where production per man has been increased greatly recently, attributes the increase in a great measure to better ventilation facilities.

Causes of Vitiated Air

Oxygen is consumed, and carbon dioxide produced in the mines, through the following agencies: Oxidation or rotting of timbers; breathing of men; burning of various types of miners' lights; blasting; oxidation of certain rocks.

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*An abstract from a paper prepared by Edwin Higgins, mining engineer of the U. S. Bureau of Mines, for the meeting of the Lake Superior Mining Institute, at Ishpeming, Mich., Sept. 1, 1914.

Without going into a detailed discussion, it may be stated that investigation points to the oxidation or rotting of timbers in the heavily timbered mines as the chief cause of the vitiation of air. The breathing of men and the burning of candles and lamps come next in importance. In heavily timbered mines, especially where the mine is wet or damp, the timbers consume from three to four times as much oxygen as do all the other factors combined.

In general, it may be said that heat is developed in mines through the following agencies: Rock temperatures; presence of men and lights; crushing and working of rock and timbers; oxidation of timbers; operation of machinery and presence of steam lines connected thereto.

The cause of humidity, of course, is the absorption of moisture in the mine by the comparatively dry air admitted from outside.

It was found that rock temperatures had practically no bearing on the great heat encountered in the sublevels, especially those subs directly under the timber mat. In several cases rock temperatures, at depths of 1500 to 2000 ft., were as much as 10° lower than air temperatures from 500 to 1000 ft. nearer the surface but under the timber mat. Air currents passing through timbered workings where no men were employed were tested at various intervals, and the temperatures were found to increase gradually, regardless of whether the course of the air was downward or upward. The oxidation of the timber is the chief cause of the production of heat. In one mine before the introduction of timber in a new sub, the temperature averaged 75°; when drift sets had been put in the average temperature of the level was 80°.

THE NATURE OF THE PROBLEM

There are two problems presented in the proper ventilation of Lake Superior iron mines: (1) To supply a sufficient quantity of air, and distribute it so that it will carry off the noxious gases produced and will have the effect of lowering the temperature and humidity existing in working places. (2) To produce smaller quantities of noxious gases.

It is a difficult matter to state just how much air should be supplied in the heavily timbered mines for the reason that there is no accurate method of calculating how much oxygen the timbers will consume. The factors effecting this are extremely variable. Damp timbers are much more active in oxygen consumption than are dry timbers. Again, due to the methods of mining, it is impossible to figure with any degree of accuracy the amount of timber in a mine. However, a study of actual conditions leads to the belief that, in untimbered mines, where no animals are used, 50 cu.ft. of air per min. per man employed underground, is sufficient. In mines where a moderate amount of timber is used there should be 100 cu.ft. per min. per man employed underground. In the heavily timbered mines, it may be necessary to increase the amount to 150 or even 200 ft. per minute.

CRITERIA OF QUALITY OF VENTILATION

There are several guides in determining whether or not there is a sufficient amount of air entering the mine. In the first place there should be sufficient air to prevent the humidity in working places from rising higher than 90%. With 90% humidity the wet-bulb thermometer should not read more than 80° in still air, 85° in a current of 400 to 500 ft. per min.; with 100% humidity these figures may be set at 75° and 80°.

A second criterion is the diminution of the amount of oxygen in the air. This is closely related, in these mines, to the content of carbon dioxide.

While a miner may feel no discomfort so long as he does not exert himself in an atmosphere in which a candle will become extinguished (from 16 to 17% oxygen), the effect may be different when carbon dioxide is present and he is working hard. Another factor to be considered is the heat usually encountered in places containing vitiated air. Miners have been observed who showed ill effects working in an atmosphere containing 1% carbon dioxide and 19.7% oxygen, the temperature being 75° and the relative humidity 95%. It is believed that miners will begin to lose efficiency in air containing more than 1.25% carbon dioxide and less than 19% oxygen, in ordinarily cool temperatures; when the working place is hot the effect is correspondingly worse.

It is a simple matter to determine whether conditions in working places are such that miners can perform efficient work. Temperatures and humidity may be determined by the use of the sling psychrometer; gases present may be determined by sampling and analyzing the air.

REMEDIAL MEASURES

The principal remedy for the conditions referred to is a sufficient air supply, and its proper distribution throughout the mine. Increased air supply may be obtained: (1) By providing a greater number of openings to the mine; (2) by providing for downcast and upcast openings, with due regard to the elevation of the shaft collars, and the presence or absence of steam pipes in the shaft; (3) by the use of fans either at the shaft collar or within the mine.

A blower fan at the collar of the downcast shaft is preferable. If an air shaft is not available, that is, one not used for hoisting, it may be possible to utilize the manway in an operating shaft as an airway, but in this case the partition between the manway and the hoisting compartments must be absolutely tight. If it is not practicable to place the fan at the shaft collar, it must then be placed within the mine workings, preferably a blower fan somewhere near the downcast shaft.

Many of the mines have a sufficient amount of air passing into them but, owing to insufficient airways, most of the air escapes from the mine without reaching the working places. Such conditions can be remedied by the running of additional crosscuts, drifts and raises for carrying the air, and by the installation, at proper places, of doors and brattices. An important aid in ventilating dead ends may be found in the intelligent use of electrically operated booster fans.

MEASURES FOR REDUCING QUANTITY OF GASES PRESENT

Of measures looking to a reduction in the quantity of noxious gas produced, those worthy of consideration are: (1) The treatment of timber with such preservatives as will prevent or retard oxidation or rotting, and (2) the use of explosives that produce a minimum amount of noxious gases. The treatment of timber has been discussed in various papers and publications and it is probable that the use of some preservative that will act as a sterilizing agent will be effective in the Lake Superior mines. Probably the preservative most used at this time is creosote. This is a subject that requires further investigation before definite recommendations can be made. The cost of treatment is an important factor. It might be added that stripping the bark from timber retards, to some extent, its liability to oxidation.

On account of the serious effect of powder gases on miners, the Bureau of Mines recently undertook an investigation with the hope of developing a powder which would evolve a minimum quantity of noxious gases.

As the result of a number of tests with straight nitroglycerin, low freezing, ammonia, and gelatin dynamites, the fact was brought out that the gelatin dynamites evolve smaller quantities of noxious gases than any other. The gelatin should, however, be made with an oxygen excess sufficient to oxidize completely all combustible matter present, including the wrappers. It is further essential that detonation be complete.

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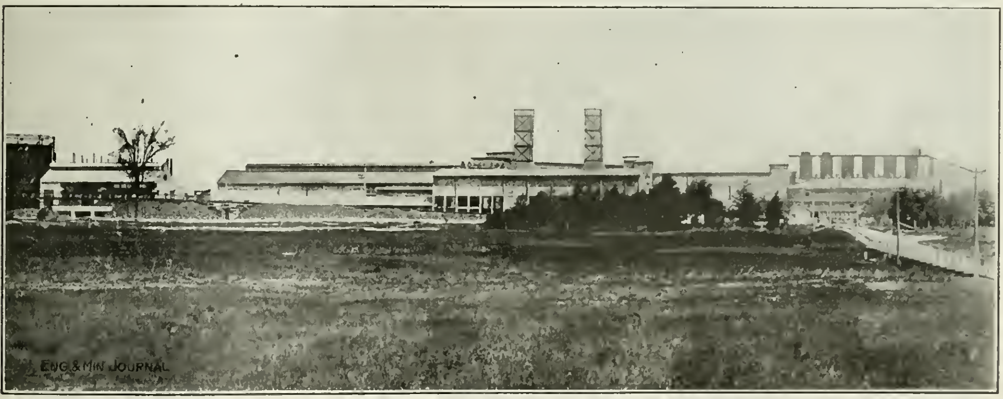
The Cyanamide Industry

The factories of the American Cyanamid Co. at Niagara Falls, Ontario, began operations in January, 1910. The original plant had an output of 12,000 tons a year, but this was increased during 1912 to approximately 32,000 tons a year and further extensions are under way to give an annual output of 64,000 tons. From the commencement of operations, it was clear that a plant producing 12,000 tons per annum was unable to meet the market requirements, but the directors of the company adopted the policy of thoroughly proving the commercial practicability of and demand for cyanamide before building a large plant. After two years, they realized that the product could be looked upon as an undoubted commercial success and it was necessary to double the existing plant in order to cope with the increasing orders.



Plant of the American Cyanamid Co., Niagara Falls, Ont.

Cyanamide is a bluish black, odorless material, containing from 18% to 20% ammonia, about 12% carbon and the equivalent of about 70 lb. of slacked lime. The material is shipped in burlap bags and can be stored indefinitely. Cyanamide nitrogen is readily soluble; 96% will dissolve in cold water and is, therefore, available as plant food. On contact with the soil, it reacts quickly and forms first urea, and then changes into double ammonium compounds. Every 100 lb. of cyanamide contains the equivalent of about 70 lb. of slacked lime, which adds considerably to its value as a fertilizer.

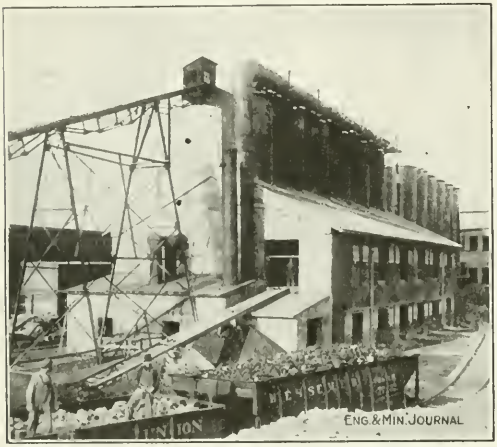
The manufacture of cyanamide depends upon the chemical fact that calcium carbide at a high heat combines with atmospheric nitrogen and forms calcium cyanamide. Calcium carbide is made by fusing together lime and coke in an electric furnace. The carbide is placed in the ovens heated by electricity to white heat and nitrogen is led into the ovens and there combined with the carbide, forming calcium cyanamide. After cooling, the cyanamide is ground, treated with water and put through a mechanical finishing process.

Before the installation of the cyanamide plant at Niagara Falls, a matter of importance was to determine the kind of reducing gas to be used in the preparation of nitrogen. After careful consideration, a coal-gas plant was decided upon, as the entire output of coke could be used in the manufacture of calcium carbide, and the coal gas gave the greatest amount of carbon content for use in the nitrogen ovens. The nitrogen ovens consist of a series of vertical retorts heated by small individual furnaces. Copper oxide is packed in these retorts, and when brought to the proper temperature, air is forced through them. The oxygen combines with the copper as cupric oxide, leaving the nitrogen free. The air is then shut off and as the oxide has gradually become foul during this cycle, coal gas is then passed through the retort, which acts as a reducing agent. The nitrogen is then forced through pipes into the electric furnaces where it combines with the calcium carbide and forms calcium cyanamide, or commercial cyanamide.

The plant for the manufacture of lime to be used in the cyanamide plant was designed and installed by the Improved Equipment Co. The original plant consisted of six Doherty-Eldred lime kilns equipped with the Eldred process, and induced draft. The present plant consists of 12 kilns.

While the nitrogen in the original plant and the 1912 extensions is being produced by the copper oxide process, the nitrogen in the 1913 extensions is being produced by the liquid-air process. Three complete sets of Claude liquid-air nitrogen apparatus, manufactured by L'Air Liquide, Paris, are used. These operate at a pressure of 600 lb. per sq.in. and a temperature of minus 300° F. The nitrogen is delivered at a purity of about 99.9%. The oxygen in this product seldom reaches 0.1%. The coke and gas plant which has a capacity of 500,000 cu.ft. per day, was also installed by the Improved Equipment Co.

In the past, the efforts of the manufacturers have been directed toward simplifying and cheapening the manufacturing process and improving the product for use as a commercial fertilizer, since there has always been a ready market for the entire production for fertilizer purposes. There are, however, a number of other ways in which the product may be used. It is well known that when calcium cyanide is fused in the presence of carbon and a suitable fluxing agent, it is converted to cyanide. The crude product, known as surrogate, may be used directly for cyaniding gold and silver ores, or it may be treated to recover the cyanide in a purer form.



Lime Kilns of American Cyanamid Co.

In the original Castner process for the manufacture of sodium cyanide, ammonia gas is absorbed by sodium at 400° C., with the formation of amide and liberation of hydrogen.

$$NH_3 + Na = NH_2Na + H$$

When melted with one molecule of sodium cyanide, the amide is converted into sodium cyanamide between 550° and 600°.

$$NH_2Na + NaCN = CN_2Na_2 + H_2$$

Cyanamide, when mixed with carbon and heated to 750° to 800°, combines with the carbon to form cyanide.

The use of the intermediary molecules of cyanide may be avoided by proceeding in a different manner, using a first carbon atom to convert two molecules of amide into sodium cyanamide, and later, at 800°, a second atom of carbon to produce cyanide.

$$2\ NH_2Na + C = Na_2CN_2 + 2\ H^2$$

$$Na_2CN_2 + C = 2NaCN$$

The usual methods of cyanide manufacture make use of sodium as the alkalai, while commercial cyanamide uses calcium, but there is no reason to believe that the latter is any less efficient than the former for metallurgical purposes when the same quantity of cyanogen is present.

Hardening and cementing powders constitute a second class of cyanide derivatives of importance. These all contain cyanamide as the nitrogen basis. The hardening powders are used in the same way as cyanides, burnt leather, etc., for case-hardening. The cementing powders are used for making cement and blister steel. Another class of derivatives consists of certain compounds used in explosives. The principal members of this class are dicyandiamide, guanadine, nitro-guanadine, guanadine-nitrate and ammonium nitrate. Urea, which, as well as dicyandiamide is used in the dye industry, may also be derived from cyanamide.

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Debris Transportation by Running Water*

The U. S. Geological Survey, in *Professional Paper* 86, publishes some interesting results of a study of the laws governing the transportation of débris by running water. The investigation was carried on in a laboratory established at the University of California, in Berkeley. The paper in general is what is called "high-brow stuff." Certain of the conclusions arrived at, however, are of value to geologists, hydraulic miners and hydraulic engineers.

For each combination of discharge, width, and grade of débris there is a slope, called competent slope, which limits transportation. With lower slopes there is no load, or the stream has no capacity for load. With higher slopes capacity exists; and increase of slope gives increase of capacity. The value of capacity is approximately proportional to a power of the excess of slope above competent slope. This is not a deductive, but an empiric law. This power is not fixed, but depends on conditions. It ranges from 0.93 to 2.37, being greater as the discharges are smaller or the débris is coarser.

For each combination of width, slope and grade of débris there is a competent discharge. The stream's capacity varies as a power of the excess of the stream's discharge over competent discharge. This power varies from 0.81 to 1.24, the values being greater as the slopes are smaller or the débris is coarser. Capacity is less sensitive to changes of discharge than to changes of slope.

For each combination of width, slope and discharge there is a limiting fineness of débris below which no transportation takes place. The stream's capacity varies with a power of the excess of the degree of comminution over this competent fineness. This power varies from 0.50 to 0.62, the values being greater as slopes and discharges are smaller. Capacity is less sensitive to changes in fineness of débris than to changes in discharge or slope.

Most of the experiments were with straight channels. A few with crooked channels yielded nearly the same estimates of capacity. The ratio of depth to width is a more important factor. For any combination of slope, discharge, and fineness it is possible to reduce capacity to zero by making the stream very wide and shallow or very narrow and deep. Between these extremes is a particular ratio of depth to width, corresponding to a maximum capacity. The values of this ratio range, under laboratory conditions, from 0.5 to 0.04, being greater as slope, discharge and fineness are less.

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*An abstract taken from U. S. Geol. Surv. "Professional Paper" No. 86.

The velocity which determines capacity for bed load is that near the stream's bed, but attempts to measure bed velocity were not successful. Mean velocity was measured instead. If slope be the constant, in which case velocity changes with discharge, capacity varies on the average with the 3.2 power of velocity. If discharge be the constant, in which case velocity changes with slope, capacity varies on the average with the 4.0 power of velocity. If depth be the constant, in which case velocity changes with simultaneous changes of slope and discharge, capacity varies on the average with the 3.7 power of velocity. The power expressing the sensitiveness of capacity to changes of mean velocity has in each case a wide range of values, being greater as slope, discharge and fineness are less.

In general, débris composed of particles of a single size is moved less freely than débris containing particles of many sizes. If fine material be added to coarse, not only is the total load increased but a greater quantity of the coarse material is carried.

Some particles of the bed load slide; many roll; the multitude make short skips or leaps, the process being called saltation. Saltation grades into suspension. When particles of many sizes are moved together the larger ones are rolled.

When the conditions are such that the bed load is small, the bed is molded into hills, called dunes, which travel downstream. Their mode of advance is like that of aeolian dunes, the current eroding their upstream faces and depositing the eroded material on the downstream faces. With any progressive change of conditions tending to increase the load, the dunes eventually disappear and the débris surface becomes smooth. The smooth phase is in turn succeeded by a second rhythmic phase, in which a system of hills travels upstream. These are called antidunes, and their movement is accomplished by erosion on the downstream face and deposition on the upstream face. Both rhythms of débris movement are initiated by rhythms of water movement.

The laboratory formulas discovered are not immediately available for the discussion of river problems.

The energy of a stream is measured by the product of its discharge, its slope, and the acceleration of gravity. In a stream without load the energy is expended in flow resistances, which are greater as velocity and viscosity are greater. Load, including that carried in suspension and that dragged along the bed, affects the energy in three ways: (1) It adds its mass to the mass of the water and increases the stock of energy *pro rata*; (2) its transportation involves mechanical work at the expense of the stream's energy; (3) its presence restricts the mobility of the water, increasing its viscosity, and thus consumes energy. For the finest elements of load the third factor is more important than the second; for coarser elements the second is the more important. For each element the net result is a tax on the stream's energy.

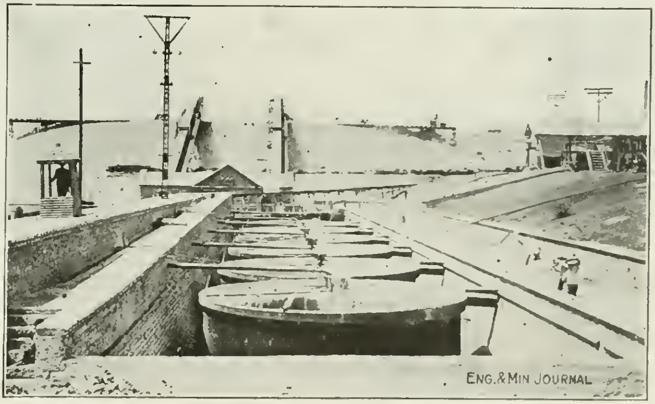
In flume transportation capacities are notably larger than for stream transportation, and their laws of variation are different: rolling is an important mode of progression; for rolled particles the capacity increases with coarseness, for leaping particles with fineness; capacity increases with slope and usually with discharge also, but the rates of increase are less than in stream transportation: capacity is reduced by roughness of bed.

The level of maximum velocity may have any position in the upper three-fourths of the current. In loaded streams its position is higher as the load is greater. In unloaded streams its position is higher as the slope is steeper, as the discharge is greater and as the bed is rougher.

Mill Construction in India

Special Correspondence

Conditions affecting labor and material in India are so different from those in other parts of the world that construction methods and results are unique. One of the most striking points is the universal employment of granite blocks, cut and dressed, for almost all kinds of construction. It is much cheaper than any other means which can be utilized, a fact which has not only been arrived at by careful computation, but also through the actual experience of building a mill with timber framework, covered with the usual corrugated galvanized iron. It cost much more than it would have had the native stone been used.



Sand-Collecting Tanks at Mysore Mill, Mysore, India

The native granite splits readily into blocks and slabs, and its cheapness in combination with the low price of native labor accounts for the economies obtained through its use. In some cases it has even been used for building fences, posts of squared granite and rails of granite slabs being used. Slabs 3 to 4½ ft. long are not unusual with the stone. Buildings, foundations, retaining walls and all such construction are usually erected with the granite.

Our illustrations shows the mill of the Champion Reef, Mysore, India, in the Kolar gold fields: the 80-stamp mill of the Mysore Gold Mining Co., Ltd., at the same place, and also the sand-collecting tank installation at the same plant. All of this construction is of cut and dressed granite, as may be seen, even the walks and stairways being built of the stone. It is an object to employ as many different native laborers as possible, in order to save them from starving to death.

Champion Reef Mill, Mysore, India

One of the Mysore Mills, 80 Stamps

⁂

Arsine Formation in Electrolytic Refining

By Francis R. Pyne*

Practically all blister copper contains arsenic in varying amounts, good pig carrying up to 0.05%, while particularly foul pig may carry as high as 2%. The anode-furnace treatment eliminates but a small amount with relatively low arsenical copper; with copper carrying 1 to 2%, the elimination may be taken in the neighborhood of 20 to 30 per cent.

The remaining arsenic goes to the tank house, where it partly passes into the anode slime, and partly into the electrolyte in the form of arsenious acid. With a highly arsenical pig, the arsenic may be made to pass into the anode slime to a considerable extent by the addition of a certain percentage of nickel to the anode which causes the formation of an insoluble nickel arsenide.

The arsenic passing into the electrolyte should not be allowed to accumulate above a certain point, else there is considerable danger of its depositing on the cathode, and exerting a tremendously unfavorable effect upon the conductivity of the resulting product.

To prevent the accumulation of arsenic in the electrolyte to an undesirable degree, it is usual in electrolytic copper refining to draw off a certain amount of electrolyte daily, and pass it through a series of tanks in which the copper anodes have been replaced by insoluble anodes, usually of lead. In these tanks the current removes the copper, arsenic and antimony partly or entirely. The solution is then returned to the tank house, or else, if high in other impurities, such as iron, nickel, etc., is given further treatment for the elimination of those impurities, and the recovery of the free sulphuric acid.

When using insoluble anodes and carrying a high current density, no metal enters the solution while, there being an insufficient number of metallic ions present at the cathode to carry the current, hydrogen is deposited in large quantities. The nascent hydrogen reduces the arsenious acid to arsine:

$$H_3AsO_3 + 3\ H_2 = AsH_3 + 3\ H_2O$$

If there is copper sulphate present, it will react with the arsine to form an insoluble copper arsenide.

$$3\ CuSO_4 + 2\ AsH_3 = Cu_3As_2 + 3\ H_2SO_4$$

However, should there be an insufficiency of copper sulphate present, the excess arsine escapes into the atmosphere. This gas being highly poisonous, it is a wise precaution to place the insoluble anode tanks in the open, where air currents can rapidly dissipate the gases as they are liberated.

A test was made some years ago to determine the amount of arsine liberated in this manner. The arsenic content of the electrolyte has been allowed to accumulate to a fairly high degree. The solution was passed through a series of four insoluble tanks, each tank having 23 pairs of electrodes. A tightly fitting hood was made to collect the gases which were drawn through a solution of silver nitrate. The arsine present formed insoluble silver arsenide, and by determining the amount of this material, the weight of arsine liberated was obtained.

The original solution contained: Cu, 3.42%; As, 0.72%. Samples taken at the outlet of each tank showed the following, the circulation of the solution being about one gallon per minute: Tank No. 1, Cu, 0.27%; As, 0.46%: tank No. 2, Cu, 0.04%; As, 0.12%; tank No. 3, Cu, 0.005%; As, 0.014%; tank No. 4, Cu, 0.004%; As, 0.003%.

The amount of arsine liberated per tank per hour was found to be: Tank No. 1, none; tank No. 2, 0.00443 cu.ft.; tank No. 3, 0.00027 cu.ft.; tank No. 4, 0.00002 cu.ft.; total, 0.00472 cu.ft. Total per day was 0.11328 cu.ft., containing 0.37 oz. arsenic.

From the above table it is seen that no arsine is liberated in tank No 1, there being sufficient copper sulphate present to react and form the insoluble arsenide. The greatest amount is liberated in tank No. 2, as would be expected.

The above solution is considerably higher in arsenic than is usual in tank-house practice, so that the danger from arsine is almost negligible. But in cases where very arsenical anodes are used, arsine may be liberated to such an extent as to be plainly noticeable.

The above may be of interest at the present time, owing to the development of leaching and electrolytic precipitation of copper direct from the ore. Many of these ores contain arsenic to a considerable extent and it will probably accumulate in the solution rapidly, necessitating frequent purification.

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*Refinery superintendent, U. S. Metals Refining Co., Chrome, N. J.

Details of Practical Mining

Reversing Rope on Single-Drum Hoist

By R. S. Schultz, Jr.*

It is well known that the life of a hoisting rope can be considerably lengthened by reversing it at the proper time. This is due to the fact that the weight of the rope itself brings a heavier load on the drum end of the rope and causes that end to fatigue more rapidly.

With a two-drum hoist, reversing the ropes is a simple process, but with a single drum, and especially with a long rope of large diameter, the change becomes more of a problem. By using two old cable-reels, reversal can be made by winding the rope from the drum on to one of the reels, rewinding to the second reel and then rewinding on the drum, but this is a slow, tedious operation and requires considerable preparation.

The following method is simple, comparatively rapid, and requires little or no preparation other than clearing a small space in front of the engine house. The skip or cage is hoisted to the collar of the shaft, securely fastened, and the rope detached. The end, just above the socket, is tightly wound with wire to prevent raveling; the socket is cut off and the rope wound over the sheaves on the drum until the end is at the cleared place in front of the engine house. The hoist is then reversed, and the rope coiled on the ground in a large figure eight, as shown in Fig. 1. Then the coils are taken a few at a time and thrown over, as shown in Fig. 2, until the whole rope is reversed.

The former skip-end is then refastened to the drum, the rope rewound on the drum, the end pulled over the sheave, the socket rebabbitted and the rope made fast to the skip or cage. Special care must be taken to bend the rope naturally in coiling and uncoiling, otherwise a serious kink may result.

In the case illustrated, seven men reversed 3000 ft. of $1\frac{1}{8}$-in. plow-steel rope in about four hours, including rebabbitting the socket on the skip end. Considerably better time could have been made, had speed been necessary.

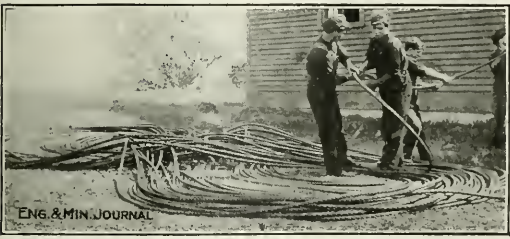

Fig. 1. Coiling the Rope in Figure 8.

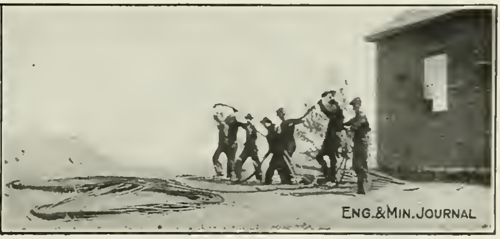

Fig. 2. Throwing over the Coils

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*Mining engineer, Hannibal, Mo.

Intake for Mine Water-Supply from Lake*

When the draining of Kerr Lake at Cobalt was begun, it was necessary to provide another water-supply for the mines that had been getting their water from that lake. It was decided to get this from Giroux Lake. The water and mud from Kerr Lake were to be pumped to Giroux so that precautions were necessary to protect the new water-supply.

It was at first planned to mount the pumps on the shore of Giroux Lake and carry the suction intakes out on piers, but the difficulty of placing piers firmly on the steep, smooth bottom, and of protecting the suction pipes against freezing, made this seem inadvisable. A well, 10 ft. square by 12 ft. deep, was sunk by air drills in the solid rock on shore, almost at water line, leaving a thin shell between lake and well. When the well was completed, a series of flat holes drilled at a depth of 5 ft. below water level and "looking out" under the lake was put in. The holes were heavily loaded, blasted simultaneously, and a clear connection made between well and lake. A 14x20-ft. pump house was erected on cement foundations over the well, in which 10x10-in. timbers were set at 3-ft. intervals, as sills for the pumps and equipment.

The pumps for this water supply are two in number, of the single-stage turbine type, each capable of delivering 500 imperial gallons per minute against a total head of 175 ft. at 1750 r.p.m. The pumps are mounted on the same base plate with a 45-hp., 2200-volt, three-phase, 60-cycle motor, direct-connected to the pumps with flexible pin coupling. The equipment comprises auto-starters, oil and knife switches, lightning arresters and meters.

The water is pumped through an 8-in. spiral-riveted bolted-joint pipe 1300 ft. in length, against a 125-ft. head to a 46,000-gal. receiving tank erected on an eminence. From this tank the supply for the different mines is delivered by gravity through 6-in. wrought-iron pipe.

Owing to the severe cold of the winters, great care was necessary in protecting all water lines. The 8-in. line was inclosed in a 4-ft. plank box, filled with sawdust and covered on top with paroid. A 1-in. steam line from each of the two mine-heating plants was run alongside the pipe to the pump house, where it was run through a coil for heating purposes, and thence to the well inlet to keep the intakes free of ice. For protection against the muddy water from Kerr Lake, a filter dam made of jute, supported on spiles, was placed around the inlet, which formed a small pond of comparatively clear water. Two gate filters of 8-oz. duck were placed over the direct inlet, further to clarify the water.

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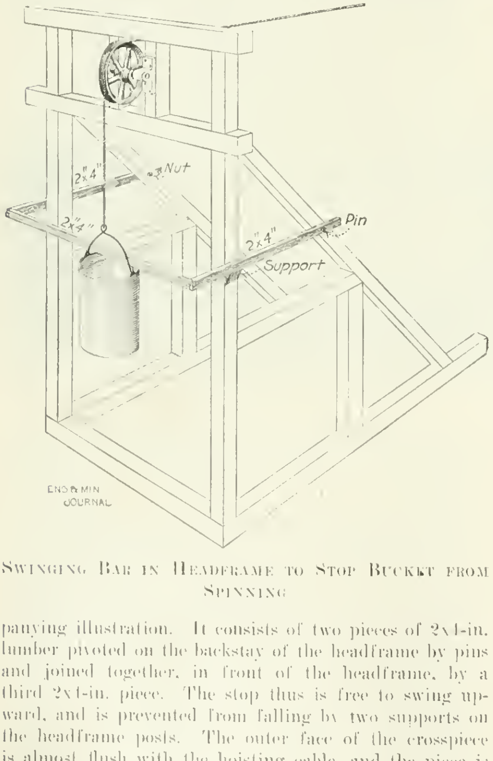
*From "Draining Kerr Lake," a paper presented before the Salt Lake meeting of the A. I. M. E.

An automatic electric signal system from tank to pump house was installed. This rings a bell in the pump house when the water in the tank passes a predetermined high or low point, and flashes one of two lights to show whether the water is high or low.

*

Device to Stop Whirling Bucket

A simple contrivance to stop the whirling of a bucket, and thereby save time and trouble, where hoisting is being done without a crosshead, is shown in the accompanying illustration. It consists of two pieces of 2x4-in. lumber pivoted on the backstay of the headframe by pins and joined together, in front of the headframe, by a third 2x4-in. piece. The stop thus is free to swing upward, and is prevented from falling by two supports on the headframe posts. The outer face of the crosspiece is almost flush with the hoisting cable, and the piece is level with the top of the bucket when it is at an elevation convenient for dumping.



Swinging Bar in Headframe to Stop Bucket from Spinning

When hoisting, the bail of the bucket may strike the stop and lift it temporarily, but when the bucket makes a quarter turn the stop will fall alongside the bail and prevent any further whirling.

Cast-Iron Guide Brackets

The Kintore shaft of the Central mine, at Broken Hill, New South Wales, consists of three compartments, of which two are used for hoisting. Each of these hoisting compartments contain six guides, the principal guides upon which the cage shoes run, being 6x7$\frac{3}{4}$ in. in section. These are approximately 20 ft. long, 5 to the level.

Referring to Fig. 1, the outside guides *A* and *B* were formerly fastened to the wall plate and the divider with $\frac{3}{4}$x10-in. countersunk lagscrews. Where the guides were joined, cast-iron brackets with recessed faces, Fig. 3, were bolted to the sets by two $\frac{3}{4}$x13-in. bolts, the guides being dapped to set back over the timbers into the recesses of the brackets. The brackets prevented side movement.

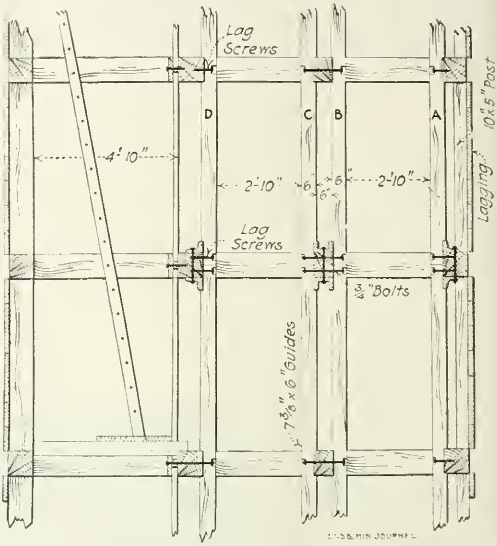


Fig. 1. Long Section of Shaft, Showing Old Method of Fastening Guides

The two middle guides *B* and *C*, Fig. 1, were similarly held by recessed brackets of the type shown in Fig. 4, and the guides were held to the dividers by through bolts. Each bracket had two vertical faces, one for each guide. The bolts holding the guides to the divider were peculiar in being made of $\frac{3}{4}$-in. square iron, 16$\frac{1}{2}$ in. over all, with one end made into a square head, and the other swaged round for 5 or 6 in. and threaded to take the nut.

In the case of the outside guides *A* and *B*, the lag-screws kept breaking, and it was inconvenient to repla these. Similarly, when any breaking occurred to the inside guides *C* and *D*, it was necessary to loosen both guides and thus disable both compartments, in order to replace one. Furthermore, the through bolts twisted off when being tightened, and were not easily extracted for replacement.

It was, therefore, decided to bolt all the guides to the

Note—An abstract from an article by N. J. Roberts, published in the "Proceedings" of the Australasian Institute of Mining Engineers, No. 12, 1913.

brackets. To do this they were bored with a brace and bit, and the casting then drilled by using a twist drill of $\frac{7}{8}$ in. diameter, set in a machine rock drill, with a feed screw fitted to the machine at the back instead of the ordinary handle. The work was done on Sundays by two timbermen or a timberman and a helper, working from the cage. Air was obtained by means of a hose 60 ft. in length attached to the air pipe at the nearest level. In this manner the brackets in the shaft were drilled for 600 ft. of depth.

The advantage of this method of fastening guides being apparent, it was decided to place brackets also at the intermediate sets where the guides had previously been screwed to the timbers. The guide *D* was easily fitted with the bracket of Fig. 3; for guides *B* and *C* it was necessary to design a bracket which could be slipped in from the side. This is shown in Fig. 5. Behind guide *A* was a vertical post between the sets, which interfered with the use of a bracket similar to that shown in Fig. 3; therefore, the bracket of Fig. 6 was designed, to slip in the 4-in. space between the back of the guide and the face of the post, with one end broader to give a better bearing on the end plate. The brackets were made right and left, in order to support the guide on alternate sides. The same length of the shaft, 600 ft., was fitted with these brackets. The new method of fastening is shown in Fig. 2.

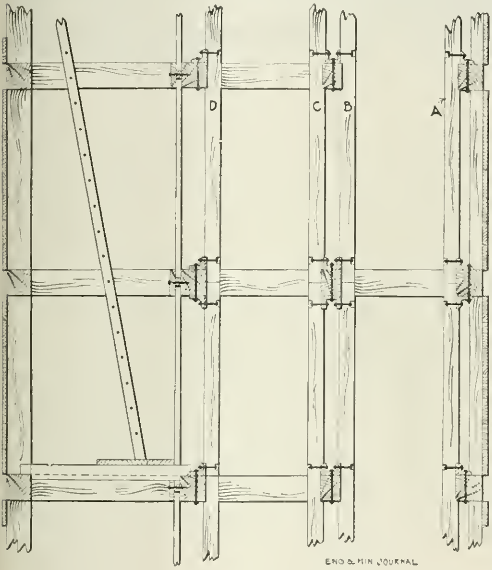
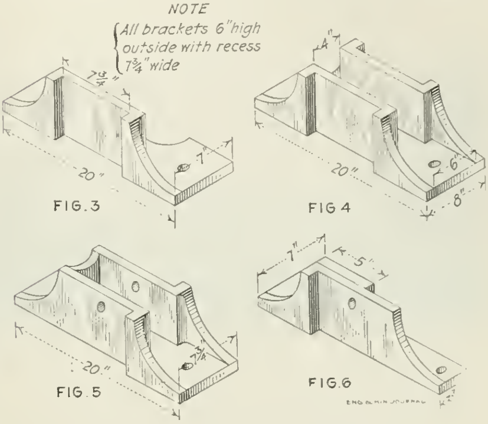


Fig. 2. Complete Set of Guide Brackets

The bolts for the guides *A* and B are $\frac{3}{4}$x7 in. and for *B* and *C* are $\frac{3}{4}$x$6\frac{1}{2}$ in., the heads in all cases being $1\frac{1}{2}$ in. square and $\frac{3}{4}$ in. thick. It was, of course, necessary to countersink these heads, and for this purpose a special chisel, as shown in Fig. 7, was made, with lugs on the sides to limit the depth to which the countersunk holes could be cut.

The convenience of removing and replacing guides with the use of these brackets is, of course, obvious. When it becomes necessary to renew all four guides from the 700-ft. level to the surface, a distance of 600 ft., the work was done in about four and a half days, working three shifts of 8 hr. each. This was made possible by systematizing the work, cutting every guide to measure on the surface, having it stacked on the proper level, and arranging hoisting devices and working platforms in each compartment.



The Various Styles of Brackets

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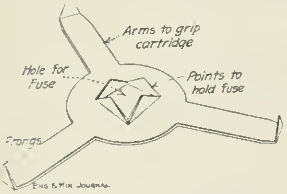
Fuse Clip for Primer

A device for holding fuses to their powder sticks in making up primers was described by W. W. Jones in the Journal of Feb. 21, 1914. A clip to serve a similar purpose is described in the *Journal* of the Chem., Met. & Min. Soc. of So. Africa, February, 1914. It is intended to obviate the necessity of tying the fuse to the cartridge in order to prevent its pulling out when tamping.



Metal Clip for Holding Fuse to Cartridge

The fuse is threaded through the clip with the points shown in the illustration toward the detonator end. When the detonator is inserted in the cartridge, the three arms are bent over so as to grip the end of the cartridge by means of the prongs into which their ends are bent. The points around the center hole grip the fuse when it is pulled back.

The clips are cheaply made and rapidly applied. It is recommended that brass or copper be avoided as likely to interfere with ore treatment and tinned or painted iron is suggested as suitable and safe material. For electric detonators, the center hole is made square.

*

A Heavy Concrete Lining for Openings which conduct gases from the Lowell fire zone is provided in the Copper Queen mine, according to the August, 1914, "Bulletin" of the A. I. M. E. The lining is applied to the more important drifts and raises. Presumably the concrete is intended to make the passages both impervious and fireproof

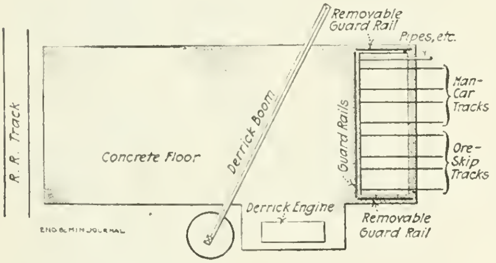
Loading Derrick at Shaft Collar

By Clarence M. Haight*

Derrick Swinging a Load to the Cage

Method of Anchoring Guy Lines

At the Palmer shaft of the New Jersey Zinc Co.'s mine at Franklin Furnace, N. J., the derrick here illustrated is used for loading timber, rails and other material on the shaft cages. As shown by the drawing, it can reach all the compartments of the shaft as well as cars spotted on the railroad track. The mast is made of 14x14-in. timber and is supported by six guy lines; the boom is made of 12x12-in. timber. The method used to anchor the guy lines, which support the mast, is shown in a photograph. When not in use the boom is supported on a post. The power is furnished by a two-cylinder Lambert engine, operating on compressed air.



Relation between Derrick, Shaft, Tracks, Etc.

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Vertical vs. Inclined Shaft†

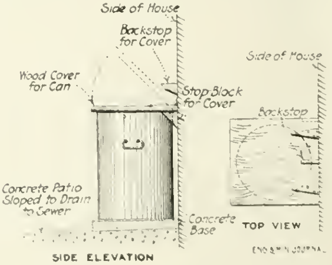
Before sinking the shaft for its Palms mine, the Newport mine management made a detailed comparison of the advantages and disadvantages of inclined and vertical shafts. An inclined shaft would have the disadvantages of rails, back runners, skip wheels, axles and boxes, and the expense and trouble of axle lubrication, and of frequently replacing supports for ropes; longer ropes would be required and the skips would have to travel a greater distance and at limited speed. There would be a constant and considerable expense for the upkeep of the shaft and its equipment. A vertical shaft in the foot wall would have only the disadvantages of longer crosscuts from the orebody to the shaft, and of the greater distance of transportation; but with transportation by electricity, distance is a small consideration. Accordingly a vertical shaft was decided upon, to be lined with steel and concrete.

[The question of vertical or inclined shaft for orebodies dipping, say, between 50° and 80° is persistent. The Newport company operating the biggest and deepest inclined shaft in any American iron mine at Ironwood, Mich., may be assumed to know something about it. On the other hand, Dr. Chance makes out an excellent case for the inclined shaft in the Journal of July 4, 1914. Like all other mining questions, the answer is the algebraic sum of a host of plus and minus local conditions. —Editor.]

⁂

The Panama Garbage Can

One of the simple and homely devices concerned in promoting the present healthful condition of the City of Panama is reproduced herewith from the *Canal Record*, of June 17, 1914. This garbage can must be strongly built of galvanized metal, 19x25 in. in size, and must be provided with a self-closing cover, which shall fit over the top of the can perfectly. The can is to be placed in an approved position; and where the floor is sloping, as in the patios of buildings, on a concrete foundation; these bases must be at least 2 in. high. The cover to the can is of wood, home-made, fitted to two hinges fastened to the wall of the building, and to prevent it from staying back when opened, a wooden check is fastened to the wall at a point where it will strike the cover about midway.



Self-Closing Garbage Can in Position

The can is to be sold to householders at about $2.50 and the cover at about $0.50. Apparently, it is intended that the can be removed from the position only temporarily for emptying. If the exigencies of the collecting system should require the can to be left some time away from its permanent position, it ought to be provided with another detachable cover.

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*Mining engineer, Franklin Furnace, N. J.

†From a paper presented before the Marquette Range meeting of the Lake Superior Mining Institute, Aug. 31, 1914.

Details of Milling and Smelting

Bosh of Lead Furnaces

The angle of bosh for lead furnaces has been the subject of considerable controversy, as well as of experimenting. With the furnace charge constituted as at present at most plants, the weight of experience is decidedly in favor of a moderate bosh, said Irving A. Palmer, in a paper before the Salt Lake meeting of the American Institute of Mining Engineers. At one plant the furnaces were built with a 20° bosh, so that the width at the top of the 6-ft. jackets was 84 in., or 36 in. greater than at the tuyere level. Whenever a furnace was blown in, and for some time thereafter, it was noticed that there was a tendency for the charge to hang at the bosh, and to descend irregularly. The assays of the slags and mattes were usually higher than those of the furnaces longer in blast. After a week or two the furnace work would begin to improve, and later would become normal. On blowing out a furnace, after a campaign, it was almost invariably observed that the space on each side of the furnace above the bosh had been filled in with partly fused charge, changing the furnace lines so as to form a gently flaring shaft 60 in. wide at the top of the jacket, or with a flare of about 1 in. to the foot on each side. The furnace had thus accommodated itself to the descending charge, and, as stated, better work was done as a consequence. The extra width of the furnace above the bosh was not only useless, but detrimental. With the furnace charges as they are now prepared and until the fusion zone is reached, there is but little contraction in volume as they descend in the shaft. There is also a much more rapid movement of the charge. In addition, the narrower shaft insures a better distribution of the ingredients of the charge, and as a rule produces hotter slags.

⁂

Reduction Treatment of Precious-Metal Ores

Charles Butters has been granted U. S. Patent No. 1,103,346, covering the process of reducing or desulphurizing precious-metal ores by means of contact with certain metals, zinc, aluminum, tin or galladium, in the presence of caustic alkali: The precious metal is freed under these circumstances, and is readily dissolved by cyanides.

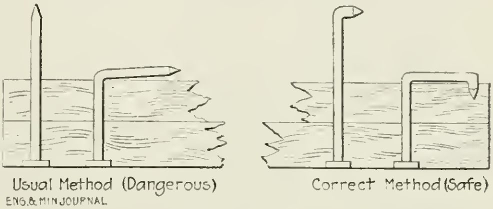
This is the process applied by Denny and Johnston to the Nipissing ores, of Cobalt, Ont., where aluminum and caustic soda solution are successfully employed.

⁂

The Nail Hazard*

Projecting nails are met with everywhere. The danger from nails is important and attention should be given to the best means of eliminating it. Men should be taught the importance, from a safety standpoint, of pulling the nails out or of bending them over and hammering their points down in a proper manner. It is safest, of course, to remove the nails entirely; but if they are bent over and hammered down, the work should be done in the right way. A nail with its point $\frac{1}{8}$ or $\frac{1}{4}$ in. above the level of the board is still dangerous, because it is likely to tear the flesh of one who has occasion to handle the board, or who may brush against it in passing. A nail point thus treated is also likely to catch in the sole of the shoe and cause a serious fall, and if it stands up by as much as $\frac{1}{4}$ or $\frac{1}{2}$ in., there is danger of the point's entering the upper or soft leather of the shoe.

In hammering down a nail, $\frac{1}{4}$ in. or so of the pointed end should first be turned over at right angles, by means of pliers or the claw of a hammer. The body of the nail then is bent over and hammered down, so that the pointed end enters the wood. The operation is shown in the illustrations.



WRONG AND RIGHT WAYS OF CLINCHING NAILS

A prolific source of accidents is the leaving of nails in the staves or hoops of a barrel, after the head has been removed. The act of knocking in the head tends to turn the points of the nails downward, and as a person removes the contents of the barrel he is quite likely to have his hand or arm lacerated.

An injury from a nail should receive immediate medical attention and treatment, because septic material is likely to be carried into the wound by the nail, and blood poisoning or lockjaw may follow if the wound is neglected, with loss of life or limb as a possible result.

⁂

Some Notes on Furnace Construction

In a paper read at a meeting of the New York section of the Society of Chemical Industry, on May 22, 1914, Gilbert Rigg, of the New Jersey Zinc Co., presented valuable data on refractory materials, particularly from the standpoint of the zinc smelter. Incidentally, he offered some hints on furnace design, of which we quote the following:

The shapes that can be made by machine are much more limited in variety than those that can be made by hand. To engineers who have to design furnaces I would say: "Avoid as far as possible complicated shapes.

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*From "The Travelers' Standard."

Try to be a [illegible]. Use rectangular masses wherever possible, and try to keep one dimension as near to a 1½-in. maximum as the design will permit. By doing this you have a chance of getting your brick burned hard to the heart, whereas, if you have all three dimensions running high, it is very difficult to avoid underburning in the middle. As long as you keep your shapes simple you can get them machine made. It is not always possible to avoid complicated shapes, but the more you can do it the more chance the brick manufacturer has to give you satisfaction."

When the object is to retain heat, loosely-compacted masses are more effective than close-textured ones. An extreme case of this condition I worked out some time ago. The questions at issue were: How many rings of brick would it be economical to place over a certain furnace arch in order to retain the heat, and what class of brick would be best? Or, could anything more effective than brick be used? We started out with 12-in. thickness of firebrick in three rings. Under the third ring and on top of the furnace arch four thermo-couples were placed at different points, and the temperature was noted from day to day, until an average figure was obtained for the temperature on top of the furnace arch. Then the three rings were taken off and other materials were tried. Eventually we found the most economical material was boiler ashes screened through ¼-in mesh; 3½ in. of this kept the top of the furnace arch as hot as 12 in. of fairly compact firebrick.

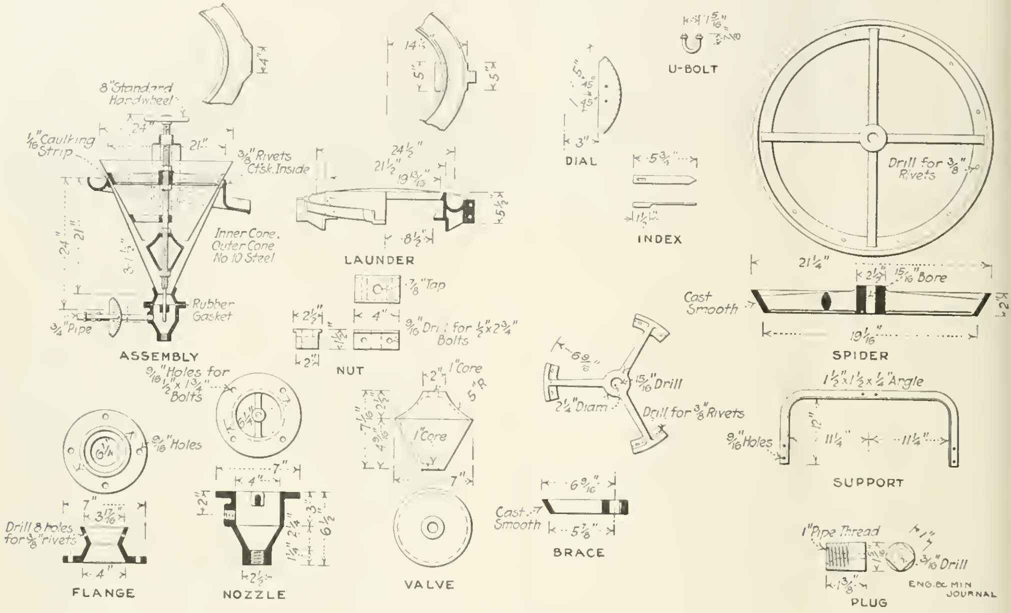
⁂

Sintering Fines at the Mond Nickel Co.'s Works, at Coniston, Ont., has resulted in the practical elimination of heap roasting. Two Dwight-Lloyd sintering machines are now in operation, treating the fines screened out at the mines. Using sinter on the blast-furnace charge has also enabled the metallurgists to reduce the coke to about 8% of the charge.

Hydraulic Cone Classifiers

By Percy E. Barbour*

The accompanying detail drawings show the 24-in. hydraulic cone classifier designed by the late J. B. Fleming and by G. B. Shipley, engineer for the Allis-Chalmers Co., for the Goldfield Consolidated mill. One of these classifiers was provided for each battery and was designed to handle the quantities shown in the accompanying table. It is a double cone, as may be seen, instead of the usual single settler, and a screw is provided to facilitate the adjustment of the two. It is made of steel throughout, and is durable and satisfactory.



Details of Hydraulic Cone

CAPACITY OF 24-IN. CONE CLASSIFIER

	Tons	Cubic Feet	Gallons
20-24 in. classifiers per 24 hr.:			
Dry slime, 16 mesh and finer, No. 21 wire	600	.....	....
Water	3600	.....	....
Water added to classify	144	.....	...
Total wet pulp	4344	.....	...
Ratio water to ore, 6.24:1.			
Feed to each classifier:			
Dry slime per minute	....	0.416	....
Water per minute	....	4.000	.....
Water added to classify, per minute	....	0.16	1.20
Wet pulp per minute	....	4.576	34.23
Spigot product, 20 classifiers:			
Dry slimes, 65% from 16 to 150 mesh	390	.....	.....
Water	594	.....	...
Wet pulp	984	.....	....
Ratio water to dry slime, 1.523:1.			
From each spigot:			
Dry slime for minute	..	0.27	.....
Water per minute	...	0.66	.....
Wet pulp per minute	....	0.93	6.9
Overflow from 20 classifiers:			
Dry slimes, 35% from 150 to 200 mesh	210	.....	.....
Water	3150	.....	....
Wet pulp	3360	.....	....
Ratio of water to ore, 15:1.			
Overflow from each classifier:			
Dry slimes per minute	....	0.17	...
Water per minute	....	3.5	..
Wet pulp per minute	....	3.67	27.45

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*Mining engineer, 887 Middle St., Bath, Maine.

The Cost of Doing Things

Drilling Costs at the North Star*

The rock at the North Star mine, in Grass Valley, Calif., is close-grained diabase in the upper levels and tough grano-diorite in the lower levels. The vein, which has an average dip of 23°, consists of about 5 ft. of "formation" lying between walls of unaltered country rock. In this 5 ft., solid quartz and stringers make up 18 in. of pay ore. The formation consists of but slightly altered country rock and is almost as hard as the unaltered walls. From 4 to 4½ ft. is sent to the mill. About one-third of the holes are drilled in the quartz; two-thirds in the formation. The holes are about 4½ ft. deep and break an average of 1.15 tons per hole. The average number of holes per stope-drill-shift is at present 5.65. The number of drill shifts throughout the mine in 1913 was 18,679, and the cost of labor for drilling, power, supplies, upkeep of machines and air lines, tool sharpening and distribution, amounted to 33% of the total mining expense. To do this work there are in commission 43 No. 12A, three No. 17V and eight No. 16V Waugh stopers, three jaekhamers, two Waugh pluggers, and 17 No. 8 and two No. 7 water Leyners.

TABLE I—COST PER DRILL SHIFT FOR WATER LEYNER No. 8

Item	Description of Unit	No. of Units Used per Drill Shift	Price per Unit	Cost for Item per Drill Shift
Labor of drilling	8-hr. shift	1	$3.25	$3.25
Maintenance,				
Labor				0.10
Supplies				0.62
Power	1,000 cu.ft. of free air compressed to 100 lb.	15	0.0275	0.41
Supplies,				
Lubricants	Quarts of "Red Engine" oil.	0.66	0.07	0.05
Hose	Feet of 1-in. 5-ply wire-wound;	0.12	0.33	0.04
	½-in wire-wound	0.12	0.19	0.025
Drill steel.	Pieces used.	16.75		
Labor sharpening and repairs				1.12
Labor distribution				0.35
Steel consumed	Pounds.	2.66	0.12½	0.33
Power for sharpener	1,000 cu.ft. free air compressed to 100 lb.	5.00	0.0275	0.15
Oil for forge.	Bbl. of 42 gal.	0.12	1.80	0.21
Upkeep of air pipe				0.09
Total				$6.75

TABLE II.—COST PER DRILL SHIFT FOR WAUGH 12A

Item	Description of Unit	No. of Units Used per Drill Shift	Price per Unit	Cost for Item per Drill Shift
Labor of drilling	8-hr. shift	1	$3.00	$3.00
Maintenance,				
Labor				0.10
Supplies				0.37
Power	1,000 cu.ft. of free air compressed to 100 lb.	17	0.0275	0.47
Supplies,				
Lubricants	Quarts of "Red Engine" oil.	0.33	0.07	0.02
Hose	Feet ¾-in. 5-ply wire-wound.	0.12	0.27	0.03
Drill steel.	Pieces used	10		
Labor sharpening and repairs				0.30
Labor distribution				0.21
Steel consumed.	Pounds.	2.2	0.065	0.14
Power for sharpener	1,000 cu.ft. of free air compressed to 100 lbs.	1.5	0.0275	0.04
Oil for sharpener	Bbl. of 42 gal	0.034	1.80	0.06
Upkeep of air pipe				0.09
Total				4.83

For the past three years a record has been kept of the repairs on each machine and the number of shifts operated by it. The figures given in Tables I and II for the cost of repairs per drill shift have been taken from this record. The underground air pressure is about 90 lb. The air consumption per drill shift was measured by aërometers. The leakage of pipe lines between compressor and meter is not included. From the number of pieces of steel sharpened for each type of drill during the year, the average used per drill shift has been ascertained. For other supplies the figures given represent a year's average.

The 16V and the 17V Waugh drills cost 10c. less for maintenance and supplies than the 12A model, but require 15 pieces of steel per shift instead of 10, which leaves the cost about equal.

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*From a paper by Robert H. Bedford and William Hague, presented at the Salt Lake meeting of the A. I. M. E.

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Cost of Fast Tunneling

The accompanying figures cover the work done in driving the Jualin tunnel in June, 1914. The work is being done by the Algunican Development Co., L. K. Kennedy, manager in charge, at Jualin, a few miles north of Juneau on the Alaskan coast. The tunnel will serve for prospecting and drainage and is to be 7000 ft. long. It is being driven in what is known as Jualin diorite.

COST OF DRIVING THE JUALIN TUNNEL FOR JUNE, 1914

Distance driven	539 ft.
Average per shift	17.96 ft.
Average round	4 ft. 8 in.

Total Wages

Labor	Number per Shift	Number of Shifts	Rate per Shift	Total Cost
Machinemen	2	199	$3.50	$696.50
Machine helpers	2	180¼	3.25	585.80
Muckers	4	376¼	3.00	1128.25
Carmen	2	27½	3.00	82.50
Blacksmith	1	31	4.05	125.25
Blacksmith helper	1	23	3.50	80.50
Powderman	1	30	3.50	105.00
Compressor man	1	30	4.80	144.00
Teamster	1	34	4.00	136.00
Dumpman	1	22	3.50	77.00
Total				$3160.80
Foreman	1	30	$6.00	$180.00
Shift bosses	2	60	5.00	300.00
Total				$480.00

Supplies and Labor per Foot

	Cost per Ft.
15-in. No. 18 gage fan pipe	$0.70
3-in. iron pipe	0.20
1-in. water pipe	0.045
30-lb. rail	0.40
No. 4 copper wire	0.21
Oil	0.03
Candles	0.07
Powder, 200 boxes, $7 per box	2.59
Fuse, 22,000 ft., $1.75 per 1000 ft.	0.18
Caps, 33 boxes, $1.25 per box	0.075
Labor	5.86
Bosses	0.89
Bonus	3.04
Waterproof goods allowance[1]	0.86
Total cost per ft.	$15.15

[1] Boots, slickers, hats for 34 men at $15 for each.

The drilling is done with two No. 18 Leyner machines. During June tramming was conducted by hand. During the month the entire 1100 ft. of track then laid was torn up and relaid with heavier rails. This work resulted in the loss of 4 rounds. At present mules are used for tramming and better footage is being made.

The crew consists of tried tunnel men; it was organized late in May and is in charge of A. Ricandeau who has all the work systematized to the last degree.

It will be noticed that the drills are Leyners as against the big pistons used on the Sheep Creek tunnel recently completed by the Alaska Gastineau not many miles away. The footage for June is an excellent showing. The two tunnels should afford an unusual chance for comparison between the two types of machine.

⁂

Concentrate Treatment Costs at Goldfield

The figures given in the following tables were taken from the 1913 report of the Goldfield Consolidated Mines Co., Goldfield, Nev. The mill treated 330,217 tons of ore from which 22,148 tons of concentrates were produced. In addition to this tonnage 3817 tons from the reserve dump were treated, making a total of 26,022 tons treated by the concentrate treatment plant. The cost of treating the dump concentrates was $13,247, which is included in the tables given herewith.

GOLDFIELD CONSOLIDATED COST PER TON OF CONCENTRATE TREATED, 1913

Department	Labor	Supplies	Power	Total	% of Total
Raw cyanidation ...	$0.095	$0.561	$0.185	$0.841	15.11
Filtering and conveying ...	0.230	0.045	0.040	0.315	5.66
Roasting ...	0.223	0.529	0.102	0.854	18.03
Acid treatment ...	0.118	0.403	0.173	0.694	14.65
Tube milling ...	0.028	0.018	0.043	0.089	1.87
Cyanidation of roasted product ...	0.085	1.077	0.138	1.300	27.42
Assaying ...	0.016	0.127	.....	0.143	2.57
Precipitation of Cu ...	0.024	0.002	.....	0.026	0.54
Precipitation ...	0.014	0.091	0.019	0.124	2.23
Refining ...	0.038	0.069	0.001	0.108	1.93
Disposal of tailing ...	0.026	0.017	0.008	0.051	1.07
General expense ...	0.015	0.011	.....	0.026	0.47
Handling dump ...	0.065	0.010	0.002	0.077	1.63
Water ...	.....	0.323	.....	0.323	6.82
Total per ton of concentrate ...	$0.977	$3.283	$0.711	$4.971	100.00
Total per ton ore ...	0.072	0.248	0.053	0.373	18.94

GOLDFIELD CONS. DETAILS OF CONCENTRATE TREATMENT COSTS, 1913

Item	Quantity	Price per Unit	Quantity per Ton Concentrate	Cost per Ton Concentrate	% of Total Cost
Cyanide ...	155,540 lb.	$0.1915	6.26 lb.	$1.200	24.14
Zinc ...	19,316 lb.	0.0944	0.87 lb.	0.082	1.65
Lime ...	740,000 lb.	0.0084	30.12 lb.	0.254	5.11
Lead acetate ...	43,654 lb.	0.0931	1.83 lb.	0.171	3.44
Water ...	27,673,000 gal.	0.2894	1060 gal.	0.308	6.20
Fuel oil ...	7,424 bbl.	1.6242	11.98 gal.	0.463	9.31
Sulphuric acid	364,800 lb.	0.0258	14.02 lb.	0.362	7.28
Muriatic acid ...	3,672 lb.	0.0465	0.14 lb.	0.007	0.14
Borax ...	2,530 lb.	0.1174	0.11 lb.	0.013	0.26
Litharge ...	7,468 lb.	0.0768	0.34 lb.	0.027	0.54
Coke ...	20,975 lb.	0.0073	0.95 lb.	0.007	0.14
Pig lead	2,490 lb.	0.0614	0.11 lb.	0.007	0.14
Slag ...	12,768 lb.	0.0073	0.58 lb.	0.004	0.08
Pebbles ...	16,160 lb.	0.0156	0.63 lb.	0.010	0.20
Assaying ...				0.127	2.55
Roaster parts				0.046	0.93
Machinery and repairs ...				0.075	1.51
Belting ...				0.100	0.20
Lubrication				0.005	0.10
Filter cloth				0.023	0.46
Pipe and fittings				0.032	0.65
General stores				0.050	1.01
Total supplies				$3.283	66.04
Labor	5463 shifts	$1.36	0.224	0.977	19.65
Power ...	214 hp	72.00	3.60 hp	0.711	14.31
Total cost concentrate treatment				$4.971	100.00

⁂

Milling Costs at Goldfield

The following figures were given in the annual report of the Goldfield Consolidated Mines Co., Goldfield, Nev., for year ended Dec. 31, 1913. The mill treated 330,217 tons of ore averaging $14.88 per ton, of which $1.19 was lost in tailings and $13.69 recovered. It cost 8c. per ton or 1.24% of the total cost of production to transport this ore from the mines to the mill. Milling cost was $1.60 per ton and concentrate treatment 33c. per ton milled. Transporting, milling and concentrate treatment costs were equal to 30.07% of the total cost of production.

GOLDFIELD CONSOLIDATED MILLING COSTS, 1913, PER TON MILLED

Department	Labor	Supplies	Power	Total	% of Total
Crushing and conveying ...	$0.017	$0.008	$0.005	$0.033	2.08
Stamping ...	0.032	0.028	0.065	0.125	7.73
Chilean milling ...	0.018	0.033	0.046	0.097	6.07
Elevating and classifying ...	0.012	0.004	0.006	0.022	1.36
Tube milling ...	0.014	0.101	0.107	0.222	13.93
Concentration ...	0.040	0.007	0.016	0.063	4.00
Neutralizing ...	0.007	0.048	.....	0.063	3.46
Settling ...	0.013	0.049	.....	0.062	3.86
Dissolution ...	0.021	0.363	0.034	0.418	26.23
Filtering ...	0.038	0.025	0.013	0.076	4.78
Tailing expense ...	0.001	.....	.....	0.001	0.09
Assaying ...	0.003	0.019	.....	0.022	1.39
Precipitation ...	0.008	0.055	0.012	0.075	4.68
Refining ...	0.023	0.041	.....	0.064	4.05
Water ...	0.005	0.066	.....	0.071	4.47
Surface and plant ...	0.011	0.005	.....	0.016	0.97
Steam heating ...	0.003	0.007	.....	0.010	0.60
Storehouse and office	0.012	0.003	.....	0.015	0.94
Stable ...	0.001	0.001	.....	0.002	0.12
Watchman ...	0.024	.....	.....	0.024	1.52
Superintendent and foreman ...	0.059	.....	.....	0.059	3.72
Lighting ...	0.002	0.002	0.014	0.018	1.22
General expense ...	0.003	0.005	0.001	0.009	0.55
Mill tools ...	0.001	0.001	.....	0.002	0.07
Electrical department	0.003	0.003	.....	0.006	0.33
Pumping battery water ...	0.005	0.002	0.015	0.022	1.34
Experimental ...	0.005	0.002	.....	0.007	0.44
Totals ...	$0.381	$0.878	$0.337	$1.596	100.00

GOLDFIELD CONS. DETAILS OF MILLING COSTS, 1913

Item	Quantity, Lb.	Price per Unit	Quantity per Ton	Cost per Ton	% of Total Cost
Cyanide ...	485,740	$0.1915	1.47 lb.	$0.282	17.65
Zinc dust ...	173,845	0.0944	0.53 lb.	0.050	3.16
Lime ...	3,780,500	0.00836	11.45 lb.	0.096	6.01
Lead acetate ...	259,893	0.0932	0.79 lb.	0.074	4.64
Muriatic acid ...	93,168	0.04654	0.28 lb.	0.013	0.81
Water, gal. ...	75,072,000	0.2706	230 gal.	0.062	3.88
Borax ...	22,770	0.1174	0.07 lb.	0.008	0.50
Litharge ...	67,207	0.07856	0.20 lb.	0.016	1.00
Pig lead ...	22,410	0.0614	0.07 lb.	0.004	0.25
Shoes and dies ...	152,649	0.0477	0.46 lb.	0.022	1.38
Pebbles ...	1,316,800	0.01618	3.99 lb.	0.065	4.07
Tube mill lining ...	201,415	0.053	0.61 lb.	0.032	2.01
Chilean steel ...	104,397	0.0603	0.32 lb.	0.019	1.19
Coal ...	71 tons	15.28	0.43 lb.	0.003	0.19
Coke ...	188,775	0.00727	0.57 lb.	0.004	0.25
Slag ...	114,912	0.00727	0.35 lb.	0.003	0.19
Waste ...	6,400	0.111	0.02 lb.	0.002	0.13
Belting ...				0.011	0.66
Lubrication ...				0.007	0.43
Machinery and repairs ...				0.018	1.14
Screens ...				0.004	0.29
Office supplies ...				0.003	0.13
Filter cloth ...				0.007	0.45
Iron and steel ...				0.008	0.59
Assaying ...				0.019	1.14
Hose and fittings ...				0.003	0.10
Pipe and fittings ...				0.008	0.59
Lumber ...				0.005	0.39
Crusher parts ...				0.006	0.30
Pump parts ...				0.003	0.11
Electrical repair and upkeep				0.004	0.27
General stores ...				0.017	1.09
Total cost of supplies not including concentrate treatment ...				$0.878	54.99
Operating labor ...	19,294 shifts	$4.97	0.058	0.290	18.20
Repair labor ...	6,635 shifts	4.53	0.021	0.091	5.70
Power ...	1,546 hp.	72.00	1.78	0.337	21.11
Total milling 330,217 tons, not including concentrate treatment				$1.596	$100.00

The costs of concentrate treatment are not included in the above tables in this article, but are given in the special tables in the preceding column.

⁂

The Efficiency of Coal-fired Reverberatory Furnaces is much affected by the amount of fines in the coal. C. D. Demond in the August "Bulletin" of the American Institute of Mining Engineers, states that a standard furnace at Anaconda smelted 270 tons per day with 60 tons (ratio 4.5) of good run-of-mine Diamondville, Wyo., coal, 60 to 70% of which was coarser than ¾ in., and 240 tons (ratio 4.0) with poor run-of-mine coal, 40% coarser than ¾ in. But with Diamondville lump coal, 80% or more coarser than ¾ in., the furnace smelted 328 tons with 63 tons of coal (ratio 5.2). Comparing ratios, the lump coal gave 30% better smelting results than poor run-of-mine and 15% better results than good run-of-mine coal.

Supporting Excavation at Lightner Mine

By Leroy A. Palmer*

SYNOPSIS—Lightner, a small but profitable property in Angels Camp, on the Mother Lode, California. It lies in the so called "talc belt." Mining by adjoining properties and between the 300 and 600 levels of the Lightner caused bad slipping in the latter. New shaft became necessary. Good body of ore found above the 300 level in drifting from this shaft. Cribs used to hold the bad ground and old stopes. Methods of drifting and mining.

⁂

The Lightner mine, one of the operating properties on the Mother Lode, is situated at Angels Camp, Calif., between the Utica and the Angels Quartz mines. Its length on the vein is only 420 ft. and its width 450 ft., so that its area is 4⅓ acres; yet this mine has paid dividends of over $330,000 as the result of work practically confined to ground between the 300- and 600-ft. levels. The mine is equipped with a 60-stamp mill and at present, with 30 stamps dropping, is treating 150 tons daily, using amalgamation and concentration.

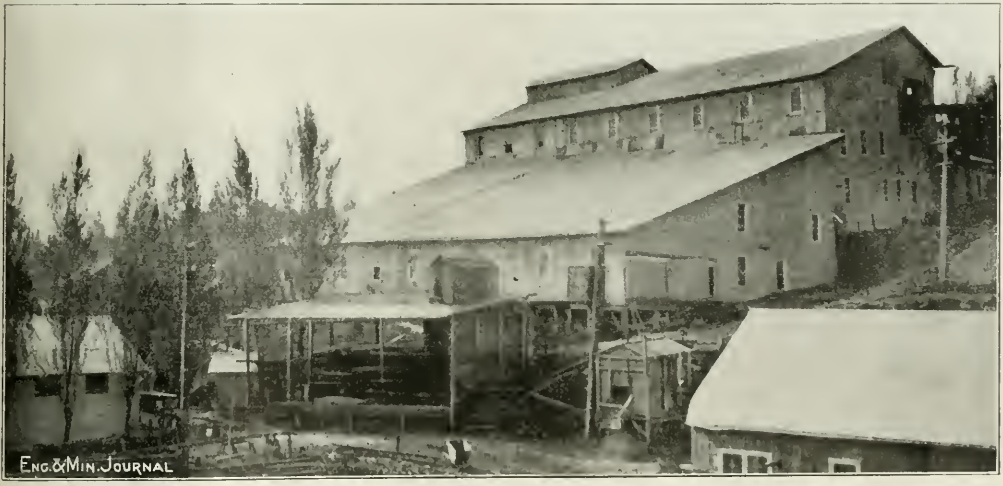

Fig. 1. The Lightner Mill

Note displacement of roof of concentrator building against side of main building.

Geology

The ore at Angels Camp is found in fissure veins or "stringer leads," in a hornblende schist associated with greenstone. The Lightner lies in what is locally known as the "talc belt," which includes also the Angels Quartz, and Utica, three of the four producers of Angels Camp.

The talc belt is a shear zone, commonly but incorrectly called a talc vein, caused by crushing during a rock movement associated with a thrust fault: this ground the hard schist to a talcy mass, which has a maximum thickness of 400 ft., but thins to the southward and disappears a short distance north of the Cross shaft. As would be expected, the "talc" shows by analysis that it has the same composition as the schist walls. It has a strike almost due north and south and an easterly dip of 45 degrees.

This shear zone is cut by the Angels Quartz shaft, between the 200- and 300-ft. level and at continually increasing depths as one passes southeasterly along the lode until at the Stickle shaft of the Utica, it is cut between the 900- and 1000-ft. points. The Stickle is the last shaft to cut it, as it thins out and disappears before it reaches the Cross shaft of the Utica, but it has been encountered in stoping a short distance north of the Cross, and if produced, would cut the latter at about the 1300-ft. level.

Both the Utica and the Angels Quartz mines stoped to the end lines of the Lightner, the Angels Quartz to a depth of 600 ft. and the Utica to a depth of 610 ft. Meantime, the Lightner had sunk its old shaft in the hanging wall, crossed the vein into the foot wall, and starting at the 600 level, had stoped up to the 300. The inevitable happened. The general slippage southerly along the talc belt was worst at the Lightner where the small block of ground, weakened within itself and at each end, was displaced perceptibly as the foot wall settled on the talc. An idea of the amount of settling can be gained by reference to Fig. 1, which shows the mill; the line above the roof of the concentrator floor represents the original position of the roof. Some delicate points might be developed in case suit for trespass were started among these mines, as it has been found that one witness tree has slid 21 ft.

The settling caused endless trouble with the old shaft and much time was lost in easing and realigning timbers until finally conditions got to be such that in a period of two months [illegible]-half of the time was spent in keeping the [illegible] open. Then the management gave up and went 260 ft. northeasterly, at right angles to the strike, and sank a new two-compartment-and-manway shaft. This shaft, farther over in the hanging, is in greenstone, well timbered on 4-ft. centers with 12x12-in. stuff and should last as long as the mine. It has been carried to the 1000-ft. level and levels cut at the 100-, 200-, 300-, 400-, 500-, 600- and 900-ft. points.

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*Mining engineer, San Francisco, Calif.

The old stopes which had been supported with square sets and had been neglected while the mine was being reopened were naturally in bad condition. A drift was run out on the 400 level and a raise from this found ore at 40 ft.; stoping was commenced and carried up to the 300 level and work started to make that the main haulageway of the upper portion of the mine and to carry the stoping to the surface.

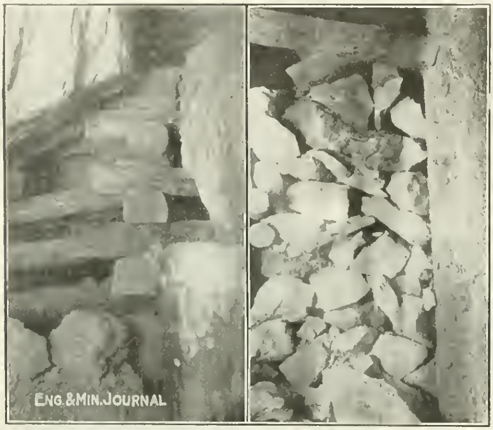

Fig. 2. Timber Crib Supporting Old Stope   Fig. 3. Rock Filling between Cribs

Conditions are such in the caved territory that no regular system of mining can be carried on in all portions; it is necessary to fit the mining practice to the exigencies of the ground. The general plan when caved ground is hit, is to put up a manway and chute one set apart, each 4x4 ft. in section and solidly cribbed with 10-in. round timbers. Three such pairs, manway and chute, are put in for each new stope, one on the hanging wall, one on the foot wall and one between. The stope is then opened by starting a sill floor and working overhead as in square setting, manways being put in every 50 ft. along the vein and chutes every 20 ft. Instead of the usual square sets, rock and timber cribs are used for support, such as shown in Fig. 2. As a stope is worked out the height of a set, the spaces between these cribs, except along passageways, are roughly filled with waste, Fig. 3.

When the works ran into an old stope and old timbers were encountered, they were used whenever possible in building cribs and many such have been built of solid timber; when more timbers were found than could be used to advantage, they were hoisted out and stocked; at one time the supply in the timber yard from this source amounting to 600 cords.

As soon as the work had progressed to such a point that the management had an idea as to conditions, the 300 was chosen for the main-haulage level. The level from the old shaft was tapped, but had settled and almost squeezed shut, Fig. 4. The rock from the stopes, therefore, is being dropped through chutes to the 400, and a drift has been started from the stope to tap the new portion of the 300 level, the waste from the drift being used in filling.

With the exception of about 50 ft., which, north of the shaft, is stopped from the 300 to the 200, the orebody extends practically from the 300 to the surface. All of this stoping, with the exception of one small piece that can be held with square sets, must be done by cribbing, since all of the ground above the 400 level has settled and badly shattered ore and cracks on the hanging wall are of common, in fact usual, occurrence.

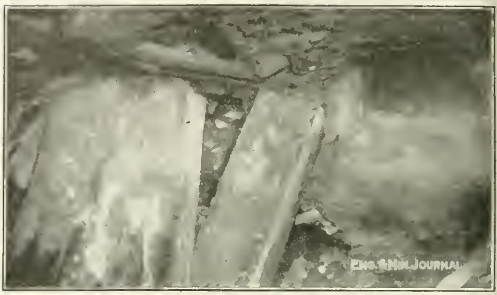

Fig. 4. Caving in Old Part of 300 Level

Under the old system, the ordinary type of tunnel set was used in the drifts, but the ground was so heavy that 30-in. round timbers and even larger were crushed. Under the new system, bridged sets are used exclusively in drifts in shifting ground and these answer well, but require continual easing to keep the sets open and in line. In drifting a heavy pole lagging, 6 in. and thicker, is always carried up to the working face so the men have continual protection overhead, the system being similar to that of forepoling in loose ground.

In spite of the nature of the ground with which the operators must continually contend, in the past two years only two serious accidents have occurred. One man was killed by falling down the shaft and another had a leg broken by a fall of roof; the latter accident is, of course, the only one attributable to the mining method.

Ingersoll-Rand butterfly stopers are used, five or six holes generally being drilled to the round, which breaks an average of 15 tons. The daily output is 175 to 180 tons with a total of 32 men, besides the foreman, employed underground as follows: 12 miners, 10 muckers, four trammers, six timbermen. The cost of mining from stope to mill, taking into consideration all charges, including insurance under the new California liability law, which amounts to about 7% of the payroll, is, in round numbers, $1.50 per ton, or $0.75 for timbering, $0.50 for breaking rock and $0.25 for tramming, hoisting, etc. One month, when conditions were favorable, these costs were brought down to $1.03. Fortunately, timber is cheap, being obtained in the Sierras at no great distance from the mine.

I am indebted to Alexander Chalmers, superintendent, and to members of his staff, for courtesies extended to me while collecting these notes.

Lake Superior Mining Institute

Special Correspondence

The Lake Superior Mining Institute opened Aug. 31, at Ishpeming, with an estimated attendance of 350. The first-aid contest was participated in by 12 teams of six men each from various Lake Superior ranges, at Union Park, near Ishpeming, in the morning. The judges were Dr. A. F. Knoefel, vice-president Vandalia Coal Co., Linton, Ind.; R. Y. Williams, director Illinois Miners' & Mechanics' Institute; G. H. Hawes, rescue engineer, Pittsburgh, Penn. Before the contest, Doctor Knoefel stated that published rules would govern the awards, and that efficiency, not show, would be considered first in judging. Event seven, the treatment of broken back, was most spectacular, and visitors showed great interest in this and other events. The teams were remarkably proficient and the participants were well trained and keen in rivalry. The expenditure of much time and money by the various companies represented was indicated, as many had been preparing for weeks with all members off regular work but on full time. The results were announced at the conclusion of the ball game in the afternoon. The teams were judged on points and prizes awarded on total points. First prize was $50 and five bronze medals of the American Mine Safety Association, won by Team Seven, Republic Iron & Steel Co., Marquette Range, Capt. Paul Mitchell. Second prize, $30 and six silk umbrellas, was won by Team Eleven, Cleveland Cliffs Iron Co., Marquette Range, Capt. J. S. McNabb. Third prize, $30 and one self-rescue apparatus was finally taken by Team Five, Oliver Iron Mining Co., Marquette Range, after being tied for by Teams Five, Eight and Nine, which worked off the tie by additional contests. Luncheon was served at the Wawonowin Golf Club. After the ball game, 50 automobiles took members to Athens and Negaunee mines of Cleveland Cliffs, at Negaunee, two of the most modern shafts in district.

The interesting features at Athens were the method of concreting the shaft and using permanent equipment to sink. At the Negaunee mine, all machinery is electrically operated by current from Carp River plant. Visiting members could inspect the latter by special arrangement. Automobiles transferred party to new steel and concrete dock of Lake Superior & Ishpeming at Presque Isle, near Marquette, then to Lake Shore Engine Works, Marquette. This company was host at a whitefish dinner, served in its pattern shop, to 300 guests. The company also formally exhibited a new loading machine, which it has been developing for five years. It is intended for iron, copper and coal mines, and is compact and differs widely from other machines for similar purposes. It created a favorable impression and much discussion. This one was built for Judson mine, Alpha, Mich., and will go into service soon. A vaudeville and moving-picture entertainment was given in the evening.

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New British Export Regulations

According to the *Chemical Trade Journal*, Aug. 22, 1914, the British Government has issued a proclamation prohibiting, among other materials, the exportation of certain warlike stores from the United Kingdom to all foreign ports in Europe and on the Mediterranean and Black Sea, with the exception of those of France, Russia (except the Baltic ports), Spain and Portugal. The list includes the following products: Aluminum, aluminum alloys; asbestos; coal, steam, large; explosives of all kinds; fuel, manufactured; manganese; mercury; mica; mineral jellies; molybdenum; nitrates of ammonium; nitrates of potassium; nitrates of sodium; nitric acid; saltpeter; sulphur; sulphuric acid; tin; tin plates; tungsten and vanadium.

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August Mining Dividends

Twenty-three mining companies making public reports paid $1,830,362 in dividends in August, as against $2,089,605 paid by 26 companies a year ago. Steel, smelting and holding companies paid $11,617,745, a decrease of $100,000, and Canadian and Mexican companies $563,506, as compared with $1,163,324.

Company	Situation	Per Share	Total
Alaska Mexican, g.	Alas.	0 20	$36,000
Alaska Treadwell, g.	Alas.	1 00	150,000
Alaska United, g.	Alas.	0 20	36,040
Bunker Hill, g.	Calif.	0 01	5,000
Bunker Hill & Sullivan, l. s.	Ida.	0 25	81,750
Chief Con., s. g. l.	Utah	0 05	43,831
Duluth & Utah, l.z.s.	Utah	0.07½	3,750
Eagle & Blue Bell, g. s. l.	Utah	0 05	44,657
Elkton, g.	Colo.	0 02	50,000
Fremont, g.	Calif.	0 02	4,000
Golden Cycle, g.	Colo.	0.03	45,000
Homestake, g.	S. D.	0.65	163,254
Hecla, l. s.	Ida.	0 02	20,000
Miami, c.	Ariz.	0 50	373,380
Mohawk, c.	Mich.	1.00	100,000
Oroville, g.	Calif.	0.06	85,000
Parrot, c.	Mont.	0.15	34,477
Skidoo, g	Calif.	0.05	50,000
Stewart, c.	Ida.	0 10	123,826
Ton Reed, g.	Ariz.	0.06	54,573
United Verde	Ariz.	0.75	225,000
Wasp No. 2, g.	S. D.	0 01	5,000
West End Con. g.	Nev.	0 05	93,424
Yosemite, g.	Calif.	0.10	2,400

Iron, Industrial and Holding Companies	Situation	Per Share	Total
Amalgamated, c.	U. S.	$1 50	$4,616,637
Cambria Steel, pfd.	Penn.	0 62½	562,500
International Nickel, pfd.	N. J.	1 50	133,689
U. S. Steel, pfd.	U. S.	1.75	6,304,919

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Amparo, g. s.	Mex.	0 03	$60,000
Crown Reserve, s.	Ont.	0 02	35,376
Dominion Steel, pfd.	Can.	1 50	150,000
Hollinger, g.	Ont.	0 15	90,000
Lucky Tiger, g. s.	Mex.	0.09	64,380
Standard, s. l.	B. C.	0 02½	50,000
Steel Co. of Canada	Can.	1 75	113,750

Dividends for the first eight months are: Mining companies, 1914, $42,410,582; in 1913, $47,540,327; metallurgical and holding companies, $56,652,093 in 1913; $56,167,506 in 1914; Mexican and Canadian companies, $12,064,368 in 1914; $15,042,619 in 1913.

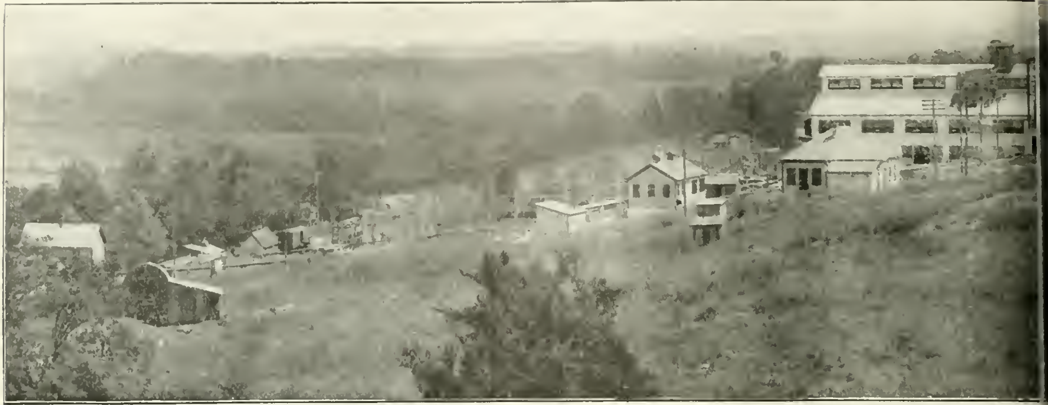
*

Magnesite

Among the shortages of minor materials due to the war is that of magnesite, which is largely used in making openhearth furnace bottoms. Most of this has been imported from Austria and Greece, and shipments have been cut off for the present, and for an uncertain time to come. The consumption has been about 12,000 tons per month, and the stocks now on hand are reported to be from 38,000 to 40,000 tons, or about three months' supply. In addition, dolomite can be used to some extent.

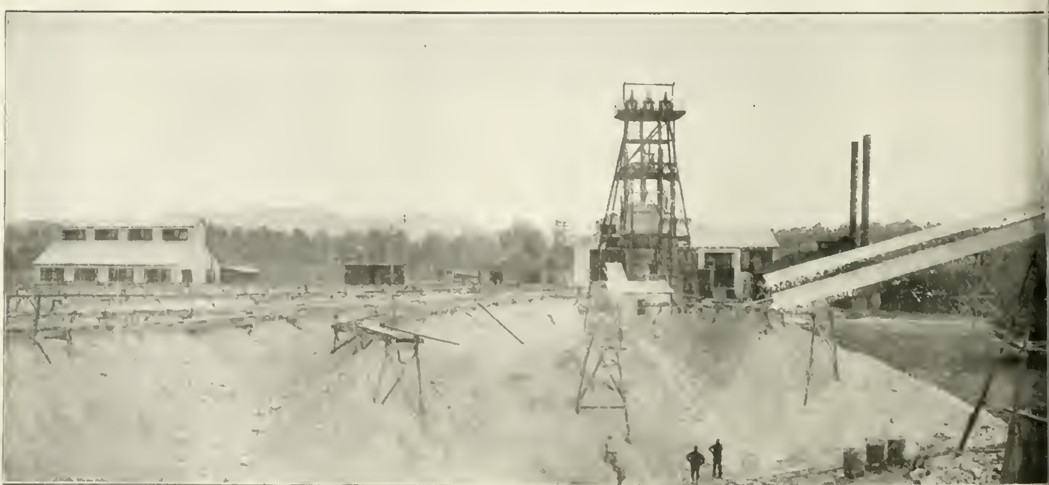
There are considerable deposits of magnesite in California, but no mining of any importance has been done, because the demand on the Pacific Coast was small, and high freight rates prevented competition in the East with Austrian magnesite delivered by water at low rates. With the Panama Canal open the California material would seem to have found an opportunity.

Zinc Concentrator at Mascot, Tenn.



Concentrator Building, American Zinc Co. of Tennessee, a Subsidiary of th
While designed to treat 1000 tons of ore per day, the actual capacity is from 1200 to 1400 tons per

View Showing the Employees' Living Quarters, Company's



Concentrator and Mine Headframe, as Viewed from
Some difficulty has been experienced in securing a high recovery of zinc from slimes. Experimental work on this
been solved and the next move will be to install

American Zinc, Lead & Smelting Co., Built and in Operation in Six Months

day, the concentrates containing 58 to 63% zinc, very low in impurities, such as lead and iron.

Mill and General Character of the Country at Mascot

Side Opposite That Shown in the Upper Photograph

problem has been carried on for some time, many treatment processes being tested, including flotation. The problem has additional equipment to treat all slimes made.

More Trouble in Butte

An explosion early Sunday morning, Aug. 30, destroyed the employment office of the Anaconda Copper Mining Co., near the Parrot mine. The building was a two-story brick building. A great hole was torn in the roof and one wall was blown completely out. No one is known to have been killed, but the watchman is reported missing.

The cause is supposed to have been the outcome of the reopening of the union's jurisdictional quarrel, in which the new union claims that the old was dominated by the Anaconda company.

It is said that the mayor and sheriff have announced that they were powerless, and that they requested the governor to send aid. He then mobilized the second regiment of the Montana National Guard, at Helena, but no time has been set for its departure to Butte. In the meantime it is also reported that the miners threaten to burn Butte, in case the soldiers are sent. Martial law was declared in Butte at midnight, Sept. 1, and troops were expected there the morning of Sept. 2, according to dispatches received as we go to press.

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Rapid Cyanidation of Ores

The American Rapid Cyaniding Co., of Detroit, Mich., reports that it has installed a Reinohl rapid-cyaniding apparatus at the Suffolk mill, Ophir, San Miguel County, Colo., operated by the Ophir Gold Mines, Milling & Power Co., George B. Pickett, vice-president and general manager, and supplies the following information:

Ore is run from a bin through crushers, then to a stamp mill where it is further crushed in a cyanide solution, and conducted through a tube mill and reduced to about 200 mesh. The pulp is then delivered to a Reinohl apparatus, comprising a launder and a lixiviator, where the pulp is heated, additional cyanide supplied progressively to maintain its strength, and the pulp continuously agitated in the presence of the oxygen of the atmosphere.

From the end of the lixiviator the pulp is conducted to settling tanks, the pregnant clarified solution decanted, filtered and conducted through zinc-shaving boxes in the usual manner. A complete cycle, from the ore bins, through the stamps, the tube mill, the Reinohl launder and lixiviator to a settling tank, clarified solution decanted from another settling tank, filtered and passed through the zinc boxes, and the solution returned to the stock tank, was made in 11 minutes. Previous practice, by other cyaniding processes, required four days to accomplish the same result.

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Steel Rates to the Pacific Coast

A matter of some importance to the iron and steel trades is the question of rates to the Pacific coast from Eastern steel mills. These rates have been so high, for the most part, that they have given an opening for the importation of material from Europe brought on a water rate which could be made very low for the sake of securing business. For some time past, the through rate on iron and steel from Pittsburgh to Pacific Coast points has been 80c. per 100 lb., or $16 per ton. Now the rate from New York to San Francisco by steamer through the Panama Canal has been fixed at 30c. per 100 lb., or $6 per ton. Adding the rate of 16c. from Pittsburgh to New York, with an allowance for transfer and dockage charges, gives about 48c., or $9.60 per ton, from Pittsburgh to San Francisco, the difference from the present rate being an important one. Eastern mills would, however, have an advantage over the Pittsburgh district in lower freight rates to New York.

Now the railroads propose to meet the canal competition by a heavy reduction in rates. The proposed new rate is based on 50c. per 100 lb. from Chicago to the Pacific Coast. This is a heavy drop, and would make the rate from Pittsburgh to coast points 61.2c., or $12.24 per ton, which is still $2.64 above the rate through the canal. The change, however, if it should go no further, will make an important difference in conditions of competition, and will probably enable our manufacturers to undersell their foreign rivals on the Pacific Coast, as they have not been able to do heretofore. So far as the Pittsburgh district is concerned, both Eastern mills and those in the Chicago district will have advantages in competition not to be neglected.

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Chronology of Mining for August, 1914

Aug. 1—First reports of curtailment in production by Butte mines and copper porphyries. Decision by Interstate Commerce Commission on railroad rate case only partly favorable to roads.

Aug. 2—Germany declared war on France and Russia.

Aug. 4—Five men killed and four injured by premature blast in steam-shovel pit of Nevada Consolidated at Ely, Nevada.

Aug. 6—Beginnings of hearings before Federal Indusdustrial Commission at Butte.

Aug. 8—First announcements of impending closing of Cobalt silver mines.

Aug. 10—Beginning of A. I. M. E. meeting at Salt Lake City. Suit brought against Bullwhacker Copper Co. by some of company officers to recover money advanced.

Aug. 12—Three men suffocated while fighting fire at Big Ben mine, Kern County, Calif.

Aug. 14—Jacob Langeloth, chairman of board of directors of American Metal Co., died.

Aug. 15—Constitutionalists entered City of Mexico.

Aug. 22—Smoot bill for silver purchase passed Senate.

Aug. 24—Receivers appointed for International Steam Pump Co.

Aug. 30—Alleged rebel miners dynamited Anaconda company's employment office at Parrot mine.

Aug. 31—Beginning of Lake Superior Mining Institute meeting at Ishpeming, Mich.

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Tennessee's Mineral Output in 1913

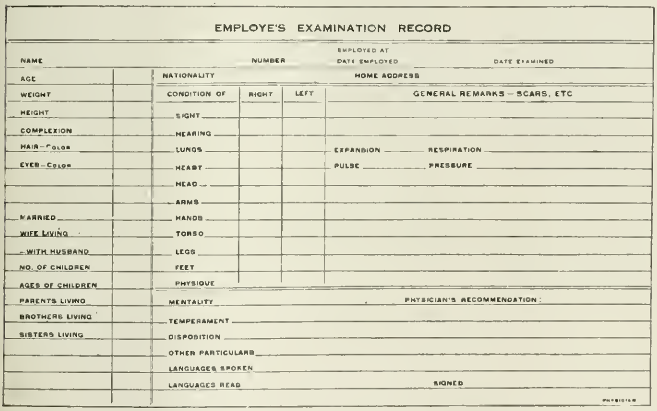
The principal items of mineral production of Tennessee in 1913 were as follows, the figures being taken from the annual report of George E. Sylvester, Chief Mine Inspector: Barytes, 1618 tons; bauxite, 11,516 tons; coal, 6,739,486 tons; coke, 372,741 tons; copper, 18,911,750 lb.; gold, 367 oz.; iron ore, 409,087 tons; pig iron, 280,879; phosphate rock, 398,044 tons; crystalline quartz 71,182 tons; silver, 108,104 oz.; sulphuric acid, 247,713 tons; zinc ore, 145,917 tons.

Correspondence and Discussion

Physical Examination under Workmen's Compensation Act

Since the Workmen's Compensation Act became operative in New York State on July 1 of this year, a number of corporations have adopted the policy of subjecting employees and applicants to a physical examination with the idea of reducing accidents and the resulting compensation to a minimum by maintaining a standard of physical and mental fitness. This policy has been met by a protest from labor organizations, which claim that men are being discharged because of failure to meet the physical examination requirements, regardless of their length of service or other considerations.

While not approving of the policy of discharging old employees on this account, preferring rather some system of transferring to other occupations, I nevertheless believe that the practice of physical examinations for all classes of labor engaged in hazardous employment is not only a just and logical sequel to the act for the protection of the employer, but inures quite as much to the benefit of the employee, for, notwithstanding the unquestioned liberality of the New York State Act, no laborer can afford to risk injury through physical unfitness tc perform the task allotted him.


EMPLOYE'S EXAMINATION RECORD

NAME NUMBER EMPLOYED AT DATE EMPLOYED DATE EXAMINED

AGE		NATIONALITY			HOME ADDRESS
WEIGHT		CONDITION OF	RIGHT	LEFT	GENERAL REMARKS — SCARS, ETC
HEIGHT		SIGHT			
COMPLEXION		HEARING			
HAIR—Color		LUNGS			EXPANSION RESPIRATION
EYES—Color		HEART			PULSE PRESSURE
		HEAD			
		ARMS			
MARRIED		HANDS			
WIFE LIVING		TORSO			
—WITH HUSBAND		LEGS			
NO. OF CHILDREN		FEET			
AGES OF CHILDREN		PHYSIQUE			
PARENTS LIVING		MENTALITY			PHYSICIAN'S RECOMMENDATION:
BROTHERS LIVING		TEMPERAMENT			
SISTERS LIVING		DISPOSITION			
		OTHER PARTICULARS			
		LANGUAGES SPOKEN			
		LANGUAGES READ			SIGNED
					PHYSICIAN

I personally believe that it is as much the duty of the employer to select employees capable of exercising due diligence in avoiding accidents inherent to the work involved as to provide safeguards for them, and especially so in cases where failure to exercise such diligence involves possibility of injury to other workmen. It has been stated that those corporations which are requiring physical examinations are mostly those which have elected to carry their own insurance. The fact that a corporation is insured under the state or in a mutual or stock company should not blind it to the fact that it is quite as necessary to reduce accidents to a minimum as when self insured, for the reason that the rates to be paid in the future will be based on the actual loss experience of the present.

The examination record blank which I have adopted for the St. Lawrence Pyrites Co. is shown herewith.

F. T. Rubridge.

New York, Aug. 5, 1914.

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What Becomes of All the Mining Engineers?

Is it true that only about 1% of graduates of mining courses are holding positions in their chosen work three years after their graduation? Are the higher positions in the mining and metallurgical field open only to outsiders? I feel sure that many have read J. I. Blair's article in the Journal of May 30 with surprise. The student will read it with dismay. The latter fact prompts me to attempt a reply.

Mr. Blair's question, "What becomes of all the mining engineers, metallurgical engineers and electrometallurgists who are graduated year after year from our universities?" is not happily phrased. Our universities and technical schools never did and never will graduate mining engineers, metallurgical engineers or electrometallurgists. Our universities and technical schools graduate men who have or should have the training which should enable them in the course of time to become mining engineers or metallurgists.

I think that most of us who have graduated from technical schools have at some time previous to our graduation labored under the delusion that we would graduate as mining engineers or metallurgists. Most men with whom I have talked admit that such is the case. Some of us have graduated with a full realization of how far short we were of being mining engineers. Others have floundered for some time in the quagmire of our delusions until the lesson of our failures has at length set us right. Still others, but their number is comparatively few, have given up in despair and turned their efforts to other lines of endeavor.

So much for Mr. Blair's question, but what does become of the graduates of mining-engineering courses in our technical schools and what percentage of the men who graduate are holding positions in their chosen work? To settle this question we need but to refer to the registers of graduates of some of our technical schools. The Case School of Applied Science has living 160 graduates in mining and metallurgy, of whom 85% are actively engaged in some line of engineering work and the greater number of them in mining and metallurgical work. Table I, giving graduates by classes, may prove of interest:

TABLE I. CASE SCHOOL OF APPLIED SCIENCE

Class	Graduates Living	Engaged in Mining or Metallurgy, Per Cent.	Engaged in Engineering Work, Per Cent.	Total in Some Form of Engineering Work, Per Cent.
1887	1	100	..	100
1888	..	..	..	..
1889	..	..	..	..
1890	1	..	100	100
1891	..	..	..	..
1892	4	75	..	75
1893	.	.	.	..
1894	1	100	.	100
1895	2	100	.	100
1896	1	.	..	..
1897	1	.	100	100
1898	1	100	..	100
1899	5	20	80	100
1900	7	29	57	86
1901	7	29	57	86
1902	9	67	22	89
1903	13	23	62	85
1904	9	56	22	78
1905	13	15	77	92
1906	6	50	33	83
1907	5	40	20	60
1908	6	50	50	100
1909	7	43	29	72
1910	13	54	38	92
1911	18	39	33	72
1912	17	41	41	82
1913	13	69	15	84
Total	160	44	41	85

Table II shows the occupations of graduates of the mining course at the Massachusetts Institute of Technology from 1868 to 1909, inclusive, as stated in January, 1910. Of the 374 graduates then living, 277, or 74%, were engaged in engineering work, for the most part mining, either as engineers, metallurgists, geologists, professors of mining and metallurgy or as executives. Many of the graduates who have gone into other lines of work have done so not because they were failures in engineering work, but rather because it fell to their lot to take up business interests inherited by them. Failures there doubtless have been, but the percentage has been small. Classes graduated recently show no decrease in the number of men following their chosen line of work.

TABLE II—OCCUPATIONS OF GRADUATES IN MINING. MASSACHUSETTS INSTITUTE OF TECHNOLOGY, 1868-1909

Occupation	No. of Men
Army officer	1
Bankers	3
Builder	1
Business (unclassified)	6
Chemists	17
Civil engineers	4
Contractors	2
Engineering work, mostly mining	53
Editors	2
Examiners, Patent Office	2
Foremen, metallurgical plants	8
Fruit grower	1
Geologists, mining and metallurgical engineers	105
Inventor	1
Lawyers	2
Managers, mining and smelting works	15
Managers, other industrial corporations	4
Manufacturer	1
Mine owner and operator	1
Opticians	2
Patent solicitor	1
Presidents, vice-presidents, secretaries or treasurers, mining and smelting companies	15
Presidents, vice-presidents, secretaries or treasurers, other industrial corporations	16
Printer	1
Promoter	1
Private business	3
Professor mining or metallurgy	13
Real estate and insurance	2
Representative metallurgical corporation	2
Student	1
Sugar planter	1
Superintendent mining or smelting works	38
Superintendent, assistant, mining or smelting works	6
Superintendent, other industrial works	6
Teachers, or in educational work	7
Trustee	1
Unknown	27
U. S. Land Office	1
Total	374

Mr. Blair's remarks with reference to conditions in various mining and metallurgical centers present much that is true, but are, I believe, overdrawn. He states, for instance, that at the great steel works technical men who have been trained to solve difficult problems in the metallurgy of steel, are working as chemists or sometimes as inspectors, doing work that requires common sense but not technical training. Such may be the case. Engineering work is, however, about 90% common sense. Without the gift of common sense the technical training that a man may have avails little. A man's ability as an engineer is judged no less by his handling of the innumerable little details and problems requiring common sense and judgment than by his ability to solve the difficult problems which confront him. If he does not show common sense and judgment in his handling of the little problems, surely he can never expect to have the larger responsibilities entrusted to him. May it not be true that the conditions described by Mr. Blair are due primarily to lack of common sense and business training on the part of the technically trained men who might otherwise obtain and hold the positions now held by men who have obtained their experience in the school of hard knocks? I have never yet talked with a so called practical man in charge of work requiring technical training who did not deplore the fact that he lacked technical training.

The higher positions in the mining and metallurgical field are open to technical graduates who are willing to fit themselves to fill them. Technical graduates endowed with good health, good habits and tact will succeed in proportion as they are able to apply their knowledge in practical ways; in proportion as they develop judgment and engineering sense, the ability to analyze conditions and to look at problems from the economic as well as from the purely scientific standpoint.

E. S. Bardwell.

Great Falls, Mont., July 1, 1914.

[The discussion of the subject of "What Becomes of All the Mining Engineers" will now be considered closed.—Editor.]

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Concentrating Nomenclature

The nomenclature of wet concentration requires some additions. It is now awkward to discriminate among the several methods of wet concentration, especially since flotation has to be discussed as a competitor of the older wet-concentrating methods. "Table concentration" and "wet gravity concentration" have been used by some writers, but these terms are neither sufficiently comprehensive nor sufficiently discriminating. Table concentration is perhaps the better of the two, even though it does not comprehend the action of jigs, which is important in dealing with the ores of many districts. "Table-and-jig concentration" would accurately describe the treatment of such ores but this designation is awkward. The treatment of many ores would be comprehended by the term "table concentration," which is the better of the two terms that have been most used to distinguish the older forms of wet concentration from flotation concentration, but I should like to have the suggestions of some other Journal readers on this point.

John H. Howard.

New York, Aug. 28, 1914.

Editorials

Some Hope in Mexico

Since the great calamity, affairs in Mexico have faded into relative insignificance, and no longer are they chronicled on the front pages of the newspapers. Indeed, there is scarcely mention of them in obscure corners. This has prevented the heralding of what really seems to be a promise of peace in that heretofore distracted country, and a resumption of business operations. Huerta has gone, Carranza has come in, and neither Villa nor Zapata appears disposed to foment further trouble. The fact of the matter is, we think, that Mexico has been exhausted by her years of revolution and the destruction of property, and now prefers peace to starvation. Just what measures are going to be taken to restore living conditions and abolish the previous causes of discontent, we do not pretend to say, but that such measures will be taken is quite likely.

The really tangible thing that comes to our notice is the definite assurance of a resumption of industrial operations. We hear directly of mining organizations that are going back to Mexico to reopen their mines. This might appear to be an inauspicious time, when there is no market for copper and only an uncertain market for silver. However, we fancy that the crippled and disorganized mining operations of Mexico are not going to become producers right away in any circumstances. Rather have they got to engage in construction to restore their destroyed, or partially destroyed, property. This is likely to be a matter of a good many months, and a beginning now is probably not too early. It will bring cheer to the hearts of manufacturers of mining and metallurgical machinery and supplies, whose Mexican business has been practically nothing for several years, and also will it bring cheer to the many mining engineers and other mining employees who have been chafing in distress through the loss of their jobs.

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The Export Trade

This is the time for American manufacturers to be alive to get their share of the export trade with South America, South Africa, China and Australia, that is surely going to develop. The development of such a trade from the United States has been a dream for many years, and some serious efforts have been made by some interests, like the U. S. Steel Corporation, to create it, but in general we have not made the headway that we hoped. In general, American manufacturers have been too inert, too little disposed to go out for foreign business, and consequently unwilling to take the trouble to study the nature of foreign requirements and the methods that must be followed in order to do business abroad. British and German manufacturers, but especially the latter, have been quite different. Their travelers have scoured the world, have studied the local requirements, have reported home, and their manufacturers have been alert to supply what was wanted.

Now we have the unique condition that the foreigners must come to us in order to get what they need, their previous sources of supply having been cut off. No longer do we have to cater especially to them, inasmuch as they are coming to us, begging us to furnish them with what we have got. Yet, it behooves our manufacturers to meet them half way, or at least a quarter way. Those who are ready to do so will reap great reward.

Already, we are reading in the commercial papers about the inauguration of new business with foreign countries, and we hear privately of numerous demands for mining supplies. We foresee in the very near future the growth of an important export trade, first probably in the staple commodities, and later in the higher grades of manufacture.

In the way of mining and metallurgical supplies, we shall doubtless export to South America and elsewhere, such things as dynamite, candles, cement, calcium carbide, structural steel, pipe, steel rails and track material, sheet steel, galvanized iron, copper wire and steel wire, firebrick, roofing material, shovels, rubber hose, rubber, leather and canvas belting, assay supplies, wire cloth, roll shells, and other crusher parts, steel castings, power-transmitting machinery, lubricants, mining machinery of all kinds, electrical machinery, etc.

The new demand for these and many other things is coming. Enterprising manufacturers will prepare for it. The shipping facilities are being provided, and banking interests are rapidly making arrangements for direct exchange between New York and South America. The Panama Canal, through which commercial ships are now passing, was opened very opportunely in view of the commercial conditions that have subsequently come about. Now let our manufacturers and merchants be enterprising and energetic.

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Labor Troubles at Butte

The labor troubles at Butte continue as a war between two rival unions, with the Anaconda company standing calmly aside. Previous to the war in Europe the company wanted only to work its mines and was willing to pay high wages for labor. The miners fell out among themselves over several disputes, but the upshot is that one group does not want to let another group work. This resulted last week in a closure of some of the Anaconda mines, to which the company was probably not averse, and to some rioting and destruction of property.

If the miners only knew it, this is not a good time for the inauguration of labor troubles. The copper mines of the United States have curtailed their production by about 50% because of inability to sell their normal output. Some of the foreign mines that have been shipping their copper to this country for refining have been closed by refusal of their consignees to take any more copper. A troublesome feature of the situation is that the curtailment of output at the mines could not affect the 60-

to 90-day production that was in transit and in stock at the refineries.

In putting the mines upon a reduced scale, the companies have exhibited all possible consideration for their employees, avoiding the discharge of any men, giving preference to the married men, etc., and in general acting in the most coöperative, humane and patriotic way that is possible. However, there is no treasury that is inexhaustible and there is consequently a limit to things. There is a strong conviction in some minds that our principal mines will have to shut down completely for a period in order to correct the situation in the market. The mine managements are naturally averse to such a step, which would inflict great hardships on their employees. However, if the employees themselves want to shut down the mines, the managements are, of course, relieved from the responsibility.

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Some Deficiencies in Mineral Resources

We have in this country grown so accustomed to consider our mineral resources as abundant and all sufficient that only a few who have been especially interested have realized that there were some points in which they were insufficient. It has taken a severe wrench, like that of the present suspension of foreign trade, to make us realize generally our deficiencies. Of course, the supply of the important metals, with exception of tin, is abundant, indeed rather too abundant at the present time, in some cases.

Perhaps the most important deficiency just now is in ferromanganese, which is essential in steel manufacture. We have mined very little manganese ore, and our known deposits are entirely insufficient to supply what we need. Foreign ores have been easily accessible, and a large supply can still be had without interference from war conditions. The trouble now is that we have heretofore made only small quantities of these alloys ourselves, having bought them from England and Germany, so that our supply has been cut off at short notice, and it will take some time to arrange for their manufacture here, though an abundant supply of ores can be had from Brazil.

Another mineral extensively used in the steel trade for furnace linings and refractory brick is magnesite, which we have imported from Austria largely. The only important deposits in this country are in California, and these have not been worked because the freight to Eastern furnaces was too heavy to permit competition with the imported material and cheap water rates. With the Panama Canal open the California magnesite can reach the East at lower rates. In addition, there are large deposits near the seacoast in Colombia, which can be quickly developed.

Among the metals which have had extraordinary advances in price since the war began, the first is antimony. With the exception of a small quantity made from imported ores, our only native supply has been found in the antimonial lead from the lead refiners. While antimony is not an important metal of construction, it is essential in many alloys, chief of which is type metal, and in most of them there is no known substitute. In the last few weeks the price of the metal has more than doubled, and our only free supply just now comes from China.

Platinum is another metal which, though used in small quantities, is essential for certain purposes. Our imports from Russia are cut off, and we have only the intermittent and irregular supply from Colombia to depend upon. The price has already advanced rapidly, and is likely to go much higher.

Quicksilver is another secondary metal which has more than doubled in price in a few weeks, going from $37 to $95 per flask. In this case, however, it is not because we have none, for our supplies have generally been enough for our needs. It is the special demand for fulminate for cartridges created by the war, coupled with the cutting off of the Idria mines, which have brought about the advance.

We do not now go into the question of the many important chemicals, the supply of which has been cut off, for that is an extensive subject of itself. Enough has been said to show some of our deficiencies in mineral resources, of more or less importance.

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A Poor Compensation Law

The principle of workmen's compensation has become pretty generally accepted in this country. A compensation law is primarily a protection for the workman, prescribing a direct or indirect payment by his employer for injuries received while working, and insuring that he shall receive this without cost and without fail, the old pleas of culpability of fellow servant, assumption of risk, and contributory negligence being disallowed.

From the point of view of public policy, such a law is justified on the ground that each industry should take care of its own injured and dead instead of leaving them or their families as charges on the community. It is argued that the additional burden on the operator will be thrown back by him on the consumer. This may take some time and the individual employer will meantime suffer; furthermore, it is hard to see how it will so work out in the case of gold mining, or in the case of any other industry until all states and countries prescribe uniform rates of compensation.

But all laws involve hardship to somebody, and in fact the extra burden thus imposed is not so very large. A typical compensation law tends to reduce the maximum award received, to increase the average and to increase the total, as compared with the old system of recovering damages through the courts. But this increase is offset largely by the savings effected in lawyer's fees and legal costs. By the elimination of parasitic lawyers it is believed that in some cases the companies get off even cheaper than before. Furthermore, the company can figure its losses much more closely and can reap the benefit of safety precaution in a way not possible before.

But to have these beneficent effects, the compensation law must be positive in its action. It must fix the compensation to be received in every case and must not permit legal action for recovery of higher damages where employer and employee are operating thereunder. This brings us to the case in point. Arizona enacted such a law not long ago, and it appears now on information received by us that this is really no compensation law at all, as the term is usually understood. The employee is not obligated to receive the fixed compensation, but may sue through the courts for a larger sum, if he prefers to take the gamble. Of course, employees and their families do thus sue frequently. For such a law, there is no justification whatever. It does not remove the old uncertainties that harassed the operator; it does not insure that the expenditure of money on safety work will yield a sure return; it does not eliminate the shyster lawyer. Indeed, we are inclined to think that the lawyers had too much of a finger in mixing and baking this legislative pie.

As a concrete instance of how the law works, an employee of one mining company received an injury of some consequence, but one not entailing permanent disability. The compensation award would have been generous enough to cover loss of time. The man elected to sue, did so, and was awarded $7500 by a jury of his peers. He recovered rapidly of his injury and then went to work for another company at a job more arduous than his old one. So far he was from deserving $7500 for permanent disability! At last accounts, however, he had not got the money. It is to be hoped in the interest of justice that the company will win on appeal.

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The Journal has this week moved to its new offices in the Hill Building, just completed by the Hill Publishing Co. at the corner of 10th Ave. and 36th St. The 34th St. crosstown cars are near at hand, as is also the 34th St. station of the 9th Ave. elevated railway, which is 12 minutes run from Rector St. We shall be glad to see our friends in our new quarters. Our new telephone number is 1500, Greeley.

BY THE WAY

London bankers have been able to arrange for the payment of dividends by the Rand gold-mining companies whose funds have been tied up on account of the moratorium. Payment of dividends was made in August by over 20 of the Rand companies and it is likely that British investors would be glad to exchange some of their industrial stocks for Kafirs, were the stock exchange transacting its regular business and the industrial stocks negotiable at anything like their former value.

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Electric lighting underground is not practiced in the Calumet & Hecla, and James MacNaughton, the manager, explained the reason before the Congressional Committee investigating the recent strike. The chief difficulties in the way of employing electricity appear to be the great extent of the workings and the fact that the ground is insecure. A fall of rock might easily interrupt the service for the mine and the fact that the foot and hanging walls in shafts and drifts are both moving would necessitate constant repair work on the wires and great expense. This can be easily believed in view of Mr. McNaughton's testimony to the fact that the company has 300 men continually repairing timbering in the shafts on account of crushing. We assume this includes the subsidiaries as well as the Calumet & Hecla itself.

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On Aug. 14, the famous Potrero No. 4 well of the Mexican Eagle Oil Co., was set on fire by lightning which struck a temporary staging with the resultant firing of escaping gas and oil. No information has been received in New York as to whether the fire has been extinguished. The London *Financial Times*, of Aug. 18, reports that up to that date the capping to the well remained intact and the small flow of oil to the tanks continued. Some time ago the well was capped to avoid any unwelcome interference from the Mexican rebels. The closing down of the property created certain leakages of an extensive character, and it is these which are now burning. The intensity of the fire prevented any attempt to extinguish it during the first week, but appliances are ready and available for this purpose when the flames can be approached. As the oil has continued to flow into the tanks the capping has remained cool. The company has been producing at the rate of 30,000 bbl. per day for some time without the Potrero No. 4 well.

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Mining engineers, who have been accustomed to adapting themselves to all sorts of conditions, should be capable of efficient service in war times. We note that the Institution of Mining and Metallurgy has offered to the British War Office a volunteer corps for special home service. Most of the 2400 members of the Institution are engaged in mining and metallurgical operations abroad but in all probability the present home list includes a sufficient number to form a useful corps. Their experience with unusual conditions and their technical training might be especially valuable in these times when so many untrained civilians are entering the service. The War Office has acknowledged the proposal of the Institution to create a special corps of mining engineers and while the time was not ripe for giving a definite answer, was glad to know that such a plan was capable of being set on foot. In this connection it may be mentioned, that the Mining and Metallurgical Club has offered its premises at No. 3 London Wall Buildings to the British Red Cross Society as an emergency hospital.

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Daniel Guggenheim returned from Europe in an optimistic frame of mind. In an interview with the *Boston News Bureau*, he said:

> We are in presence of the greatest opportunity in history of this country. It is up to the press and public-spirited men to emphasize this. It is a public duty. Ordinarily, I do not advocate paternalism in the central government, but I believe this the exception that proves the rule. Let every one push and pull to get started. Washington should pass laws, and speedily, to develop our finance and commerce, ship subsidies, special bills, anything necessary to get things going.
>
> For the first time the world's marts lie at our feet uncontested. Our European competitors are hopelessly crippled for the time being, and it is up to us to reap the benefits. Let us get ships without delay, start building them, let the Government buy private ocean-going pleasure yachts, any kind of ships that can be used for transportation. Europe wants our products and manufactures, and in a short time will be desperately in need of them.
>
> There must be financing and plenty of it, but we can do it. The new currency act gives us power to finance a thousand millions of trade. The machinery to set this country humming is at hand—it only remains to see whether we are energetic and enterprising enough to set it in motion. The outlook? In six months, even less, I expect to see this country fairly boiling with activity.
>
> Copper may be a drug on the market now, but its time will come, even before the war abroad ends, for the domestic consumption, I believe, will shortly call for more metal. Right now the two largest consumers of copper in Germany are shut down tight and consequently not taking a pound of copper. The Government should now stop baiting the trusts
>
> I ran out of funds while in England, and could get no accommodation except through cabling home. I received a remittance by return cable with this addition from my son "Now you know how it feels to be broke."

PERSONALS

Carl A. Allen has returned to Denver from Nevada.

B. B. Thayer has returned to New York from Butte.

Granville Moore, of San Francisco, is in Alaska on examination work.

John T. Fuller, of Little Rock, Ark., is spending a few weeks at his old home in Pennsylvania.

Vernon M. Bovie, of New Rochelle, N. Y., has been appointed superintendent of the United States Assay Office at New York.

A. F. Huston, president of the Lukens Iron & Steel Co., who has been detained in Paris by war conditions returned to this country last week.

Leon J. Pepperberg, of San Francisco, a former member of the U. S. Geological Survey, is making an investigation of the Calgary oil field in Canada.

Wilbur E. Sanders has retired from the superintendency of the Alkali Mines Co., of Eureka, Nev., which has ceased operating, and he is now at Oakland, Calif.

C. B. Lakenan was operated on at the Mayo Hospital for duodenal ulcer on Aug. 28, and surgeons report he will be fully relieved from an old time malady.

S. H. Brockunier, of Nevada City, Calif., is examining the property of the Montana Consolidated Gold Mining Co., at Jardine, Montana, in the interest of eastern capitalists.

Henry C. Frick was last week reported dangerously sick at his summer residence at Beverley, Mass. Later advices are that his illness was slight, and that he is recovering.

C. T. Griswold is now at the Pittsburgh office of the Associated Geological Engineers, having returned from examining several gold prospects in the Sudbury mining district in Ontario.

Baylies C. Clark, of Sutter Creek, Calif., has been examining placer properties in the department of Antioquia, Colombia, for Breitung & Co., during the past year. He expects to return to California in October.

L. H. Underwood, formerly superintendent of blast furnaces at the Riverside, W. Va., works of the National Tube Co., has been appointed assistant superintendent of the hy-product coke department at the Gary, Ind., works of the Steel Corporation.

Francis Church Lincoln, until recently resident engineer of the Bolivian Development & Exploitation Co., with headquarters at La Paz, Bolivia, has left that company to take the position of Head of the Mackay School of Mines at the University of Nevada, Reno, Nevada.

L. Selim has accepted the position of chief chemist and metallurgist with the Otis Steel Co., Cleveland. For the past seven years, he has been in charge of the chemical and metallurgical laboratory of the Lake Superior Iron & Chemical Co. Since June 1, he has been employed on special work at the plant of the Zenith Furnace Co., Duluth.

H. M Wolflin, acting for the California Industrial Accident Commission and the United States Bureau of Mines, has recently visited Trinity, Siskiyou and Shasta counties continuing his tour of mine inspection. He will go next into Plumas and Sierra counties, and will visit Jackson on Labor Day to address the first-aid meeting to be conducted by Mr. Krogdahl. Later in the season Mr. Wolflin will make a tour of the quicksilver districts south of San Francisco.

Frederick Lyon, managing director of the United States Mining & Smelting Co., having completed adjustment of working conditions at the Mammoth smeltery at Kennett, Calif., returned to San Francisco on his way to Needles. Other properties to be visited are at Gold Road and Kingman, Ariz.; Midvale and Tintic, Utah, besides the Grasselli and Chrome plants in the East

The Batopilas Mining Co. is going to resume operations at Batopilas, Chihuahua, Mexico. The operating staff intended to leave El Paso for the mines on Aug 24, consisting of the following men: John R. Harbottle, general manager; Charles F. Gerhardt, superintendent of mines; Homer L. Nix, chief accountant; W. R. Kaufman, master mechanic; J. C Rumball, chemist, and Dr. O. H. Talley, company physician.

Reginald W. Brock, director of the Canadian Geological Survey and deputy minister of mines, has resigned his position to become professor of applied science in the new University of British Columbia. Much of his research work has been done in that province, one of the principal contributions to the knowledge of Canada's mineral resources being his report on the Rossland mineral area. R. W. McConnell, of the Geological Survey, has been appointed acting deputy minister of mines, and will probably be confirmed in the position.

OBITUARY

Jack Harris, one of New Mexico's most widely known pioneer mining men, died in Albuquerque, Aug. 8. He had been connected with mining operations in the state for many years. The body was interred in the Santa Barbara cemetery, Albuquerque.

William Thomas Lewis, Lord Merthyr, died in London, Aug. 26, aged 77 years. He was one of the largest coal mine owners and operators in Wales. He served for many years on royal commissions on matters connected with coal mining, trade disputes, and various labor questions. He was president of the University College of South Wales and Monmouthshire, formerly president of the South Wales Institute of Engineers, the Mining Association of Great Britain, and the Institute of Mining Engineers, vice-president of the Iron & Steel Institute and the Institute of Mechanical Engineers, and chairman of the Monmouth & South Wales Board of Examination for Mining Certificates.

Fritz Cirkel, of Montreal, died recently, age about 50 years. He was a German by birth and graduated from the Royal Technical Academy at Aachen in 1888. In 1891 he became managing engineer of the Templeton Asbestos Mining Co., at Templeton, in the Ottawa district, Canada. He was subsequently engaged in the exploration of mica and graphite deposits in the Laurentian formation, and also did considerable work in the Sudbury nickel region and the Lake of the Woods gold area. Mr. Cirkel went to British Columbia in 1897 as consulting engineer for Vancouver and Ottawa investors, and returning East in 1901 established himself as a consulting engineer in Montreal. He was the author of a number of reports issued by the Canadian Department of Mines dealing with the mica, asbestos and graphite resources of Canada.

SOCIETIES

American Institute of Metals—The eighth annual meeting will be held in Chicago, Sept. 7-11, and will be in part a joint meeting with the American Foundrymen's Association. A long list of papers is on the program, and the meeting promises to be an unusually strong one and of great interest to the nonferrous metal industry. It certainly represents a lot of work on the part of the chairman of the Papers Committee, H. W. Gillett. The headquarters of the institute for the meeting will be at LaSalle Hotel, Chicago.

Michigan College of Mines—The chair of metallurgy and ore dressing at the Michigan College of Mines, recently made vacant by the resignation of S. S. Bruce, has been filled by the appointment of A. J. Houle, who is a graduate of the class of 1896, and for the last few years has been connected with the college as assistant professor of mining and civil engineering. Previous to that, he had considerable experience in metallurgical work, having built the smeltery of the North American Copper Co. at Encampment, Wyo. More recently, and during a year's leave of absence from the college, he was at the Calumet & Arizona smeltery at Douglas, Ariz. T. G. Chapman, a graduate of the Massachusetts Institute of Technology, who has instructed in the metallurgy department at the Michigan College of Mines for the last two years, has been recently appointed assistant professor of metallurgy and ore dressing, under Prof. Houle. The chemistry department will be headed this year by S. R. Brinkley, a graduate of a Georgia college and an assistant at Columbia last year. Mr. Brinkley succeeds Dr. A. A. Koch, resigned.

INDUSTRIAL NEWS

At a meeting of the board of directors of the Westinghouse Electric & Manufacturing Co., held in New York, Aug. 26, Henry D. Shute was elected treasurer to succeed T. W. Sieman who recently resigned to accept the position of secretary-treasurer of the Union Switch & Signal Co. Truman P. Gaylord, district manager of the Electric Company at Chicago, was elected acting vice-president to succeed Mr. Shute.

Editorial Correspondence

SAN FRANCISCO—Aug. 27

Gold Mining Investments in California will no doubt be retarded by the effects of the European war on financial conditions in London, Berlin and New York, whence most of the capital for mining investments comes. The report that the dredging land deals that have been under negotiation in Trinity County for several months must be postponed is probably true, as the John Hays Hammond interests are back of them. Another report is that the Golinsky copper mine in Shasta County was under consideration by German investors and that George Bayha, engineer and promoter, has wired from New York that owing to the war he will not continue his journey to Germany where it is claimed the purchasers of the Golinsky awaited his arrival and the closing of the deal. Whether or not these reports are strictly true the present conditions in Europe and in this country due to the European war will interfere with the exploitation, development and reopening of old mines that were, in early days, among the producers and only await judicious investment and intelligent development to place them again in the producing and dividend class. The dredging industry is in particular need of financial encouragement at present. The great dredging fields are gradually being worked out and new fields are eagerly sought. Dredging men are and for some time have been pessimistic regarding the future of the industry, and there have been a number of reasonably good prospects turned down in the last two years, due largely to disagreement as to terms and to the fact that in some instances the land is not as rich as desired. There are still some large areas of dredging lands and many smaller holdings that will pay to dredge, since both the initial cost of installation and the operating costs have been reduced. While the financial depression may not largely effect the present operators who are acquiring new dredging lands, it will be difficult to finance new enterprises until European affairs are settled.

SALT LAKE CITY—Aug. 27

The Reports of Sensational Gold Strikes continue to come from the new camp of Fortuna, in Beaver County, and the Salt Lake Commercial Club has received requests for definite information as to this camp. At a recent meeting of the board of governors, it was decided to send four members of the mines committee to visit the camp and district, and report on it. These members will leave for the camp Aug. 29, and will file a report on their return.

The Utah Copper Co. Will Continue Its Steam-Shovel Operations on the same scale as has been in force since the recent curtailment. The company has been treating 12,000 to 14,000 tons per day at the Magna plant. At present, there are twice as many shovels on stripping as in ore, and it is proposed to continue stripping as long as possible. About the same amount of overburden will be removed this year as last, but less stripping will be required each succeeding year. There is at present enough ore exposed to permit mining for a long period. The curtailment has been about 50%, or from a normal monthly output of 13,200,000 lb. to 6,600,000 lb. copper.

The Bureau of Mines Rescue Car, which was in this city at the convention of the American Institute of Mining Engineers, will visit the various coal camps of the state, giving instruction in mine-rescue work and first aid to the injured. The car is in charge of J. C. Roberts and assistant, Mr. Boardman. The itinerary is as follows: Leave Salt Lake City, Aug. 15, for Sunnyside, and remain until Aug. 22; then Hiawatha to Aug. 29, Black Hawk to Sept. 5, Mohrland to Sept. 12, Kenilworth to Sept. 19, Standardville to Sept. 26, Storrs to Oct. 10, Castle Gate to Oct. 17, Schofield to Oct. 24, Winterquarters to Oct. 31, Clear Creek to Nov. 7, and return to Salt Lake City, Nov. 8.

The Smelters Are Now Buying Direct From the Mines, instead of advancing 25c. or 40c., as was done a short time ago. Local settlement by the smelters from Aug. 12 to 19, inclusive, was at the rate of 56⅝c. per oz.; Aug. 20 to 22, at 56c. On Aug. 23-24, settlement was made at 55¾c.; Aug. 25, 53⅝c.; Aug. 26, 54⅜c.; Aug. 27, 55c. Since Aug. 19, silver has been paid for in full. Lead has been settled for at $3.87 to $3.90. The provisional advancement of 10c. per lb. is still being made on copper. The recent advance in the price of spelter to $5.87½ will be of benefit to some of Utah's zinc producers. The May Day and Lower Mammoth of Tintic have put men to work on this class of ore and will start shipping. The Gemini, Yankee and other properties will doubtless ship. The Scranton, in North Tintic, produces a high-grade zinc ore from large deposits of zincite, and also zinc-carbonate ores. The zinc in the other properties mentioned is chiefly in the form of the carbonate. Zinc sulphides are mined with other ores in Bingham, Park City and other parts of the state. Park City produces zinc middlings and concentrates, and the Bingham mines of the United States company furnish zinc, which is treated at this company's Huff electrostatic plant.

Curtailment of Ore Shipments has gradually been taking place at Bingham, Tintic, and Park City. These camps have decreased their output approximately 50%. At Bingham, the Utah Copper has cut down its output one half; the Bingham-New Haven has practically closed, the Yampa, and Utah Metal have stopped work. Shipments of copper ore from the United States properties have been reduced, but shipments of lead ore are being made as usual. The Utah Consolidated has curtailed shipments. The Utah Apex is shipping lead ore and the Ohio Copper is operating. At Tintic the output for the week ended Aug. 14, was 76 cars as compared to 146 cars two weeks ago. The Lower Mammoth, May Day, Uncle Sam, Gemini, Godiva, Ridge & Valley properties are working, but have stopped shipments,—though some ore is being shipped by lessees. The Eureka Hill, Mammoth, Grand Central, Gold Chain, and Opohongo are employing only enough men to keep the properties in repair. The Centennial Eureka is shipping 200 tons a day, the Eagle & Blue Bell, 75 tons, The Iron Blossom and other Knight mines, 125 tons, and the Chief Consolidated, 150 tons. At Park City the Silver King Consolidated and Silver King Coalition are shipping about as usual. The Daly-Judge has suspended shipments. The Daly West is installing its new equipment. All of the smelting plants are operating, though on account of the reduced output of concentrates by the Utah Copper, the Garfield smeltery is running three reverberatories and one blast furnace, as compared to five reverberatories under normal conditions.

SPOKANE—Aug. 28

Stockholders of the National Copper Mining Co. have formally ratified the action of the board of directors in authorizing an increase from $2,000,000 to $2,500,000 in the capitalization of the company. The new issue of the stock will go to the owners of the Continental company, which holds the Nellie claim, adjoining the National's property in the Cœur d'Alenes, near Mullan, Idaho. The National's oreshoot has been proved to run through the Nellie, and the claim will now be in possession of the company. The National mill is temporarily shut down, but full production will be resumed before December.

The Increase in the Price of Zinc due to the European war situation has resulted in increased activities in the Nine Mile zinc mines, near Wallace, Idaho, in the Cœur d'Alenes. Instructions have been received by the managers of the Interstate-Callahan mine to put on 100 miners at once and push the property to its capacity as fast as possible, according to advices received in Spokane. The Interstate-Callahan company will take advantage of the zinc situation as fast as its plant can be enlarged, and with this end in view a new milling plant has been planned for construction at an early date. The location of the plant has not been made public, but it is known that several different places have been looked over, including a site at Enaville, Idaho. At this point, the company would have plenty of room and plenty of water for milling purposes, as well as cheap transportation from the mine after the necessary arrangements for tunnels and tramways were completed. The present mill is unable to handle a quantity approaching the output of the mine. The Interstate is easily the largest zinc mine in Idaho

Increased Activity Is Apparent around the Republic Mine, at Republic, Wash., now that the Rathfon Reduction Works people have clear title to the property. This week three groups of lessees were given blocks in the mine, and more are negotiating for leases. By next week Manager F. W.

Bewley expects to have leasing contracts in effect. Aside from the leases the company has six miners on the payroll. A car of high grade ore was sent out last week by the Rathfon Reduction Works from the Republic mine to the Granby plant, at Grand Forks, the last to be shipped to that point until the furnaces blow in again. The company is negotiating with the Tacoma works to take the ore.

President Conrad Wolfe, of the United Copper Mine, at Chewelah, Wash., who was on Vancouver Island looking after his mining interests when the European war closed down the plants and mine, arrived at Chewelah last week to size up the situation and decide upon the future action. Mr. Wolfe stated that he had decided to keep from 20 to 25 men at work indefinitely, extending the north drift, filling the ore bins with the shipping ore and taking out just enough low-grade to keep the mill running one shift. He will continue the raise from the 400-ft. level to the old shaft, which will open up some new stoping ground. Much depends on what the smelters do as to the length of time work will be continued. All the smelters are refusing to receive ore and no returns will be made on the July shipments until the exchanges reopen to establish the price of metal.

Directors of the Caledonia Mining Co., operating the Caledonia mine, at Kellogg, Ida., do not consider it necessary to build up a large treasury fund, but have decided to disburse the monthly profits in dividends as soon as the treasury contains a reasonable operting fund, according to the annual report of the corporation received in Spokane this week. The report adds:

"The present unsettled condition of the metal market makes it impossible for us to say definitely when we can commence the payment of dividends. We assure you that this will be done as soon as business conditions permit. In settling the litigation with the Bunker Hill & Sullivan Mining Co. last fall, arrangements were made whereby the Caledonia ore was to be worked through the lower tunnel belonging to the Bunker Hill & Sullivan Co., and milled in a mill furnished by them. In order to connect with the Caledonia mine it was necessary to drift off to one side of the Bunker Hill tunnel and connect with the Caledonia workings by means of two double-compartment raises. This work was begun last October, was completed in July and is now in full operation. The mill furnished us by the Bunker Hill Co. was completely overhauled and equipped by them with modern concentrating machinery. It has a daily capacity of 300 to 350 tons, can be operated at a low cost and will make as high extraction as any mill in the district. During the month of June the mill was started and run a few days; 360 tons of concentrates and crude ore were shipped. In July the production amounted to over 700 tons, about half of which were concentrates. This tonnage was produced with an average of 23 men employed in the mine. The crude ore gives net smelter returns of $50 to $60 per ton; the concentrates run from $60 to $140 per ton. A large body of good ore is developed in the mine. The cash statement shows $50,172 on hand in the new corporation and $36,933 held for the stockholders in the old company, before the capitalization was increased to settle the Bunker Hill litigation. The Caledonia is one of the Coeur dAlene producers whose stock is held largely in Spokane."

MARQUETTE—Aug. 29

The Newport Company's Power House at "K" Shaft was partially destroyed on Aug. 22, when some unknown person placed a large quantity of dynamite near the building and set it off. The electric hoist used for raising coal to the automatic stokers was wrecked and damage done to the coal dock. The boilers remained intact, otherwise the damage would have been heavy. Every effort is being made to locate the guilty party.

The Bodies of All Seven Men Entombed in Pickands, Mather & Co.'s Balkan mine at Alpha, a few weeks ago, when a run of overburden suddenly filled the workings with sand, have now been recovered. It was unnecessary to sink a drop shaft, as advised by some mining men. Instead, the drift which the sand had engulfed was cleared of its débris. The work was perilous, but was performed without mishap. The condition of the mine was found much better than expected. Most of the bodies were 250 ft. distant from the shaft. Winston Bros., contractors, who are removing the overburden from the orebody, are making excellent progress.

The Newberry Furnace of the Lake Superior Iron & Chemical Co. will go into blast on Sept. 10, and the Ashland plant will be started on Dec. 1. Both plants have been idle since last spring to permit repairs. A new chemical plant is being constructed at the Ashland furnace to replace the one destroyed by fire a few months ago. It will be ready for operation when the furnace is blown in. The Elk Rapids and Boyne City furnaces of the company have been in operation continuously all year. No reason is given for starting the other plants at this time, and the management states that the pig-iron market has not shown any improvement.

The Jones & Laughlin Steel Co. Laid Off 100 Men at its Forbes mine, near Iron River, a few days ago, and little mining will be done until next spring, if the market is in better shape by that time. A similar number of miners have been let out at the company's Rolling Mill mine, at Negaunee. Little ore will come to surface, only enough men being employed to carry on development work and keep the workings open. The management states that it can purchase ore at a lower figure in Minnesota than it can be mined for in Michigan. Last year, Jones & Laughlin used the ore from all of its mines and purchased about 1,000,000 tons from other producers.

CALUMET—Aug. 29

The Following Notice Has Been Posted at the Calumet & Hecla mine and at the various subsidiaries: "On account of the extraordinary conditions prevailing in the copper market, it has become necessary for this company to curtail production. Beginning Sept. 1, all the mines, mills and smelters of this company will be operated three-quarter time, and the rate of wages existing immediately prior to May 1, 1912, will be restored. A reduction of 15% in the pay of the officers and all those not affected by the increase May 1, 1912, will be made. A similar reduction will be made in the pay of all officers and employees of the Boston and New York offices."

The Tamarack Mining Co. Has Suspended All Operations with the exception of pumping, and the La Salle Copper Co. has shut down the two shafts on its property. At the Osceola Consolidated Mining Co., No. 5 shaft has closed down. The Quincy Mining Co. has announced a reduction in wages of about 12½%, starting Sept. 1, and a material reduction will be made in production. Some of the exploration companies that have sufficient money to carry on development work for some time are maintaining their working forces. The Keweenaw is sinking its shaft below a depth of 700 ft. and is putting some of the houses at the Phœnix in shape for occupancy.

TORONTO—Aug. 29

The Drop in the Price of Copper, together with the inability to market copper and nickel, has resulted in a partial closing down of the Canadian Copper Co.'s plant at Sudbury. Approximately 1500 men have been laid off and little new work of any importance will be undertaken.

The European War Had a Decided Effect upon mining throughout Ontario. While the gold mines are the least likely to be affected, and, in fact, while it is strictly to their advantage to keep operating, trouble may arise over the failure to receive supplies of cyanide, zinc dust and Danish pebbles for tube-mill work. There has already been a shortage of cyanide and unless further supplies are received in the near future, some of the mines may be forced to close down, or at least to depend altogether upon amalgamation and store their tailings for future treatment.

The Cobalt Bank Managers and Mine Operators have made arrangements under which the banks will make advances covering the cost of operating the mines, accepting silver bullion as collateral. This will enable the companies to meet current liabilities and continue production. Owing to the closing down of several mines and the reduction of working forces about 1200 men in the camp are unemployed. It is expected that the action of the banks will prevent any further suspension of operations and probably lead to the resumption of work by some of the mines temporarily closed down. Bullion shipments have been resumed, the express companies accepting it for trans-Atlantic shipment at the same rate of insurance as before the war.

The Iron and Steel Industry, which has been paralyzed by the war, is likely to experience a sudden revival, owing to the demand in England for building and construction material, the supply of which from Germany and Belgium has been cut off. These products include wire nails, wire rods, steam tubes, bars and sheet metal, the imports of which from Germany to England have been steadily increasing. A syndicate of British manufacturers has commissioned P. G. Donald to visit Canada with the object of arranging with Canadian steel mills for a supply of these products for the British market. The Steel Company of Canada, with headquarters at Hamilton, Ont., the Dominion Steel Corporation and other large manufacturers have been notified of this new opening for Canadian trade, which is likely to tax their capacities in these lines to its full extent, and as soon as arrangements can be effected through Mr. McDonald, a resumption of activity is anticipated.

The Mining News

ARIZONA

Cochise County

COMMONWEALTH (Pearce)—Reported that Commonwealth mine of Nevada Arizona company has been closed.

WILLIE ROSE (San Simon)—Hoist, oil engine, compressor and air drills have been ordered. Last car shipped to El Paso averaged $12 per ton.

TRUAX (Bisbee)—Juniper Flats gold prospects continue to attract attention. From original discovery in Truax ore running up to $500 per ton has been found. Small force taking out high-grade.

CALUMET & ARIZONA (Douglas)—During July all previous records at C. & A. smelting plant were broken; 85,000 tons ore smelted, producing 7,350,000 lbs. copper. Recently there was received from mines at Bisbee heaviest ore train yet shipped carrying 65 cars of 50 tons each.

Maricopa County

KAY COPPER (Phoenix)—New concentrator is being installed on Kay and Harris copper properties, 50 miles north of Phoenix. Expected to be running within the next 30 days.

Mohave County

GOLCONDA (Golconda)—Sauer truck working three shifts lands about 60 tons of ore daily at railway to be shipped to Bartlesville.

CALIFORNIA

Placer County

BANNER (Auburn)—Mine is being examined by Wilbur E. Sanders, consulting engineer for purpose of enabling owners to decide on contemplated development.

DAIRY FARM (Sheridan)—Development has been temporarily curtailed at this copper mine operated by Guggenheim interests, on account of conditions resulting from war in Europe. Work still progresses on grading narrow gage railroad from Sheridan to mine.

BLACK CAÑON (Westville)—Electric power for hoist, mill and compressors being installed. Current to be furnished by Pacific Gas & Electric Co. over pole line 13 miles long from Alta. Machinery for installation at mine being hauled from Auburn on S. P. R. R., over 30 miles at cost of $1.50 per 100 lb.

Plumas County

ENGEL (Keddie)—Forty of the 100 men employed have been laid off on account of condition of copper market and financial disturbance. Installation of concentrating plant interrupted.

San Bernardino County

ATOLIA (Atolia)—Leasers at tungsten mines notified that leases will expire Aug. 30. Cleanups by leasers in July aggregated about $12,000.

HARDENBERG (Jackson)—Operation reduced, but mine and mill are kept in shape for early resumption of regular extraction and milling.

Shasta County

DRY SLIDE (Keswick)—Mine bonded to I. Washburn and D. W. McCleum of Los Angeles, with option of purchase at $25,000. Mine was producer about 15 years ago when there was large demand for siliceous quartz by smelting plants.

Trinity County

ALTA BERT GOLD DREDGING CO. (San Francisco)—Poverty Slide hydraulic mine adjoining dredging ground of this company near Trinity Center will be taken over Sept. 1. Negotiations consummated over a year ago, and in August certain required payments made, giving possession. Price is $100,000. Poverty Slide worked since 1908 by hydraulic methods.

COLORADO

Clear Creek County

CAPITAL CENTRAL (Georgetown)—Property secured under bond and lease by J. R. Reed and associates; 300-ft. crosscut tunnel started which will cut vein at depth of about 200 ft. L. G. Davenport in charge of operations.

GOLDEN EMPIRE (Empire)—Satisfactory progress being made in driving main crosscut. Ore struck in Arvada tunnel. Track to mill being laid on new grade. Additional bins will be constructed and mill will be ready to resume operations in near future. Mr. Tefft is superintendent.

BIG FIVE (Idaho Springs)—Work resumed on Edgar property which is intersected by crosscut tunnel at distance of 2500 ft. from portal. Development being performed in breast of East drift 400 ft. from tunnel. Streak of ore is 8 in. wide and assays $40 per ton. Lessees are driving through Lake and Windsor Castle properties to reach Bald Eagle vein. West drift on Lake vein has opened a 3-ft. pocket of $8 ore. Development on Bellman vein, about 9000 ft. from portal of main crosscut, has opened up promising shoot of ore which runs $25 per ton. Lessees will sink 100-ft. winze to prospect this oreshoot in depth. Connection is being made on tunnel level between Bellman and Lake workings for purpose of ventilation. East drift on Lake vein has opened pocket of $15 ore 4 ft. wide. Big Five Co. is driving east on tunnel level to connect with Dove Nest shaft. Total advance to date is about 1000 ft. Company plans to drive another 2500 ft.

Lake County

SIWATCH TUNNEL (Leadville)—New leasing company composed of local business men resumed development in this Sugar Loaf Mt. tunnel and opened into Venture vein. A 40-ft. raise disclosed 3 ft. of ore said to average $50 in gold and silver.

EVENING STAR (Leadville)—About midnight, Aug. 14, hoisting engine was destroyed by incendiary charge of high explosive that must have been placed within motor parts; 112-hp. electric motor was blown to pieces and frame and drum of engine broken. Fire, set at same time, destroyed building, which was not occupied. Two nights before, owing to curtailment in market demands for ore, night shift had been laid off and it is supposed that the damage was perpetrated by one or more of men thus dropped from payroll. George E. Cramer, manager, is having plant rebuilt. Self-dumping skip at shaft collar at time of fire was permitted to drop to bottom of the shaft when fire had burned the brake shoes on the drum, and intense heat appears to have severed the hoisting cable close to the drum. Fortunately, surrounding buildings were uninjured.

San Juan County

SILVER LAKE (Silverton)—Mill being remodeled and will be ready for operation as custom plant within next few weeks. New flotation process developed by manager L. R. Clapp and others, installed. Estimated that process will increase recovery and reduce milling costs. Process is especially designed for treatment of gray copper ores.

MEARS-WIFLEY MILL (Silverton)—Plant recently placed in operation, now running three 8-hr. shifts. Designed to treat from 400 to 500 tons of tailing per day from Silver Lake mine. Average value of these tailings estimated at $3. Quantity in Silver Lake available for treatment placed at about 500,000 tons. Planned to operate plant the entire year. Equipment includes double deck 12x47-ft. Wifley tables, one of latest inventions of A. R. Wilfley of Denver, designed to handle large quantity of low-grade material. Tailings from these tables reground in tube mill and passed to multiple-deck Wilfley slimers. Mill was built by Otto Mears, A. R. Wilfley, and associates. C. J. Estabrook, superintendent.

San Miguel County

STANDARD CHEMICAL CO. (Vanadium)—On account of collapse in market for carnotite ore, due to war, all mining operations of this company discontinued and most of miners laid off. Few men employed on surface improvements.

Summit County

CONGRESS (Breckenridge)—D. A. Knight has moved ten-stamp mill from the Carrie mine and is erecting it at the Congress. He will install also two Wilfley concentrators and a Deister slimer.

PROSPECTING AND LODE MINING in Breckenridge district is about twice as active as year ago. While this indicates reasonable improvement in conditions, little can be said concerning new operations. July production of placer gold figured at $127,620, of which 96½% was recovered by the three boats of the Tonopah Placers Co., and the one boat of the French Gulch Dredging Co. Placer bullion here averages about $16 per oz.

Teller County

GOLD COIN (Goldfield)—Water level is lowering in the Gold Coin shaft and 12th level will soon be recovered.

MARY McKINNEY (Anaconda)—Promising strike made by lessees in Block 34, in shallow shaft near summit of Gold Hill.

NEVILLE MILL (Altman)—Plant on property of Free Coinage Gold Mining Co. on Bull Hill, is being remodeled and treatment capacity will be increased. Foundations for new machinery laid and machinery purchased. Plant will probably be in operation sometime in September.

DILLON (Goldfield)—Sinking of three-compartment shaft by Granite Gold Mining Co. is proceeding at rapid rate. Estimated that depth gained in August will be almost 80 ft. The rock has recently been hard but is now becoming softer and more rapid sinking is being acomplished.

VINDICATOR (Independence)—New concentrating mill now under construction will be operated by electricity. Power will be supplied by Arkansas Valley Railway, Light and Power Co. and will be delivered to Vindicator transformer station at pressure of 20,000 volts. Vindicator contemplates early installation of large motor-driven air compressor.

DEEP DRAINAGE TUNNEL—New water courses recently cut resulted in increased flow. On Aug. 1 this was 7590 gal. per min., now increased to almost 10,000 gal. per min. Soft and caving ground has recently hindered rapid driving. At present two shifts are kept at work. Machinemen and helpers break ground on one shift and muckers and trammers clean out waste on second shift. Soft ground being timbered with square sets to avoid chances of further caving.

MINNESOTA

Cuyuna Range

1914 CUYUNA TONNAGE—Unless conditions change materially toward close of the season, it is unlikely that 1914 Cuyuna Range shipments will exceed 1,000,000 tons. Of this amount, Kennedy will ship 180,000 and Armour No. 2 about 240,000. Remainder will be split among Rowe, Thompson, Cuyuna-Mille Lacs and Ironton. Pennington pit and Armour No. 1 have not started shipping.

Mesabi Range

SPRUCE (Eveleth)—Cave-in at No. 1 shaft resulted in death of one laborer, Aug. 26, being first fatality at mine in three years.

MISSOURI

Joplin District

COMMERCE ROYALTY & MINING CO. (Miami, Okla.)—Rich vein of blende encountered in shaft at 140-ft. level.

MORNING HOUR (Yelville, Ark.)—Operations resumed after lengthy shut down, due to low ore prices. Week-end run produced car of concentrates.

OTIS MNG. CO. (Joplin, Mo.)—Operations now carried on from two shafts, with double crew employed. Two weeks' operations produced three 60,000-lb. cars of blende.

MOORE TRACT (Galena, Kan.)—Subleases awarded by T. B. Carpenter, holder of first lease, and many companies soon to start work. One shaft now in ore at 65-ft. level.

J. M. SHORT AND HERMAN JONES of Joplin are sinking shaft at Neck City, Mo., to reach good strike made at 135-ft. level. Property near Quick Seven mine, famous zinc producer.

AMERICAN L., Z & S. CO. (Aurora, Mo.)—Two strikes made in local field by this company, one on Terre Haute land and other on lease of Tooker tract. Both at deep levels.

F. C. WALLOWER OF WEBB CITY, Mo., is erecting 350-ton concentrator at Monticello mine, Prosperity, Mo. Will have 400-ton hopper. Mine is on Connor land. Operations will be conducted at 190-ft. level.

PAUL & SONS (Granby, Mo.)—Rich lead strike is being worked by this company on Granby Mining & Smelting Co.'s land. Drifting from 90-ft. level uncovered one of the best finds ever made in local field. Ore assayed as high as 84.8%.

FOLMER TRACT (Galena, Kan.)—Lease taken by Arbuthnot Bros., of Webb City, Mo., who will prospect at deep level. Only shallow runs worked heretofore. A. J. Burnham, formerly superintendent of Oronogo Circle mine in charge. Extensive prospecting campaign planned.

CENTURY MNG. CO. (Joplin, Mo.)—Company has leased Prairie Chicken mine, including 10-acre tract, adjoining Lockie land which it now is working. Prairie Chicken was one of greatest producers in district and Century company believes good deposits were never touched.

MONTANA

Madison County

MINES CLOSED DUE TO WAR—Moffett mine in Cole Cañon, Eastern Pacific, above Virginia City, and many other copper and silver mines in district are closed, due to refusal of smelting works to accept ore for treatment during present period of curtailment.

Silver Bow County

BUTTE & SUPERIOR COPPER CO. (Butte)—Monthly report was filed in Federal court, Aug. 20, in compliance with order of court made last November in suit of Minerals Separation Co. against Butte-Superior. According to report, 29,652 tons was treated by flotation, at cost of $3.08 per ton. Concentrates amounted to 7207 tons, assaying 54.93% zinc, 26,473 oz. silver and 0.0547 oz. gold.

NORTH BUTTE MINING CO. (Butte)—Speculator mine, principal property of this company, was shut down Aug. 23 for an indefinite period, to make needed repairs at the mine. All told, about 500 men will be laid off, while balance of regular crew will be employed in retimbering about 300 ft. of Speculator shaft. Various other repairs will be made during shut down. This will reduce amount of ore sent to Washoe smelter by about 750 tons per day. Since general curtailment was put into effect, mine has been running at practically 60% of normal output, which in round figures is 2,000,000 lb. copper per month.

BUTTE MINE WORKERS' UNION (Butte)—At regular meeting, held Aug. 24, union went on record as favoring suggested plan that all mine employees wear button of new organization. Volunteer committee of 40 men was accepted to see action carried out. Committee, appointed to wait on management of various Butte mines, regarding safety and sanitary conditions in mines, reported that managers' attention was called to some faults in enforcement of regulations. Committee also reported having presented several other propositions to managers which it is hoped managers will agree to.

MOUNTAIN VIEW MINE (Butte)—At 5 p.m., Aug. 20, fire was discovered near air shaft of this mine, property of the Anaconda company. Owing to prevailing high wind, fire made rapid progress and became difficult to handle. Engine room, ore bins, dry house, headframe and quantity of timber were destroyed, causing damage to amount of $50,000, which is partly covered by insurance. Fire reached three or four sets down the shaft before it was under control, and for time it was feared that it might reach underground levels and spread into levels of adjoining mines. These were immediately closed down and the men hoisted to surface. No one was hurt. Mountain View mine has been closed for five months, pending repairs to main shaft. Hoisting engine damaged by fire and put out of commission. New fireproof buildings will be erected and temporary hoisting engine will be installed at shaft. It has been said that fire may have been caused by sparks from passing engine, which, fanned by the high wind, started the blaze. All men laid off during fire in the adjoining mines went back to work following morning.

BULLWHACKER COPPER CO. (Butte)—President Patrick Clark has issued statement to stockholders in which he explains attitude in recent transactions in court and elsewhere, affecting affairs of company. Clark, through Clark Bros. and Klein Trust Co., of Spokane, advanced from time to time money to carry on operations at mine and mill up to total of about $125,000. When trust company demanded payment of both principal and interest on notes, company could not even pay interest and was unable to borrow sufficient funds to carry on operations. Mr. Clark has made arrangements for auditing company's books, a summary of which will be sent to all stockholders. Stock is nonassessable and cannot be made assessable without unanimous consent of stockholders. To do this and to give all stockholders chance to subscribe to fund for paying off indebtedness and continue operations, he suggests that all owners of stock endeavor to have same transferred on the company's books to their own name and give their proper address. Also that stockholders appoint committee to call for meeting and at meeting arrange that stockholder pay his proportion of indebtedness. Mr. Clark expresses faith in Bullwhacker and believes that with completion of mill, property will soon enter ranks of dividend payers.

NEVADA

Elko County

MIZPAH CONSOLIDATED (Mizpah)—Tunnel has been driven 1365 ft. to cut Nevada Northern vein. Oreshoot has been cut at 800 ft. from portal.

NEVADA MINING, MILLING & POWER CO. (Contact)—A 100-ton leaching plant will be built, it is stated. Electric power may be transmitted from Snake River Valley.

ELKO-JARBIDGE GOLD MINING CO. (Jarbidge)—Main tunnel cut shoot of good-grade gold ore at point 125 ft. from portal. About 1000 ft. of development work done.

Esmeralda County

GOLDFIELD MERGER MINES CO. (Goldfield)—New pumps will be installed in St. Ives shaft. Centrifugal pump of 500 gal. per min. capacity will raise water from sump at 1800-ft. level to 1325-ft. level, and from there to surface, water will be raised by triplex pump.

JUMBO EXTENSION (Goldfield)—During 1913 a total of 3564 ft. of development work was done at a cost of $6.28 per ft. Milling costs were $3.65 per ton, including freight and treatment. During first five months of 1914, development work was 1698 ft. at cost of $5.72 per ft., and 8653 tons of ore were produced at profit of $53,343. Milling cost at Bonnie Clare mill, $3.15 per ton. Agreement is now in operation with Goldfield Consolidated to mill 100 tons per day at cost of $3 per ton.

Humboldt County

DRILLING FOR POTASH will be done by United States Geologic Survey in Black Rock Desert near Gerlach, on line of Western Pacific, it is stated. Thought that potassium chloride will be found; at upper end of desert, potassium nitrate is found in almost pure state.

HATCH LEASING CO. (National)—Lease on Jumbo and Combined lode claims of National Consolidated Mining Co. secured and crosscutting under way.

LEONARD CREEK PLACER MINES are causing considerable excitement. About 50 men are washing gold, and much property has changed hands.

ROCHESTER CONSOLIDATED MINING & MILLING CO. (Rochester)—Excavating for new mill will commence at once, it is stated. Water-supply line is half completed.

Lander County

DISCOVERIES AT McCOY of lead-silver and gold-bearing veins have been made. District heavily covered by débris, which makes prospecting difficult and expensive.

RUBY SILVER MINING CO. (Battle Mountain)—Winze from uper tunnel, 110 ft. deep, is in good-grade ore for total depth. Raise being lifted in ore from lower tunnel to meet this winze. Lower tunnel will also be driven; this is expected to increase water supply. Large-size Denver quartz mill will be installed in milling plant, recently completed. New pipe line laid to supply mill with additional water.

Lincoln County

GOLD STRIKE EAST OF PIOCHE has been made. Many claims staked and new camp named Gold. On property of Cowan & Kennedy, 8-ft. shoot of ore assaying $16 in gold and $1 in silver been opened in 32-ft. shaft, it is stated. Option taken on this property by Eastern men, and contract let for 200 ft. of sinking and 100 ft. of drifting. Gold is 23 miles east of Pioche.

Lyon County

BLUE JAY (Yerington)—Hoist installed and stoping under way on 100-ft. level; 300-ft. tunnel being driven to connect with shaft. Shipping will begin soon.

NEVADA-DOUGLAS (Ludwig)—Recent dvelopment on 100-ft. levels of Casting Copper and Ludwig mines opened ore of shipping grade. Leaching plant siding is being built, and grading for plant and ore bins will commence at once, according to statement of A. J. Orem, president of company.

Nye County

DECREASE IN TONOPAH PRODUCTION is due to suspension of milling operations of North Star, MacNamara and Merger Mines Co. Work also stopped at Cash Boy and Umatilla. Silver bullion produced by Tonopah Mining Co., Tonopah Belmont, West End and Jim Butler is being stored; gold bullion is sold.

ROUND MOUNTAIN MINING CO. VS. ROUND MOUNTAIN POWER & WATER CO.—A compromise may be made in this injunction proceeding and the case settled out of court.

TONOPAH EXTENSION MINING CO. (Tonopah)—Capacity of milling plant will be increased by 100 tons daily; extensive improvements now under way. Mill building increased in size; 10 stamps, tube mills, agitators and thickeners will be installed. New bullion house, blacksmith shop and hoist house built, a 150-hp. Nordberg hoist ordered, and a 60-drill compressor received. About 70% of ore now being milled is from development work on 950-, 1020-, 1100- and 1170-ft levels.

Storey County

CROWN POINT-BELCHER (Virginia City)—Water in joint incline lowered 15 ft. recently, making total of 95 ft. recovered below 1600-ft. level. About 100 tons of ore per day being hoisted from these two mines.

NEW JERSEY

BASIC ORE MINING CO. (Buttzville)—Plant at Dahlke iron mine is closed. No market for 100,000 tons of ore on hand. Suspension will throw 100 men out of work. Company owns Pequest furnace, which will be dismantled.

NORTH CAROLINA

Montgomery County

STEELE MINE—A plant is being erected to treat the dumps and consists of roaster and amalgamator. It is reported that the mine will be unwatered and developed.

COGGIN MINE (Eldorado)—The mill is again in operation after a three weeks' shutdown on account of burning out the armature coils of the generator that supplies power for driving part of the mill machinery.

OREGON

Baker County

ANTICIPATING that diversion of water of Snake River through big tunnel at Ox Bow power plant will uncover gold-laden gravel on the river bottom, many old-time placer miners are gathering at and near Copperfield, in this county, awaiting the opening of the big tube. The gravel and sand of Snake River are known to be rich in gold and black sands, but the gold is fine and difficult to save. It is thought, though, that larger gold will be found in river bottom, when the water is diverted.

Douglass County

PLATINUM ORE ON ROCK CREEK has been found and samples of ore are now being assayed.

Grant County

BEN HARRISON (Granite District)—Baker County mining men are of the opinion that this mine is to be sold to the United States Smelting, Refining & Mining Co., which is now operating the Rainbow mine in the Mormon Basin. Experts employed by the smelting company have recently shipped out 6000 lb. of samples from the mine.

UTAH

Beaver County

THERE IS EXCITEMENT AT FORTUNA, a new gold camp near Sheep Rock mine, in Bald Hills, at base of Tushar Mountains, in the Newton mining district. A number of ledges opened and reported to pan free gold. Camp is 12 miles northeast of Beaver City.

NOONDAY (Milford)—Word received to resume work at this property, near Old Cave mine.

LEONORA MINING & MILLING (Milford)—Ore opened recently is being developed. Mine is in the Star district.

CAVE (Milford)—Lease was recently taken on this property by J. S. Wilkin, superintendent at the Moscow, and associates.

MONITOR (Milford)—Settlement received on recent shipment gave net returns of $14 per ton. Ore carries gold, silver and lead. Property is about half a mile southeast of Moscow.

SHEEP ROCK (Beaver City)—Ore carrying gold and silver being sacked for shipment and five-stamp mill is running. New ore reported to have been opened on 300 level. Twenty men are employed.

SOUTH UTAH (Newhouse)—Limited tonnage of high-grade copper ore recently mined. This occurs in small pockets and fissures in monzonite, consisting chiefly of chalcopyrite and tetrahedrite. Small force only being worked between 500- and 600-ft. level. No work being done in other parts of mine or at mill.

MOSCOW MINING & MILLING (Milford)—Drifting from bottom of new working shaft at east end of property has cut silver vein productive in upper workings. Drift is on the 800 level and out about 450 ft.; 3 or 4 in. of ore opened, and will be followed upward on bedding. On pitch of ore-shoots, this will give about 425 ft. below old stopes. Ore makes at intersection of mineralizing fissures with certain limestone beds, and rakes to northeast. Prospecting will be done for back vein, which is 50 ft. in footwall of silver vein. New shaft is double compartment and manway, paid for by mining sufficient ore from old workings, without crowding production. Shaft will obviate much rehandling of ore. Working forces were reduced to 13 men, but 50 men were added Aug. 22, as result of improved conditions in metal market.

Juab County

CENTENNIAL-EUREKA (Eureka)—Vein carrying gold has been opened in work on ledges above shaft. Assays up to 2 oz. gold obtained. Find will be thoroughly prospected.

CHIEF CONSOLIDATED (Eureka)—Report for six months ended June 30, 1914, shows 23,739 tons of ore shipped, which brought net returns of $183,387. Net profit for half year, after payment of dividends and all charges, was $57,610. Development amounting to 3350 ft. was done.

GRAND CENTRAL (Eureka)—Mine in good condition and shipments from 36 to as high as 60 cars per month have been made this year; output for first six months was 289 cars, about 14,000 tons of ore. At special directors' meeting, Aug. 4, it was decided to increase working forces at mine to normal, and to resume work at the Gold Chain soon.

MAY DAY (Eureka)—New body of lead-silver ore being developed along main tunnel level is being further opened, though no shipments are being made at present, owing to condition of metal market. Ore is above that mined by Kitt-Mitchel lease in early part of year. Some zinc ore opened below lead deposits in this neighborhood. Small cyanide mill operated by Griggs, Carter & Castleton is handling fair tonnage.

EAGLE & BLUE BELL (Eureka)—High-grade galena ore found to continue from 1450 level down to 1600, lowest level. Drifting in ore being done from bottom of winze sunk from 1550 to 1600. Ore ran well in silver and lead. Preparations being made to sink main shaft to 1700 from 1550; this work will be started as soon as word is received from managing director in Boston. With this done and connections made with winze, ore can be sent to the surface without rehandling.

Salt Lake County

BINGHAM-NEW HAVEN (Bingham)—Mine and mill are being put in shape for normal production, and new flumes built to carry off tailings.

DIPPER GOLD MINING & MILLING (Alta)—Bond and lease taken on this property by Evans & Shields. Ground adjoins Wasatch-Utah, near mouth of Little Cottonwood Cañon.

WASATCH MINES (Alta)—Lessees in tunnel of old Columbus Consolidated have 100-ton shipment ready. Some ore recently opened in old Flagstaff ground owned by this company.

ALTA CONSOLIDATED (Alta)—Ore being mined from east drift on tunnel level, where it has been followed 55 ft Three cars lead-silver ore were shipped recently, another in transit.

MICHIGAN-UTAH (Alta)—Settlement received on 10 tons of ore mined by lessees on City Rocks. Settlement also been made on two other shipments. Tramway has been repaired, and is again operating.

SOUTH HECLA (Alta)—Shipments of 35 to 40 tons of ore daily being made. No effort to crowd production. Ore coming from new body opened for several hundred feet above tunnel level carries silver and lead principally.

OHIO COPPER (Bingham)—New coarse-crushing equipment is in operation and showing good results. Further additions to plant will be made. Fine slimes are treated in separate building. About 2300 tons daily being treated.

Tooele County

NEW STOCKTON (Stockton)—Eagle-Campbell-Mills lease is making shipments from stopes on 500-ft. level. Material carries lead and silver. Some jigging being done.

DULUTH & UTAH DEVELOPMENT (Stockton)—Company's property recently purchased by Bullion Coalition and dividends or distributions from money received have been made to stockholders; in April, 4½c. per share, and on Aug. 13, 7½c. per share. Further distributions due after final payment is made.

SOUTH DAKOTA

Lawrence County

HEIDELBERG (Two Bit)—Company secured ample subscriptions for treasury stock to provide funds for further development. Stock all sold in Deadwood. Shaft work commenced.

RATTLESNAKE JACK (Galena)—With receipt of nine motors and duplex classifier this week, practically all machinery for cyanide mill under construction was delivered except motor and second classifier. Mine work showing well.

ORO HONDO (Lead)—Auxiliary hoist being installed on 1000-ft. level to facilitate sinking main shaft, now 1150 ft. deep. Several houses being constructed, for residence of superintendent, bunk house, boarding house, etc.

CANADA

Ontario

BEAVER (Cobalt)—Work in mine, closed down three weeks ago, again resumed.

CROWN RESERVE (Cobalt)—Mine shipped this week 55,000 oz. silver to London market, to be followed by another consignment soon.

BUFFALO (Cobalt)—Three drills are in operation underground. Final clean-up is being made at high-grade mill preparatory to closing down.

MOND NICKEL CO. (Sudbury)—Mine practically closed down owing to the difficulty in marketing ore. Just reorganized and registered in England with nominal capital of £1,700,000 in £1 shares.

TOUGH OAKES—(Kirkland Lake)—This company has made another payment of $200,000 of the amount due on the purchase money. Force has been reduced to 60 men, but there are still 200 men at work .

DOME LAKE (Porcupine)—Reported that No. 1 vein. drifted on for 70 ft. at 180-ft. level, shows width of 9 to 11 ft., with ore averaging $16 No. 3 vein has been opened up for 200 ft. at 300-ft. level, where 2½ ft. of ore is reported to average $28.

MEXICO

Chihuahua

BATOPILAS MINING CO. announces that its staff of Americans left El Paso for mines, Aug. 27, in charge of John R. Harbottle, who has been appointed general manager More active operations will now be carried on, although business has been operated on small scale under two of its most trusted Mexican employees since former American staff left in September, 1913

Sonora

W. C. LAUGHLIN CO (Nogales)—On June 26, auto truck carrying bullion was attacked near La Colorada, Sonora, en route from San Javier, by Mexican bandits, and mill superintendent Thomas Farrell, formerly of Dolores, was killed On Aug. 6 ,another bullion train was attacked by Yaqui Indians near La Colorada killing Arthur Squires, an employee, and securing 39 bars of bullion valued at $21,000. Since this, Indians have raided American owned property of Toledo on Yaqui River. Due to inability of mine owners to get supplies through territory controlled by Indians, business is at standstill.

The Market Report

METAL MARKETS

NEW YORK—Sept. 2

The Metal Markets are still in a disturbed and unsettled condition. Some of the minor metals are holding sharp advances, due to the war conditions abroad.

Copper, Tin, Lead and Zinc

Copper—The situation remains unchanged. The refineries are beginning to feel the diminished supply coming from the mines.

Base price of sheet copper is 18c. per lb. for hot rolled and 19c. for cold rolled. The usual extras are charged, and higher prices for small quantities.

Exports of copper from New York for the week were 6001 long tons. Our special correspondent gives the exports from Baltimore for the week at 525 tons.

Exports of copper in all metallic forms from the United States in the fiscal year ended June 30, were 435,175 long tons; an increase of 57,705 tons over 1912-13. Exports of copper ore and matte in 1913-14 were 71,410 tons, or $3,257,089 in value.

Imports of copper in metallic form in the fiscal year ended June 30, 1914, were 125,686 tons; in ore and matte, 50,121; total, 175,807 long tons.

The London correspondent of the "Boston News Bureau" reports that there is very little to tell about copper. The London Metal Exchange is closed and the authorities ruling it have forbidden the furnishing of prices to the newspapers —a very wise step, seeing that many contracts are based upon paper prices and that today everything is at sixes and sevens. There is not much doing in manufactured material, but one small but comforting sign is that the government has begun to allow the movement of stuff intended for government use, and has permitted shipments of sheets, tubes, etc., for India and Australia.

Brass Prices are announced by the American Brass Co. as follows, to date, from Sept. 1: Sheets, high brass, 14⅜c. net per lb.; low brass, 15⅞c. Wire, high brass, 14⅛c.; low brass, 15⅞c. Rods, high brass, 14⅛c.; low brass, 16⅝c. Tubes, brazed, 18¾c.; open seam 18¾c. Angles and channels, 18¾c. Scrap allowances are 8⅞c. net per lb. for high brass and 9⅞c. for low brass.

Tin—Supplies have been coming forward more freely.

It has been announced that the postponed Banka tin sale was to take place Sept. 3. The tin offered is about 2500 tons, at a limit of 25 florins.

Lead—Business in this metal has been in reduced volume but prices have been held firmly.

Spelter—The foreign demand appears to have culminated on Aug. 26, at which time as high as 6.10c., St. Louis, was paid for a lot for export, while at the same time American consumers were able to buy at 5⅞c. American consumers, however, were at no time on the recent upward movement active buyers. On the contrary, they were supposed to have overbought their immediate requirements at the low prices of last July and earlier, the mid-year statistics strongly indicating such a position. A confirmation of this suspicion developed last week in the overtures made by some consumers for the resale of round lots, they being attracted evidently by the fine profit offered by the sharp rise. These offers, together with the halt in demand from abroad caused the market to soften, and from day to day the metal was offered down, without there being many acceptances. Indeed, the volume of business during the week has been light. At the close spelter was freely offered at 5.75c. This recession is regarded, however, as only temporary, inasmuch as a further demand from abroad is expected. We have heard of some new inquiries from distant countries. Some sales of brass special and intermediate spelter are reported at fancy prices, while high-grade spelter fetches in the neighborhood of 10c. per pound.

Other Metals

Aluminum—The market is still quiet, with only moderate transactions, and deliveries chiefly on contract. Prices are quoted at 20@20½c. for No. 1 ingots, but are rather nominal.

Antimony—The market is quiet, but strong. Only a small business is reported, but some scarcity is apprehended and stocks are firmly held. Ordinary brands—Chinese, Japanese, etc.—are quoted at 12@13c. per lb. Cookson's is held at 15½@16½c., and 14½@15c. is asked for other special brands.

Quicksilver—The market is strong and rather excited, though prices have eased off a little from the extreme high point. The present quotation is $75@85 per flask of 75 lb., New York.

Gold, Silver and Platinum

Gold—As heretofore noted, the Bank of England has made arrangements to buy gold to be deposited to its credit at Ottawa, Canada. S. Montague & Co. write from London, Aug. 20: "The Bank of England has extended the purchase of gold abroad against payment in this country to another British possession besides Canada. The Bank is prepared to purchase gold tendered in British South Africa, and will make advances to the extent of 97% of the value on the basis of 77s., 9d., per ounce standard. The balance will be adjusted on the arrival of the gold in London."

Imports of gold in Great Britain seven months ended July 31, were: £35,488,752; exports, £25,134,365; excess of imports, £10,354,387, against £11,760,064 last year.

Platinum—The situation is not materially changed. The future is uncertain, as it is difficult to say what will be done when present stocks are exhausted. Dealers ask, for immediate delivery only, $50 per oz. for refined platinum, and $57.50 per oz. for hard metal.

Silver—The market has been sustained abroad chiefly by mint orders. The break on Aug. 28 in the price of silver was caused by the arrival and offering of an unusually large volume of silver from the United States. Price closes today (Sept. 2) fairly steady.

The London quotations for the week have been 25d. on Aug. 27; 23 13/16d. Aug. 28; 23⅞d. on Aug. 29, 24¼d. on Aug. 31; 24d. on Sept. 1; 24d. on Sept. 2, the closing.

DAILY PRICES OF METALS

NEW YORK

			Copper	Tin	Lead		Zinc	
Aug. Sept	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb	St. Louis, Cts. per Lb.
27	*	55	*	†40	3.90	3.70 @3.75	6.00 @6.15	5.85 @6.00
28	*	53¼	*	†40	3.90	3.70 @3.75	6.00 @6.15	5.85 @6.00
29	*	53	*	†40	3.90	3.70 @3.75	6.00 @6.10	5.85 @5.95
31	*	53¼	*	†39	3.90	3.70 @3.75	5.90 @6.00	5.75 @5.85
1	*	53¼	*	†38	3.90	3.70 @3.75	5.85 @5.95	5.70 @5.80
2	*	53¼	*	†37	3.90	3.70 @3.75	5.85 @5.95	5.70 @5.80

*No quotations. †Nominal.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

Shipments of silver from London to the East, Jan. 1 to Aug. 20, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£4,639,000	£4,454,500	D. £184,500
China	542,000	42,000	D. 500,000
Total	£5,181,000	£4,496,500	D. £684,500

In Washington, Aug. 28, the United States Mint bought 200,000 oz. of silver at 53.10c: per oz., delivered at San Francisco.

Imports of silver into Great Britain seven months ended July 31, were valued at £7,061,279; exports, £8,491,478; excess of exports, £1,430,199, which compares with an excess of imports of £723,913 last year.

Gold and silver movement in the United States seven months ended July 31, as reported by the Bureau of Statistics, Department of Commerce:

	Gold		Silver	
	1913	1914	1913	1914
Exports	$72,388,585	$117,643,959	$38,258,234	$29,463,126
Imports	35,769,107	34,135,137	20,930,629	13,828,568
Excess, exports	$36,619,478	$83,508,822	$17,327,605	$15,634,558

Exports of merchandise for the seven months were valued at $1,200,925,440; imports, $1,141,094,215; excess of exports, $59,831,225. Adding the excess of exports of gold and silver gives $158,974,605 as the total export balance.

Zinc and Lead Ore Markets

JOPLIN, MO.—Aug. 29.

Blende advanced another $2 on high, closing at $53, the assay base $48@50, the metal base $47@48 per ton of 60% zinc; calamine base $24@27 per ton of 40% zinc. Average of all grades of zinc $45.20 per ton. Lead continues unchanged at $46 per ton of 80% metal contents, and the highest price paid was $46.55 per ton; the average, all grades, is $45.80 per ton.

Sellers held until Friday and some Saturday for an assay base of $54, but buyers declined to offer over $50, and the sellers capitulated tonight, with the market looking easier for next week. If sellers are not ready to sell on Thursday they will need to hunt the buyers, hereafter.

SHIPMENTS WEEK ENDED AUG. 29.

	Blende	Calamine	Lead	Values
Totals this week	9,259,060	1,016,440	1,578,260	$268,910
Totals this year	355,128,720	26,569,460	60,340,750	$8,934,090

Blende value, the week, $218,730; 8 mos., $6,893,950.

Calamine value, the week, $14,040; 8 mos., $305,130.

Lead value, the week, $36,140; 8 mos., $1,435,010.

PLATTEVILLE, WIS.—Aug. 29

The base price paid this week for 60% zinc ore was $49 per ton. The base price paid for 80% lead ore was $45 per ton.

SHIPMENTS WEEK ENDED AUG. 29

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,327,600	58,000	797,000
Year	102,025,650	3,578,500	24,641,570

Shipped to separating plans during week, 4,937,420 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Sept. 2

The condition of the iron and steel trades just now is uneven, but the outlook is not discouraging.

While buyers do not seem disposed to take on new commitments very freely, specifications on contracts are on a good scale and mills continue to run on about the same proportion of capacity as last week. The smaller number of new orders seems to be largely due to disturbed financial conditions; this being especially the case with structural steel. A number of contracts on buildings have been held up or postponed for this reason.

While there are large expectations for export trade, little has actually developed so far. There is a good deal of inquiry, but not many actual sales, nor can much be expected until conditions improve abroad.

Pig iron is quiet and rather dull. Sales this week have been chiefly of small lots for early delivery.

In the complaint filed by the Low Moor Iron Co. and others against the Chesapeake & Ohio and other railroads, complaining of discrimination in rates, the Interstate Commerce Commission has ordered reductions in the rates on pig iron from Low Moor and other points in Virginia to Baltimore, Philadelphia, New York and Boston on and after Oct. 15. The new rates to be to Baltimore $2.25, to Philadelphia, $2.75, to New York, $3, and to Boston, $3.25.

It is announced that the Tennessee Coal, Iron & R.R. Co. will shortly put one of its blast furnaces at Ensley, Ala., on ferromanganese. The company has a stock of Indian and Brazilian ores on hand.

PITTSBURGH—Sept. 1

The market continues very quiet here so far as new business is concerned. Specifications on contracts are coming in fairly well and the mills continue running at about the same rate as they have done for two weeks past. One exception, perhaps, is with the tinplate mills which are running just now at a higher rate than most others. The anxiety as to the supply of tin has largely passed away and the metal can now be had at reasonable prices, with the prospect that there will be no interruption in the supply.

Additional orders have been received for 1000 tons of wirerods for export to England. Other inquiries are pending, but the export business is in some doubt at present on account of high insurance rates, the difficulty in securing tonnage and also the financial disturbances preventing arrangements for payment.

The advance in steel prices from the very low level of two or three months ago is firmly held. These advances have been $2 a ton in bars, plates, shapes and wire and $4 in sheets. They have not been due so much to the war, and would probably have been made even if war conditions had not intervened, although the resulting uncertainties have helped to maintain them. The fact is, that advances were due and it is pretty certain that they have not in any degree checked buying.

The falling off in new orders, especially for structural material, is due largely to financial conditions and to the uncertainty as to the future.

Pig Iron—The market continues rather slow and sales for the week have been mainly in moderate quantities. W. P. Snyder & Co. report the August average for bessemer iron at $14, and for basic, $13 at Valley furnaces. There has been no change in these averages for five months now, an unusually long period. Foundry iron shows very little change. Quotations are $14 for bessemer, $13 for basic, $13@13.25 for No. 2 foundry, all at Valley furnaces, 90c. higher for Pittsburgh delivery.

Ferromanganese—Quotations for resale lots have fallen from the extraordinary figures lately given although as high as $100 per ton is said to have been paid. Supplies of English metal are now being received and it is expected that contract deliveries will be resumed.

Steel—No changes are reported, and prices continue at about the same level as last week.

COKE

Coal and Coke Tonnage of Pennsylvania R.R. lines east of Pittsburgh and Erie, seven months ended July 31, short tons:

	1913	1914	Changes
Anthracite	6,138,175	6,347,822	I. 209,647
Bituminous	28,833,947	27,521,539	D. 1,312,408
Coke	8,569,978	6,075,020	D. 2,494,958
Total	43,542,100	39,944,381	D. 3,597,719

The total decrease this year was 8.3%, the larger part of it being in coke.

Exports and Imports of Fuel in the United States, six months ended June 30, in long tons:

	Exports		Imports	
	1913	1914	1913	1914
Anthracite	2,067,930	1,872,477	30	7,233
Bituminous	8,031,888	5,749,132	724,614	668,764
Coke	489,920	350,812	33,121	52,504
Bunker coal	3,732,403	3,852,889	....	...
Total	14,322,141	11,825,310	757,770	728,501

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The greater part of the trade, both imports and exports, is with Canada.

CHEMICALS

NEW YORK—Sept. 2

The general market is still disturbed and uneasy. Business in heavy chemicals is not active and prices are unsettled.

Arsenic—The market is quiet, with moderate sales. Prices are a shade weaker at $4.25 per 100 lb. for both spot and futures.

Copper Sulphate—Business continues on a moderate scale, but steady, with unchanged prices. Quotations are $4.50 per

COPPER SMELTERS' REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments	2,069,960	1,279,537	585,387	1,114,758	2,879,396
Anaconda	23,800,000	22,900,000	23,500,000	23,800,000	. . .
Arizona, Ltd	3,286,000	3,570,000	3,092,000	3,742,000	3,300,000
Copper Queen	7,637,012	7,562,723	8,388,203	7,613,719	7,817,318
Calumet & Ariz.	5,875,000	5,450,000	5,495,000	4,630,000	5,940,000
Chino	5,399,814	5,926,591	5,496,875	5,486,419	.
Detroit	1,973,725	1,790,926	2,105,034	2,129,100	1,966,526
East Butte	1,546,180	1,178,000	1,179,762	1,215,323	
Giroux	287,980	45,948	429,553	425,000	
Mason Valley..	1,250,000	862,000	916,000	950,000	.
Mammoth.	1,800,000	1,850,000	1,750,000	1,725,000	1,950,000
Nevada Con.	5,218,257	4,880,013	4,959,589	4,483,175	
Ohio	597,520	610,518	625,000	605,000	. . .
Old Dominion.	2,997,000	2,779,000	3,302,000	2,937,000	2,962,000
Ray.	6,036,908	6,089,362	6,300,847	5,941,567	
Shannon	1,082,000	1,012,000	1,056,000	1,049,227	1,084,000
South Utah	406,381	247,641	55,394	62,990	
Tennessee.	1,262,184	1,370,800	1,336,950		
United Verde*..	3,100,000	3,000,000	3,100,000	2,900,000	
Utah Copper Co	12,323,193	12,739,757	13,208,483	12,870,063	
Lake Superior*....	11,000,000	13,000,000	12,500,000	16,000,000	
Non-rep. mines*	8,200,000	8,000,000	8,200,000	8,000,000	
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	
Total prod.	109,649,144	108,644,846	110,082,077		
Imp., bars, etc.	22,676,605	17,043,191	19,081,487	23,885,521	.
Total blister...	132,326,049	125,688,037	129,163,564		. . . .
Imp. ore & matte.	7,029,616	10,400,122	10,586,506	9,157,540	. . . .
Total Amer...	139,355,695	136,088,159	139,750,070		. . . .
Arrivals-Europe†	17,572,800	17,299,520	13,558,720	19,040,000	. . . . . .

† Does not include the arrivals from the United States.

100 lb. for carload lots, and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Conditions are unchanged, and the market is rather quiet. Current quotations are 2.15c. per lb. for spot, 2.12½c. for September, 2.10c. for October, 2.05c. for November and December, 2.02½c. for 1915 deliveries.

The Chilean Congress has authorized an appropriation for government loans to producers, in order to prevent the closing of some works.

PETROLEUM

Exports of mineral oils from the United States in July were 230,269,485 gal. For the seven months ended July 31 the exports were 1,132,824,757 gal. in 1913, and 1,348,173,519 in 1914; an increase of 215,348,762 gal., or 19% this year.

OTHER ORES

The Carnegie Steel Co.'s new schedule, dated Aug. 5, gives prices per ton of 2240 lb. for domestic manganese ore delivered at Pittsburgh or Etna, Penn., or at South Chicago, Ill., as follows: 49% metallic manganese, 26c. per unit; 46 to 49%, 25c.; 43 to 46%, 24c.; 40 to 43% manganese, 23c. per unit.

Prices are based on ores containing not more than 8% silica or 0.20% phosphorus, and are subject to deductions as follows: For each 1% in excess of 8% silica there shall be a deduction of 15c. per ton; fractions in proportion. For each 0.02%, or fraction thereof, in excess of 0.20% phosphorus there shall be a deduction of 2c. per unit of manganese per ton.

Ores containing less than 40% manganese or more than 12% silica or 0.225% phosphorus are subject to acceptance or refusal at the buyer's option.

Settlements are based on analysis of sample dried at 212° F., the percentage of moisture in the sample as taken being deducted from the weight.

Assessments

Company	Delinq	Sale	Amt.
Alameda, Ida.	Sept. 5	Sept. 29	$0.005
Alta, Nev.	Aug. 18	Sept. 11	$0.03
Andes, Nev. (post.)	Aug. 28	Sept. 18	0.03
Aurora-Sampson, Ida. (post.)	July 18	Sept. 18	0.002
Big Elk, Ida.	Aug. 25	Sept. 25	0.001
Black Bear, Ida.	Sept. 1	Oct. 1	0.01
Blue Star, Ida.	July 28	Sept. 25	0.03
Cons. Imperial, Nev. (post.)	Aug. 27	Sept. 18	0.01
Con. Virginia, Nev.	Sept. 3	Sept. 24	0 10
Eagle Mountain, Ida.	Aug. 22	Sept. 22	0.001
Emerald, Utah	Aug. 15	Sept. 12	0 0033
Great Western, Nev. (post)	Aug. 25	Sept. 15	0.01
Huron, Mich. (Iron)	. . .	. . . . . .	3%
Hypotheek, Ida	Aug. 17	Sept. 15	0.01
Idaho & Los Angeles, Ida.	Sept. 7	Sept. 25	0.005
Idaho-Nevada, Ida.	Sept 7	Oct. 1	0.001
Laclede, Ida.	Aug. 21	Sept. 14	0.005
Lehi Tintic, Utah	Aug. 12	Sept. 17	0.0025
Lucky Calumet, Ida.	Aug. 21	Sept. 21	0.005
Monarch-Pittsburgh, Nev. (post.)	Sept. 14	Sept. 21	0.01
New Hope, Ida. (post.)	July 13	Sept. 11	0.002
North Star, Ida.	Aug. 8	Sept. 10	0.0015
Ophir, Nev. (post.)	Aug. 31	Sept. 24	0.10
Oreano, Ida. (post.)	July 24	Sept. 25	0.002
Plutus, Utah	Aug. 28	Sept. 15	0.002
Sandstorm-Kendall, Nev.	Aug 10	Sept. 14	0.01
Sierra Nevada, Nev. (post.)	Aug. 28	Sept. 18	0.10
Tintic Standard, Utah	Aug. 10	Sept. 14	0.005
Torino, Ida	Aug. 10	Sept. 10	0.001
Utah Metal, Utah	. . .	Oct. 1	0.05

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56 260	62 938	57 572	25 887	28 983	26.553
February	59 043	61 642	57 506	27 190	28 357	26 573
March	58 375	57 870	58 067	26 875	26 669	26 788
April	59 207	59 490	58 519	28 284	27 416	26 958
May	60 880	60 361	58 175	28 038	27 825	26 704
June	61 290	58 990	56 471	28 215	27 199	25 948
July	60 654	58 721	54 678	27 919	27 074	25 219
August	61 606	59 293	54 344	28 375	27 335	25 979
September	63 078	60 640		29 088	27 986	
October	63 471	60 793		29 299	28 083	
November	62 792	58 995		29 012	27 263	
December	63 365	57 760		29 320	26 720	
Year	60 835	59 791		28 042	27 576	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50 298	37.779	238 273	171.905
February.	48 766	39 830	220 140	181 556
March.	46 832	38 038	213 615	173.619
April	49 115	36 154	224 159	163 963
May	49 038	33 360	224 143	150 702
June.	44 820	30 577	207 208	138.321
July.	40 260	31 707	183 511	142 517
August	41 582	.	188 731	. . . . .
September	42 410		193 074	
October..	40 462		184 837	
November..	39 810	. .	180 869	
December...	37 635		171 786	
Av. year	44 252	. . . .	206 279	

New York in cents per pound. London in pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January..	6 931	5 262	6.851	5 112	26.114	21.533
February.	6.239	5 377	6.089	5 228	25 338	21 413
March.	6 078	5 250	5.926	5 100	24.605	21 460
April.	5 641	5.113	5.491	4.963	25.313	21.569
May	5 406	5 074	5.256	4.924	24.583	21.393
June	5 121	5 000	4.974	4 850	22.143	21 345
July.	5 278	4 920	5.128	4 770	20 592	21 568
August	5 658	5.562	5.508	5.412	20 706	. .
September	5 694	. . . . . .	5.444	. .	21.148	. . . .
October	5 340	. . . . .	5.188	. . .	20.614	. . . .
November	5 229	. .	5.083	.	20 581	. .
December	5 156	. .	5 004	. . .	21.214	. . .
Year	5.648	. . .	5 504	. . . . . .	22.746	. . . . .

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16 488	14 223	71 741	64 304	77 750	69 488
February	14 971	14 491	65 519	65 259	71 57.	70 188
March	14 713	14 131	65 329	64 276	70 658	69 170
April	15 291	14 211	68 111	64 747	74 273	69 313
May	15 436	13 996	68 807	63 182	71 774	67 780
June	14 672	13 603	67 140	61 336	70 821	66 274
July	14 190	13 223	64 166	60 540	69 416	64 955
August	15 400		69 200	.	74 313	
September	16 328		73 125		78 614	
October	16 337		73 383		79 250	
November	15 182		68 275		73 825	
December	14 224	.	65 223		69 583	
Year	15 269		68 335		73 740	

New York, cents per pound, London, pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4 321	4 111	4 171	4 011	17 114	19 665
February..	4 325	4 048	4 175	3 937	16.550	19 606
March..	4 327	3 970	4 177	3 850	15.977	19.651
April	4 381	3 810	4 242	3 688	17 597	18 225
May	4 342	3 900	4 226	3 808	18 923	18.503
June	4 325	3 900	4 190	3 810	20 226	19 411
July	4 353	3 801	4 223	3 738	20 038	19 051
August	4 624	3 875	4 550	3 715	20 406	
September	4 698	.	4 579		20 618	
October	4 402		4 253		20 302	
November	4 293		4 146		19 334	
December	4 047		3.929		17 798	
Year	4 370		4 238		18 743	. . .

New York and St Louis cents per pound London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18 15	$14 94	$17.35	$13.2	18 59	$13 90
February.	18 15	15.06	17 22	14 1	18 13	14 09
March	18 15	15 07	16.96	13.94	17.53	14 18
April	17.90	14.90	16 71	13.90	16.40	14 10
May	17.68	14 90	15 80	13 90	15.40	14 23
June	17.14	14 90	15 40	13.90	15 10	13 97
July	16 31	14 90	15.13	13.90	14 74	13 96
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The Engineering and Mining Journal

VOLUME 98 SEPTEMBER 12, 1914 NUMBER 11

El Paso Smelting Works--I

By Richard H. Vail

SYNOPSIS—The El Paso Smelting Works of the Consolidated Kansas City Smelting & Refining Co. has been for 30 years the most important custom smelting works in the Southwest. Recently the supply of lead ores has dwindled and copper smelting now predominates at this plant. A new copper works was added when the company contracted to smelt the Chino concentrates. The first installment of the article treats of the lead-smelting department.

⁂

General View of El Paso Smelting Works, El Paso, Texas

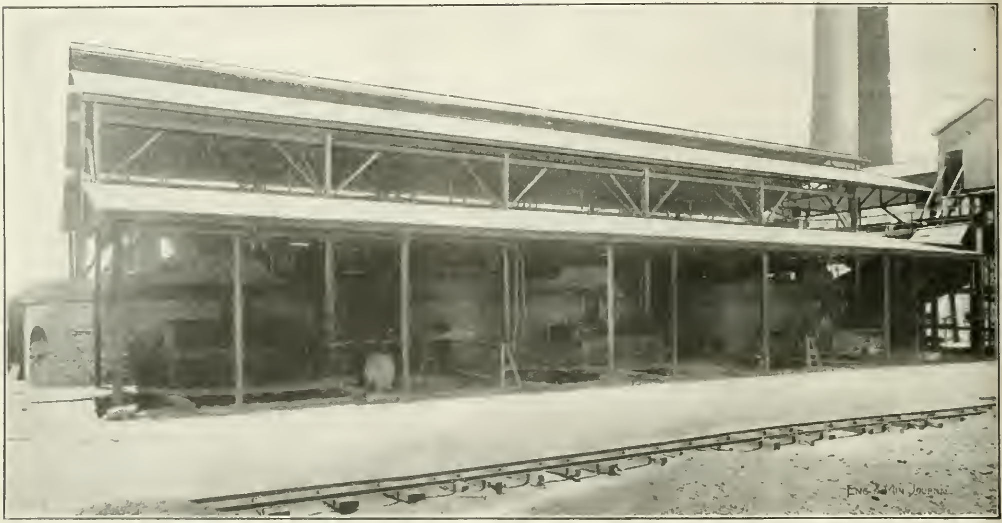
The El Paso plant of the Consolidated Kansas City Smelting & Refining Co. is situated about three miles from the center of the city of El Paso, Tex. It is just outside the northern city limits and close to the Rio Grande, from which most of its water supply is obtained, though the plant has also a connection with the El Paso water-works. The plant has a normal annual capacity in the lead-smelting department of about 350,000 tons of charge, and a capacity of 500,000 tons of charge in the copper department, which is now the most important branch, owing to the contraction of the lead-ore supply and the development of copper properties in this region.

Smelting operations were begun at El Paso in 1886, at which time the plant consisted of four lead blast furnaces and four hand roasters. For many years it was the only important silver-lead smelting works in the Southwest. The plant burned in 1900 and was rebuilt, but largely with the idea of utilizing hand labor, cheap Mexican labor being then available, though this has since become more expensive. At the time these notes were written, two lead furnaces out of eight were in blast and two copper blast furnaces were smelting custom copper ore. The company about three years ago took the contract for smelting Chino concentrates and built what is practically a new copper-smelting works; this includes a roasting plant containing eight Wedge furnaces, three 19x100-ft. reverberatories, and a converting plant that now comprises two Peirce-Smith converters and one 12-ft. Great Falls type converter with eccentric mouth.

Ores Unloaded by Contract

At the El Paso Smelting Works, as this plant is usually known, ores are received principally in box cars and gondolas, and are unloaded by contract. After the plant was closed for a few weeks by a labor strike in April, 1913, it became necessary to break in new men. The work of unloading proceeded slowly until a contract system, based on the foot-tons moved, was established and now there is a constant waiting list of men to get on the unloading gangs—a good example of the intelligent application of efficiency engineering. These men work in groups of four and earn from 1½ to two times the average day wage for unskilled labor. The pay, as above stated, is based on the foot-ton moved, but consideration is given to the character of the material unloaded and the distance it is wheeled. When ore is spread on the beds, an extra allowance is made to the unloading gang for this work.

Recently a Browning locomotive crane with 40-cu.ft. Brownhoist grab bucket has been added to the plant equipment for the purpose of handling stockpiled ore, of which there is a considerable accumulation, owing to the exigencies of operation during the last year. The stockpiles of Chino concentrates that were received in excess of the reverberatory smelting capacity, have been covered with a lime grouting to prevent them from being blown away by the strong winds prevailing in this region.



THREE GODFREY FURNACES FOR PRE-ROASTING LEAD ORE AT THE EL PASO WORKS

MECHANICAL SAMPLING PRECEDED BY HAND SAMPLING

This works receives a great number of small lots of ore. In consequence, though it has four mechanical sampling mills, the first sampling is done by hand when unloading. Every fifth or tenth shovel is taken, depending on the character of the ore; on concentrates every fifth shovel is retained and this sample is cut in half in the car. The shovel samples are then taken to the sample mill, the concentrate samples going directly to the quartering floor where they are first coned; then distributed in a ring and coned again, after which every third shovelful is taken for sample; this operation is repeated until the sample is reduced to approximately 100 lb., when it is taken to the finishing plates and then to the grinding and bucking room.

The shovel sample from the ore lots may be reduced in any one of four sets of automatic sampling-and-crushing equipments. Two of these are for ores not exceeding three inches in size and two mills handle the coarser ore.

THE SAMPLING MILLS

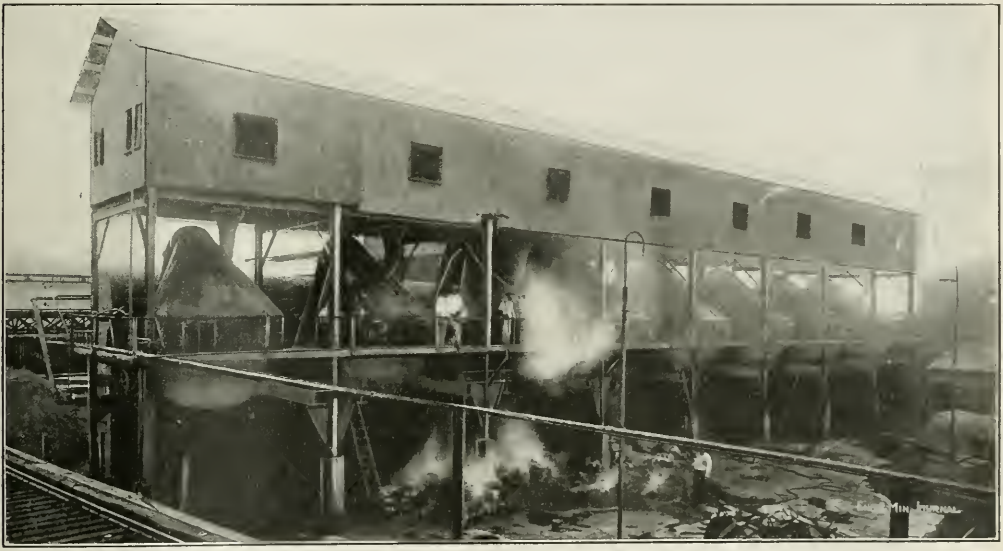
The equipment in each of the fine crushing mills is as follows: One 9x12-in. Blake crusher; one 8-in. bucket elevator; one Vezin sampler, cutting 1/5; one set of 12x36-in. Allis-Chalmers rolls, crushing to ½ in.; one 8-in. bucket elevator; two Vezin samplers, making a ¼ cut at similar points in the stream and giving a final duplicate sample, crushed to ½ in.

The coarse-crushing sample mills differ slightly and take their names from the size of the gyratory crusher, through which the ore first passes. The so called No. 4 mill comprises: One No. 4 Gates gyratory crusher; one 12-in. bucket elevator; one Vezin sampler, cutting 1/5; one 14x36-in. roll crushing to 1 in.; one 10-in. bucket elevator; two Vezin samplers, making a ¼ cut at the similar points in the stream and giving duplicate samples.

The No. 6 coarse-crushing sampling equipment includes: One No. 6 Gates gyratory crusher; one 14-in. bucket elevator; one Vezin sampler, cutting 1/5; one 14x36-in. roll, crushing to 1½ in.; one 10-in. bucket elevator; two Vezin samplers making a ¼ cut at the same points in the stream and giving duplicate samples.

The No. 1 coarse-crushing mill is being remodeled so that it may be used either as an automatic sampling mill or as a sulphide-ore crushing mill. The company, however, already has a sulphide mill, containing the following equipment: One 12x18-in. Blake crusher; one 16x30-in. roll, crushing to ½ in.; one 8-in. bucket elevator; one 3½x8-ft. trommel with screen having ¼ in. perforations; one 6x12-in. Colorado Iron Works roll, crushing oversize from the above trommel to pass ¼-in. opening.

The samples from the coarse-crushing mills go to the fine-crushing sample mills and the duplicate samples from the latter go to two sets of finishing rolls, each 14x24 in. There is also a set of 14x36-in. finishing rolls for separate work. The samples from the finishing rolls are dried in two steam-drying rooms and thence go to two bucking rooms; the duplicate samples are handled in different rooms. The equipment in the rooms is in duplicate and comprises four Engelbach grinders and four Eaton pulp mixers. The latter are small revolving cylinders having several interior shelves to assist in mixing the material. From the larger Eaton mixers, the sample is riffled down on a Jones divider, and then goes to the bucking board. From the bucking board the pulp is returned to a small Eaton mixer and after being revolved for a few minutes, the material is poured out and the sample is placed in the pulp envelopes, taking the material from different portions of the flattened cone. In the case of bonded ores, as many as nine pulps are made, two for the shipper, three for the smelter, two for the Mexican Government and two for the United States Government.



Huntington-Heberlein Sintering Plant at El Paso Smelting Works

Lead Ores Sintered in H. & H. Pots

Roasting for the lead department is done in Godfrey roasters and Huntington-Heberlein pots, for which a most satisfactory product is obtained. The preliminary roast is made in three 26-ft. Godfrey reasters, two of which are oil-fired and one coal-fired, the latter furnishing the coals for the ignition of the H. & H. pot charges. The oil-fired Godfreys consume about 0.2 bbl. per ton roasted, and about 0.09 ton of coal per ton of charge is used in the coal-fired furnace. The Godfrey furnace has a movable hearth with stationary rabbles and firebox. The product from the Godfrey furnaces is removed in tram cars, which are raised by a lift to the charge floor of the H. & H. building.

There are eight Huntington-Heberlein pots, in which two 6-ton charges are made per 24 hr., approximately 100 tons per day being obtained from this plant. Blast is supplied at 8-oz. pressure by a No. 7½ Baker rotary blower. The sintered charge is dumped from the pots on a bumping block made from an old roll shell. It is further broken by hand, and the product usually contains less than 10% of fines—probably not over 5% that would pass ½-in. ring. The Godfrey roasters reduce the sulphur content to about 11% and with this elimination treat from 27 to 30 tons per day. The sulphur remaining in the H. & H. sinter during a recent month was 5.66%, when the average output per day was 11.4 tons per pot.

Blast-Furnace Ores Bedded

The usual practice of bedding most of the ore is followed in both the lead and copper blast-furnace departments. Some ores of uniform character and of which a large quantity is received, are often placed in separate bins and added directly to the charge. The lead charges are collected in wheelbarrows and the different constituents, after weighing, are dumped into large gable-bottom larry cars of the type now customary in most large lead-smelting plants. These cars have a capacity of 180 cu.ft. and are raised to the feed floor of the blast-furnace building by two hydraulic lifts operating at 190-lb. pressure and designed to raise the larry car and a 5-ton load. The larry cars operate by the third-rail system.

The charges for the two copper blast furnaces are collected and taken to the feed floor in a similar manner. The gases from the copper furnaces are drawn into the flue, at a point below the charging floor, in the same way as the lead-furnace gases are removed. Only one man is required on the charge floor for the lead department, but owing to the fact that a lower column is carried in the copper furnaces, one man for each furnace is employed on an intermediate floor to feed the charge as needed. When the larry car discharges the copper charges, they fall into hoppers that feed into the stack, through several gates along the furnace sides, at a suitable height on the intermediate feed floor. This arrangement is an ingenious adaptation to suit prevailing conditions and works well, enabling the feeders to dispose of the charges in the places where needed.

Lead Blast Furnaces

There are eight lead blast furnaces, 46x162 in., with a 23-ft. brick shaft above the water jackets. Double-tier steel-plate jackets are used, the lower jackets having a height of 46 in. and the upper jackets 24 in. The lower jackets have a bosh of 18 in. in a vertical height of 2 ft. 6 in. There are 16 tuyeres, 3½ in. in diameter, placed 13 in. from the bottom of the jackets. The hearth area at the tuyeres is 47.25 sq.ft. Four-ton charges are usually used and from 150 to 200 tons of charge are smelted per day. In a recent month, the coke on charge amounted to 14.6%; the sulphur on charge 3.2%; and the lead, 14%. The blast pressure on the lead furnaces carried at 45 oz. The flue dust seldom averages over ½% of the weight of the charge and passes into a flue, 10x17½ ft., leading to the main stack about 700 ft. distant.

Briquetting of flue dust is done in a Chisholm, Boyd & White press, making briquettes of circular section, containing about 10% of lime. In this operation the dry, slacked lime is mixed with the flue dust. The latter is brought to the briquetting plant in wheelbarrows, on which the proper amount of lime is added, the wheelbarrow load then being dumped on a floor in front of a bucket elevator. After a preliminary mixing by shoveling, it is fed into the elevator boot delivering to a trommel, which permits material of suitable size to go to the briquetting press where a sufficient amount of water is added. The briquettes so made seem to be fairly hard and stand handling well.

The slag and matte from the lead furnaces are tapped directly into small slag pots and wheeled to one of two Rhodes separators, which give the matte and slag a better chance to separate than is offered in the ordinary furnace settler. These separator furnaces were developed by R. D. Rhodes, at Leadville, Colo.; they are of the reverberatory type, 14x25 ft., with water-cooled bottom and sides, though above the bottom plate there is an inverted arch of silica brick. Only one of the separators is regularly used, the other being maintained as a spare. The separator furnace is oil-fired, consuming from 15 to 20 bbl. of oil per day. The slag is tapped at intervals into a train of pot cars and hauled to the dump by 15- and 20-ton coal-burning locomotives. Matte is tapped from the separator and granulated by a double stream of water under a pressure of 60 to 100 lb. It falls into granulating boxes having a sloping side, up which it is raked out, loaded and delivered to the Godfrey roasters by contract. The slag from the separator for a recent month averaged: SiO_2, 31.2%; FeO, 30.1; MnO, 4; CaO, 22.9; Al_2O_3, 5.1; ZnO, 2.8; Cu, 0.23; Ag, 0.6 oz.; Pb, wet, 0.83%; Pb, fire, 0.51. Slags direct from the lead furnaces usually run about Ag, 0.7 oz.; Pb, wet, 1.10% Pb, fire, 0.85%. The first matte averages Ag, 125.8 oz.; Pb, 12.9%; Cu, 19.6; Fe, 31.5. Fumes from the tapping of the lead furnaces are carried off by 30-in. ventilating pipes in connection with movable hoods, under natural draft; the arrangement is highly satisfactory and keeps the tapping floor free from fumes.

The slag and matte from the furnace concentrating lead matte is tapped intermittently into a rectangular cast-iron settler, 4x8x3 ft. deep. The matte is separated in the settler by a brick-faced cast-iron water jacket, below which is an 8-in. opening for the matte to flow to the matte compartment. When the furnace is being tapped, the matte overflows continuously and as the concentrating charge runs faster than the regular lead charge, an extra man is employed to remove the matte pots as they are filled. Thus four men are employed in pot pulling instead of three, as on the regular lead furnaces. Besides the pot pullers, there are a furnaceman, a tapper and sometimes a helper.

This plant obtains good results from its matte concentration runs, the copper-to-lead ratio rarely failing to exceed 4:1. The matte on a recent monthly run assayed: Cu, 47.9%; Pb, 9.9; Fe, 20.4; Ag, 129.6 oz. The slag from this run had the following composition: SiO_2, 31.3%; FeO, 29.4; MnO, 2.6; CaO, 22.5; Al_2O_3, 6.7; ZnO, 2.4; Pb, wet, 0.75; Pb, fire, 0.39%; Ag, 0.42 oz. The concentrated copper-lead matte is resmelted in the copper blast furnaces, the lead being wasted, this being more economical than to attempt its saving.

The bullion in the lead-furnace crucibles is tapped from the customary lead wells into small pots from which, after skimming, it is ladled into molds holding 105 lb. The skimmings and any drossy bars are taken to the sweater furnace where the lead is melted out and recast into bars, the dross being returned to the ore charge.

With the building of lead-smelting works in northern Mexico and the generally disturbed condition of the country, much of the former ore supply for the El Paso works has been eliminated and the lead-smelting department is now operated on a much curtailed basis. Lead smelting at El Paso, however, was for many years an important operation and the plant has been noteworthy for several features of its practice, such as the use of Rhodes separators for cleaning blast-furnace slags, and the success attained in the concentration of copper-lead matte. Also, at this plant, a record so far as I know was made in the banking of a silver-lead blast furnace. After the labor strike in 1913, a furnace that had been banked 36 days was started and in a short time was in normal running condition. Another furnace that remained banked 10 days longer, was started and slag obtained, but the furnace did not recover so well and it was considered inadvisable to run the furnace in bad condition for the mere sake of a record. The best previous record at this plant of a banked furnace successfully restarted, was 28 days.

(*To be Continued*)

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Lead and Radio-Lead

When radium, of atomic weight of 226, undergoes its successive breakdowns, it gives for the fifth disintegration product a radio-lead of atomic weight 206 (226 — 5 atoms of helium @ 4 = 206). When the thorium family undergoes disintegration a radio-lead results of atomic weight 206 (*Metaux et Alliages*, June 20, 1914). It then appears that lead, of atomic weight 207, is a mixture of two distinct radio-leads of unequal atomic weights, but identical chemical and electrochemical properties.

Relation of Feed to Tube Mill Efficiency

By R. T. Mishler*

SYNOPSIS—Tests with short (14-ft.) tube-mills indicate that grinding efficiency increases with the tonnage; but that above 200 tons (dry weight) of sands per day the gain in efficiency is small, not offsetting the greatly increased cost of elevation and classification. By raising the feed per mill from 35 tons to 200 tons daily, the cost of tube-milling has been reduced more than one-half.

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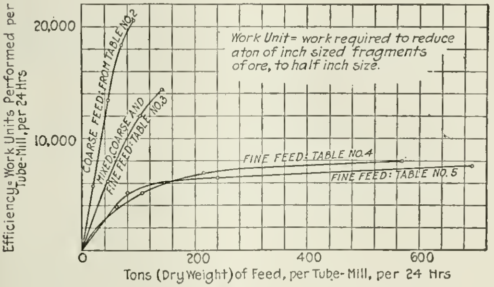
Much has been written regarding the effect of dilution on the grinding efficiency of tube-mills, it being well established by varied and ample tests that 40% moisture is usually the best dilution at which to feed the pulp. The effect of varying the tonnage of feed has not received as much attention, and a few additional notes on this phase of the subject may not be unwelcome to those interested in tube-milling. This article deals with an effort to ascertain the tonnage of feed giving maximum efficiency in short tube-mills at the Lucky Tiger cyanide plant in Sonora, Mexico.



Relation of Tube-Mill Feed to Efficiency

The fine-grinding equipment of the Lucky Tiger plant consists of five 5x14-ft. tube-mills. They are lined with manganese-steel liners, of a modified El Oro type, which reduce the effective dimensions to 4½x13½ ft. The feed ends of the tube-mills are equipped with spiral sand feeders, and the discharge ends with worm pebble feeders. Each mill is driven, through gearing, by a separate 60-hp., slip-ring, induction motor. There are ammeter and watt-hour meter connections to each motor, making it possible to ascertain the power used by any mill. The speed of the mills is constant at 27 r.p.m.

Danish flint pebbles of the best grade are used, the pebble load being kept fairly constant at seven tons. This is accomplished by regulating the feed of pebbles by the readings of the ammeter, an amperage of 58 being maintained. With a voltage of 450, and a power factor of 0.75, this indicates a horsepower of 45.5 per mill.

The tube-mills receive from the concentrating plant and from old dumps, an average of 150 dry tons per day of clean, coarse sands. After passing through the tube-mills, these sands are raised in bucket elevators, passed over Wilfley tables, and then distributed to four 16-ft. drag classifiers. The sands discharge from these machines is returned to the tube-mills, and the slimed overflow is sent to agitation tanks, thus being removed from the tube-mill circuit. An average of 80% of the overflow passes a 200-mesh screen, the remaining 15% being finer than 150 mesh.

The experiments for determining the proper tonnage of feed to the tube-mills were made on single mills running under actual working conditions. Special efforts were made to keep the character and dilution of feed constant throughout each series of experiments. Before beginning any test, the mills were run for 90 min. on the same tonnage of feed to be used in the test. Sampling of feed and discharge was then commenced, the sampling continuing 90 min. At the end of this period the volume of feed was changed and the mill again allowed to run 90 min. before sampling was commenced on the following test. Four times during each sampling period, the feed was diverted into a suitable vessel and the flow of wet pulp measured. Knowing the dilution and the specific gravity of the pulp, it was then possible to calculate the tonnage per hour of dry feed. The samples of feed and discharge were retained for moisture and screen analysis, and, together with the tonnage, form the basis for the comparison of efficiency.

TABLE I. EXAMPLE OF CALCULATION OF WORK DONE BY TUBE MILLS.

Tonnage, 45 tons (dry wt.) per 24 housr.

			Feed		Discharge	
Mesh	Average size of particle Inches	R = Reciprocal of size	% of various sizes	$R \frac{\%}{100} =$ Work Units	% of Various Units	$R \frac{\%}{100} =$ Work Units
+20	0.0550	18	0.8	0.1	....	...
+40	0.0245	41	3.6	1.5	...	....
+60	0.01185	84	18.8	15.8	0.4	0.3
+80	0.00775	129	14.2	18.3	2.0	2.6
+100	0.00615	163	15.0	24.4	6.0	9.8
+150	0.00458	218	14.8	32.3	10.0	21.8
+200	0.00330	303	11.2	34.0	11.6	35.1
—200	0.00250	400	21.6	86.4	70.0	280.0
Work units per ton, in feed				212.8		
Work units per ton in discharge				319.6		
Diff. = work done per ton of feed				136.8		
Tons × diff. = work done per day				6156		

Note:—Work-unit = work required to grind a ton of inch-size fragments of ore, to half-inch size.

Four series of tests were run. Table 2 gives the results from the first series, consisting of four tests made on coarse concentrator tailing, with no admixture of return feed. Table 3 shows the results of four tests run on

TABLE II. EFFECT OF VARYING TONNAGE IN TUBE MILLS.

(Coarse Feed)

Test No.	1		2		3		4	
Tons dry sands per day	22		47		70		85	
Moisture, L:S ratio	1.1:1		0.94:1		0.84:1		0.90:1	
	Feed	Disch	Feed	Disch	Feed	Disch	Feed	Disch
Per cent on 20 mesh	11.2	0.3	21.6	0.2	18.4		22.4	
Per cent on 40 mesh	28.0	0.6	39.6	0.6	45.2	0.4	39.4	0.6
Per cent on 60 mesh	25.6	1.4	23.0	0.8	19.6	4.0	20.6	5.2
Per cent on 80 mesh	13.4	0.4	3.8	2.2	5.0	4.2	4.2	6.2
Per cent on 100 mesh	6.0	1.2	2.4	2.9	2.8	5.4	2.6	6.8
Per cent on 150 mesh	4.6	2.4	2.2	5.4	1.8	8.4	1.2	9.6
Per cent on 200 mesh	3.6	2.6	1.0	4.9	1.2	6.2	0.8	4.8
Per cent through 200 mesh	7.6	91.1	6.4	83.0	6.0	71.4	8.8	66.8
Work units in feed		113		82		81		87
Work units in discharge		381		367		341		326
Diff. = work done per ton		268		285		260		239
Tons × diff. = work done per day		5896		13,395		18,200		20,315

Power constant at 47 h.p.

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dump sands, mixed with a small amount of return feed. Tables 4 and 5 give the results on tests run on a mixture of return feed with a relatively small amount of dump sand.

TABLE III. EFFECT OF VARYING TONNAGE IN TUBE MILLS

(Mixed Coarse and Fine Feed)

Test No.	1		2		3	
Tons dry sands per day	45		103		145	
L:S	0.44:1		0.46:1		0.57:1	
	Feed	Disch.	Feed	Disch.	Feed	Disch.
Per cent on 20 mesh...	0.8		1.0		1.0	
Per cent on 40 mesh..	3.6		8.4		5.4	
Per cent on 60 mesh..	18.8	0.4	18.4	2.2	17.4	4.4
Per cent on 80 mesh.	14.2	2.0	13.6	5.2	18.0	8.2
Per cent on 100 mesh	15.0	6.0	13.8	9.8	17.0	12.2
Per cent on 150 mesh...	14.8	10.0	14.2	13.0	16.0	16.4
Per cent on 200 mesh...	11.2	11.6	10.2	12.0	10.2	13.0
Per cent through 200 mesh.	21.6	70.0	20.4	57.8	15.0	45.8
Work units in feed.	213		203		194	
Work units in discharge	350		320		293	
Diff. = work done per ton.	137		117		99	
Tons × diff. = work done per day......	6,165		12,051		14,355	

Power constant at 47 h.p.

TABLE IV. EFFECT OF VARYING TONNAGE IN TUBE MILLS

(Fine Feed)

Test No.	1		2		3	
Tons dry feed per day	109		217		570	
L:S	0.47:1		0.49:1		0.53:1	
	Feed	Disch.	Feed	Disch.	Feed	Disch.
Per cent on 20 mesh...	0.52	.	0.76		0.42	.
Per cent on 30 mesh...	0.08	0.08	2.72	0.28	1.76	0.60
Per cent on 40 mesh...	4.52	0.44	3.40	1.04	3.60	2.56
Per cent on 60 mesh..	6.48	2.96	7.24	4.64	10.92	10.56
Per cent on 80 mesh...	9.44	5.44	7.76	6.68	13.08	11.08
Per cent on 120 mesh...	27.36	19.20	25.40	22.60	29.60	30.52
Per cent on 150 mesh...	30.60	32.96	31.20	34.28	24.86	25.20
Per cent on 200 mesh..	12.44	18.88	13.28	13.92	9.28	9.20
Per cent through 200 mesh.	8.56	20.04	8.24	16.56	6.48	10.28
Work units in feed.	218		216		198	
Work units in discharge.	264		248		212	
Diff. = work done per ton.	46		32		14	
Tons × diff. = work done per day...	5014		6944		7980	

Power constant at 45.5 h.p.

TABLE V. EFFECT OF VARYING TONNAGE IN TUBE MILLS.

(Fine Feed)

Test No.	1		2		3		4	
Tons dry feed per day	67		80		239		693	
Moisture, L:S ratio	0.45:1		0.44:1		0.46:1		0.55:1	
	Feed	Disch.	Feed	Disch.	Feed	Disch.	Feed	Disch.
Per cent on 20 mesh...	0.20	.....	0.32		0.51	.....	0.99	0.19
Per cent on 30 mesh.	0.76	..	0.96		1.08	0.40	2.23	1.14
Per cent on 40 mesh.	1.72		2.12	0.40	2.21	1.00	4.52	3.42
Per cent on 60 mesh.	4.40	1.10	7.20	1.80	6.43	4.65	11.48	10.81
Per cent on 80 mesh.	8.56	2.85	12.46	4.25	12.78	9.05	12.78	12.96
Per cent on 120 mesh.	25.76	14.75	28.40	19.00	30.71	27.50	27.98	28.50
Per cent on 150 mesh.	30.20	25.78	27.18	29.30	24.98	27.05	24.92	24.63
Per cent on 200 mesh.	17.90	25.49	12.82	15.10	12.62	14.35	9.59	10.26
Per cent through 200 mesh	10.50	30.03	8.54	30.15	8.68	16.00	5.51	8.09
Work units in feed	234		216		214		194	
Work units in discharge..	293		281		241		205	
Diff. = work done per ton	59		65		27		11	
Tons × diff. = work done per day...	3952		5200		6543		7623	

Power constant at 44.8 h.p.

In order to reduce the screen analyses and tonnages to terms of grinding work, a modification of the method suggested by Algernon Del Mar[1] has been employed. Table 1 furnishes an example of this system. The work units in Tables 2, 3, 4 and 5 were all calculated in the same manner as in Table 1, though the calculations have been omitted on account of space; only the final results being given. The work units in feed and discharge are obtained by multiplying the reciprocal of the average size (in inches) of the sand grains corresponding to each mesh, by the proportion (not the percentage) of the sample remaining on each mesh. The sum of all these products is the work units in one ton of the pulp sampled. The difference between the work units in the discharge and the work units in the feed gives the work units performed upon one ton of the pulp in passing through the mill; while this difference multiplied by the tonnage per day gives the total work units performed by the mill in one day. The advantage of this system is that it furnishes a perfectly definite unit of grinding work: i.e., the work required to reduce a ton of inch-sized fragments of ore to half-inch size. In Table 1, the work units per ton in the feed are shown to be 212.8. This means that in order to reduce the feed to the size shown by the screen analysis, it has required 212.8 times the amount of work which would be required to reduce a ton of inch-sized fragments of the same ore to half-inch size. This system has the same disadvantage as all other systems for determining the amount of grinding work done from screen analyses: it disregards the fact that different sands vary in hardness, and it is therefore accurate for comparing grinding efficiencies only when the material ground is of the same hardness in all cases compared.

That there are pronounced variations in the hardness of sands, even in the same plant, is shown by comparing Table 2 with Tables 4 and 5. At a given tonnage of feed to the mill, five times as much work is indicated in Table 2 as in Tables 4 and 5. Still the horsepower required is practically the same in each case. The explanation of this apparent anomaly is that in the first case the feed consists of comparatively soft fragments of the original ore, while in the last two cases the feed is composed of the harder fragments of the original ore and of particles from the flint pebbles, which were too hard to be pulverized in the first passage through the mill.

The principal lessons, however, to be gleaned from the tables and diagram are, first, that the power consumption is independent of the tonnage of sands fed to the mills, and second, that the proportion of pulverized sands in the discharge is highest for lower tonnages, and decreases as the tonnage is increased. At low tonnages (20 tons per day), coarse sands are slimed in a single passage through the mill—the discharge containing more than 90% of minus 200-mesh product. On the other hand, when tonnages in excess of 200 tons per day are fed to the mill, the discharge is only slightly finer than the feed. The third point is that when we consider tonnage, multiplying the tons passed through the mills by the grinding work done per ton, we see that without a single exception the total grinding work, or "efficiency," increases as the tonnage of feed is increased.

A large feed has the same advantage over a small feed that a short tube-mill has over a long one; i.e., the pulp passes oftener through the classifiers, the pulverized sands being promptly removed from the circuit, and the work of the tube-mill being expended more upon grinding coarse sands than upon grinding sands already sufficiently fine.

Extremely large tonnages, however, have two important drawbacks: first, the gain in efficiency is small; second, the proportion of coarse sands in the discharge is greatly increased. The small gain in efficiency for large tonnages is best shown by reference to the diagram: above a feed of 200 tons of dry sands per day, the curves flatten, indicating practically no gain in efficiency. The increase of coarse sands in the discharge is shown in Tables 2, 3, 4 and 5, and is also indicated in Table 6. This last table shows the increase of return feed when the number of tube-mills in operation are reduced. As the tonnage is crowded into fewer mills, the amount of return feed increases out of all proportion to the tonnage fed to each mill. This excess of return feed must be elevated, concentrated, classified and returned to the tube-mills. The extra cost of performing this work, when the tonnage of feed per mill exceeds 200 tons per day, is easily in excess of the slight reduction in cost due to increased grinding efficiency. Hence an average daily feed of 200 tons of dry sands per mill has been selected as the tonnage giving best results. This 200-ton feed includes 50 tons per day of concentrator tailings ("initial feed") and 150 tons of sands returned from the classifiers after having passed one or more times through the tube-mills.

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[1] "Eng. and Min. Journal," Dec. 14, 1912.

TABLE VI. RELATION OF FEED PER MILL TO TONNAGE OF RETURN FEED

Tube mills Operating	Tons dry sands per day Feed per mill	Total feed to all mills	Total return feed
5	40	200	50
4	80	320	170
3	200	600	450
2	600	1200	1050

Note: In each case the total initial feed of concentrator tailings, passing to the tube-mills, was 150 dry toos per 24 hours.

When operations were started at the Lucky Tiger plant, all five mills were run as much of the time as possible. It was soon noticed, however, that the mills grinding the return sands were receiving very little feed, and one of these mills was stopped. Later, three mills were forced to do all the grinding when the feed was light, and a fourth mill run during heavy feeds. Recently (after completing the above tests), a greatly increased initial feed was crowded into three mills, the fourth mill being run only during exceptionally heavy feeds. By this means the total daily feed (initial and return feed) has been increased to 200 tons per mill, which is the tonnage shown by the tests to give maximum efficiency. This crowding of the feed through the tube-mills has resulted in practically doubling the capacity per mill. When five mills were being run, the average daily tonnage of initial sand from the concentrating plant was barely 26 tons per tube-mill. Now, with three mills in operation, the average tonnage of initial sands per mill is 50 tons per day. This increase in capacity has occasioned no decrease in the grinding work done, the screen analyses of the final overflow from the classifiers still averaging 80% through 200 mesh, as it did during the time five mills were used.

TABLE VII. EFFECT UPON PEBBLE CONSUMPTION AND COST PER TON, OF INCREASING FEED TO TUBE MILLS

(From records at Lucky Tiger Mill)

	Average Tonnage of Initial Sands Feed, per Tube Mill, per 24 Hr.	Approximate Tonnage of Combined Initial and Return Feed, per Tube Mill, per 24 Hr.	Lb. of Quarry Rock per Ton of Initial Feed	Lb. of Imported Pebbles per Ton of Initial Feed	Cost U. S. Currency per Ton of Initial Sands Feed, of Tube Milling, Elevating and Classifying
First 3 months of operation (data not complete).					
Next 6 months of operation.	26 1	35	10 0	17 9	$1.88
Next 9 months of operation.	40.3	80	nooe	15 8	1.01
Next 12 mooths of operation.	42.0	85	oooe	15 3	0.94
Last 3 months of operation.	50 0	200	none	8 2	0.68

The power required to grind a ton of sands has decreased in inverse ratio as the capacity of the mills has increased. It now requires 22 hp.-hr. to grind a ton of concentrator tailings to such a fineness that 80% passes a 200-mesh screen. This is half what was required when the mills were run on a light feed.

The decrease in pebble consumption has been even more noticeable. With a feed of 26 tons of initial sands per day, it was necessary to charge 2860 lb. of quarry rock and 467 lb. of imported pebbles per day into each mill. This is at the rate of 110 lb. of quarry rock and 17.9 lb. of imported pebbles per ton of sands ground. When the feed per mill was incerased to 41 tons of initial sands per day (80 tons per day of combined initial and return feed), the imported pebbles charged to each mill amounted to 640 lb. per day, or 15.5 lb. per ton of initial coarse sands. No quarry rock was used. When the tonnage was further increased to 50 tons of initial sands, or 200 tons of combined initial and return sands per day, the daily consumption of imported pebbles dropped to 410 lb. for each mill, or 8.2 lb. per ton of initial sands fed.

The cost of tube-milling has been reduced in proportion to the reduction in power and pebbles consumption. With a light feed, the cost of grinding, elevating and classifying, per ton of initial sands fed, was $1.88 U. S. currency. With a medium feed, the cost per ton was reduced to 97c. Now, with a heavy feed, the cost has dropped to 68c. per ton.

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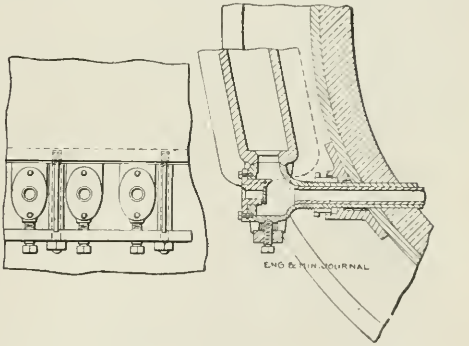
Bernhard Converter Tuyere

Richard Bernhard has been granted a patent (U. S. Pat. 1,097,907, assigned to the Power & Mining Machinery Co.) for a converter construction having a wind box suitably apertured to receive the inlet end of tuyeres that may be quickly disconnected. A ball-and-socket engagement is provided between the wind box and the tuyeres, the latter being pressed against the wind box so as to insure a tight joint by means of setscrews that engage the lower side of the tuyere. Exterior leaks around the tuyere pipes are prevented by packing, which may be pressed as tightly as desired by a brass gland threaded to fit the tuyere pipe.



Bernhard Converter Tuyere

The construction will be readily understood from the accompanying drawing. By simply loosening the setscrew which holds the tuyere in engagement with the wind box, the individual tuyeres can be quickly disengaged. The rounded end of the tuyere finds its seat automatically, as the setscrew is turned up, and by reason of the ball-and-socket connection between the wind box and the tuyeres, the accurate alignment of the latter with respect to the wind box is unnecessary, and a material saving is attained in the machining and assembling of these parts. It will be noticed that the engagement of the tuyere is accomplished with a single setscrew instead of two bolts, as in the case of older forms of bolted-flange connections.

The Leyner Machine for Drift Rounds

By Charles A. Hirschberg*

SYNOPSIS—Advantages of the Leyner type of hammer machine drill. Can drill upper holes and can get closer to the rock sides than can the piston drill. The typical "Leyner cut" and other rounds for which that machine is particularly adapted. Examples from South Africa, Cripple Creek, Michigan copper and iron regions, Roosevelt, Lucania and Laramie-Poudre tunnels.

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Economical mining and tunneling calls for the breaking of the most ground with the least footage of holes, inasmuch as this means a saving of powder, time, labor, materials and power. To accomplish this, a thorough knowledge is necessary of the character of the ground to be drilled and broken, its hardness and stratification, whether damp or dry and whether likely to cave or not. Drill steel properly gaged and bitted must be provided, and drilling machines that are economical of power, easily maintained, quickly handled and capable of rapid drilling. Some types of machine drills, while having a large capacity for work when no limitations are imposed as to location, size and depth of holes, cannot always be utilized for drilling the most effective round of holes, due to various features of design to be enlarged upon later.

These features cannot be categorized with faulty design, in the true sense, but rather should be considered as limitations that render an otherwise efficient machine unsuitable for certain rounds of holes calling for drilling close to the top or side walls and at a slight pitch; such machines require ample head and wall room for operation; consequently they are slow in operation and hard to handle.

These drills are of the piston or reciprocating type, as distinguished from the hammer drill. Although all hard-rock drills are reciprocating machines, strictly speaking, the term is best applied to that type in which the steel is rigidly fastened to the front end of the piston and reciprocates back and forth with it, while the term "hammer" is applied to that type in which the steel is inserted loosely in the front end of the machine and is struck by the piston.

The hammer drill divides itself into several styles as distinguished by the method of application to the rock. First, the mounted type, of which the Leyner is an example; second, the self-supporting and automatic air-feed type, commonly called a stoper; and third, the held-in-the-hand plugger or sinker type.

It is the purpose of this paper to deal more particularly with the mounted-hammer type in describing drilling rounds for different characters of ground, and it will be brought out that reciprocating drills are restricted in their application to certain drilling rounds, and hammer drills, on the contrary, are readily applicable to the drilling of all kinds of rounds. It is between these two types alone that a true comparison can be made, inasmuch as both are applied to similar work, such as drifting or tunneling, whereas the stoper and the plugger can rarely come into competition with the mounted machines.

The Leyner Cut

Fig. 1 shows a round of holes, to which the term "Leyner cut" has been applied, used in a drift or tunnel where the rock is extremely hard. It has been used with variations in the mines of Arizona, Colorado and Michigan. It involves a pyramid or center cut including a great many upper or dry holes.

The advantages of the Leyner cut are: (1) The holes are drilled with as few changes of machines and set-ups as possible; (2) a pyramid-shaped wedge of rock is first pulled from the center, after which the rest of the round breaks readily. While there is no hard-and-fast method of putting in such a round of holes, the principle is the same in all cases and involves the many upper and dry holes shown in the illustration.

It is particularly suitable for solid formations containing no slips or seams to break to. It has been used with marked success in the hard rock and ore of northern Michigan, and in at least one case has resulted in drifting at nearly four times the speed formerly made with piston machines. The object of the cut and the system of putting in the holes have been found capable of easy explanation to the foreign miners, so that in a short time they were taught to use this round successfully and almost automatically.

Referring to the illustration, *C* designates the position of the crank of the drill in each case. *A* is a crossbar in the first position. From the top of the bar the four back holes, Nos. 9, 10, 11 and 12, are drilled. The machine is then "dumped" or tipped forward until the crank can just turn and clear the back or top of the drift, is moved out a little on the bar and the top center-cut holes 1 and 2 are drilled. If the bar is set up correctly in a drift of the size shown, the machine can be dumped enough to reach the center of the drift heading with the bottom of the hole. The machine is then turned under the bar and the side holes 7 and 8 and the cut holes 5 and 6 are drilled.

The crossbar is next dropped to position *B*, the machine is set up on top and the side holes 13 and 14 drilled. Finally, the machines are turned under the bar, tipped up in front so that the crank just clears the bottom of the drift and holes 3 and 4 are drilled so as about to meet Nos. 1 and 2 in the center of the heading. The four lifters, 15, 16, 17 and 18 are drilled last, except that, if there is time enough, relievers something like *X* and *Y* may be put in to make sure. When sufficiently strong explosive is used, however, the round will break without these last.

Some of the holes could be placed to better advantage, perhaps, if there were time for another "set-up," or if a column could be used, but this particular sketch applies to a place where it was necessary to drill 100 ft. with two machines in extremely hard steel-ore and jasper and there was no time to waste.

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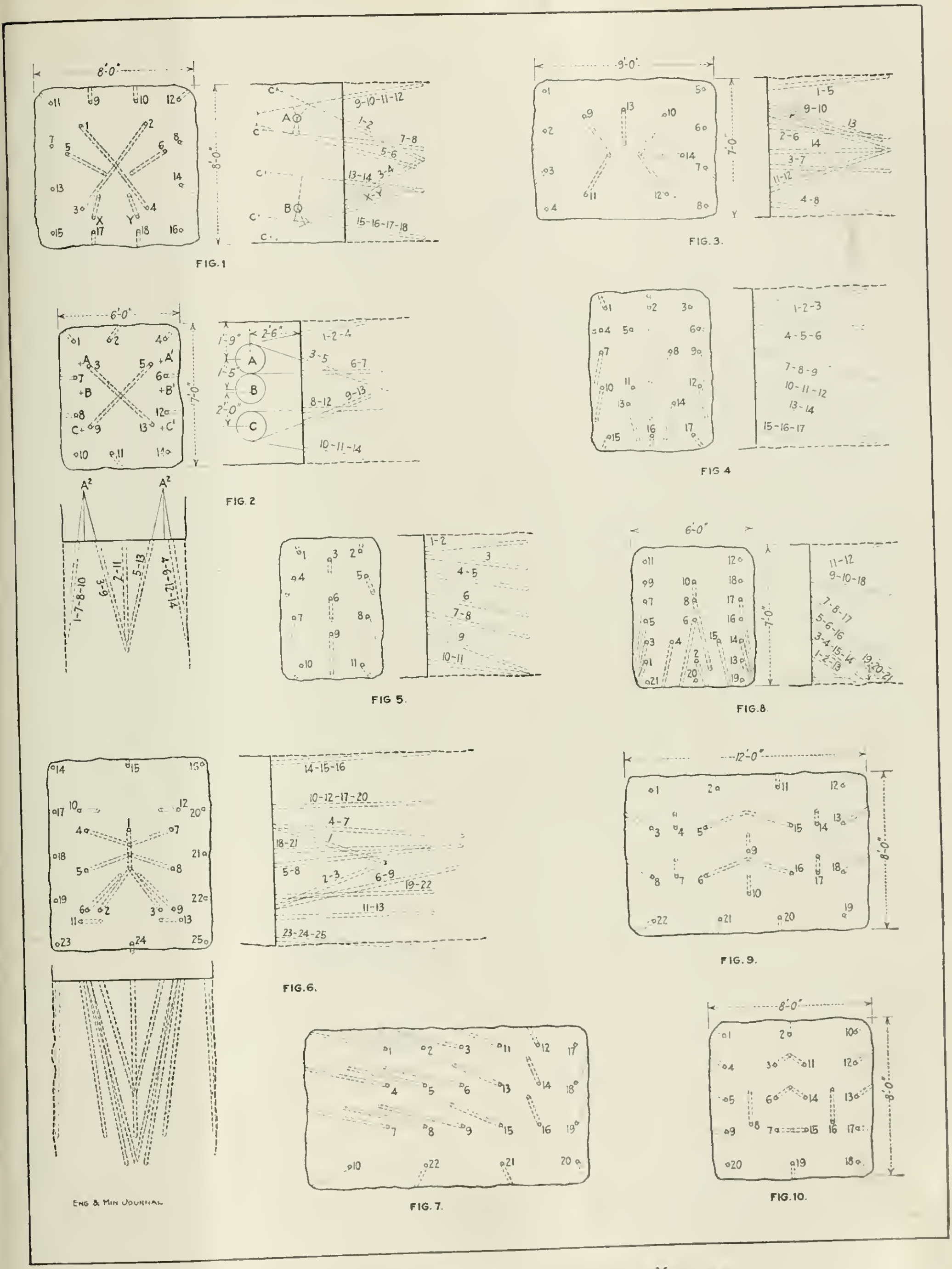
*Ingersoll-Rand Co., 11 Broadway, New York.



FIGS. 1-10. VARIOUS LAYOUTS FOR THE LEYNER MACHINE

The full round shown in the illustration is designed for hard rock, but a modified round of this kind could be used almost anywhere. In softer and better breaking ground, cut holes 5 and 6, relievers X and Y, one lifter and one back hole can be left out, but the four cut-holes 1, 2, 3 and 4 are nearly always used and are pitched up or down, and in, to meet about at the center.

There are two reasons why this round is practically impossible with piston drills. First, they cannot drill it fast enough, particularly on account of the dry holes; and second, the size of the piston drill is too great to permit operating it in the positions necessary to give the holes the proper pitch and angle.

Fig. 2 shows another pyramid cut as used in some of the mines of Mexico for driving small drifts in hard rock. This round is drilled from an arm mounted on a column, A and C, A^1 and C^1 representing the vertical positions of the arm, and A^2 the horizontal position of the arm and drill on both sides of the column; the column is placed midway between the walls of the drift. Holes 4 and 5 are first drilled from the top of the arm, on the right-hand set-up. The drill is then swung under the arm and hole 6 put in. Next the arm is swung to the left-hand side of the column and hole 7 drilled. The machine is turned to the top of the arm and holes 1, 2 and 3 are drilled. The arm and drill are then dropped to C and hole 8 drilled; the machine is swung under and 9, 10 and 11 put in. Holes 13 and 14 are drilled by swinging the arm and drill to the right of the column with the machine underneath. The machine is turned on top of the arm and hole, 12 drilled, which completes the round.

For extremely hard ground extra holes may be drilled with the arm and machine at B, but in all moderately hard rock this has not been found necessary.

A SOUTH AFRICAN ROUND

Fig. 3 shows a round of holes employed in the mines of South Africa in a drift 9 ft. wide by 7 ft. high. It usually comprises 12 holes. Hole No. 13 is sometimes drilled when the rock is not breaking properly, while both 13 and 14 are used when extremely hard rock is encountered.

The distance between holes 1, 2, 3 and 4 in the vertical line is approximately 2 ft., likewise the distance between holes Nos. 5, 6, 7 and 8. Holes 9, 10, 11 and 12, or, in other words, the cut holes, are put in approximately 4 ft. apart at the face of the rock, but holes 9 and 10 slant downward and inward and meet holes 11 and 12, which slant upward and inward. The distance between the junction of holes 9 and 11, and 10 and 12, at the bottom, is approximately 18 in. Hole 13, when used, is put in $1\frac{1}{2}$ ft. below the top of the drift and slanting downward until it comes to about a central point 18 in. from the junction of holes 9 and 11 and from that of 10 and 12.

Hole No. 14, when used, is put in at the face, about 2 ft. 6 in. from the center of the cut, and slants in as shown, to a distance of about 18 in. from the junction of holes 10 and 12. Usually, however, holes Nos. 13 and 14 are not used. The round of 12 holes generally breaks between $5\frac{1}{2}$ and 6 ft. of ground. The machine is mounted on a column and arm.

CRIPPLE CREEK ROUNDS

Fig. 4 shows a hammer-drill round used in the Cripple Creek district of Colorado. It consists of 17 holes and is used only in drifts 8 ft. high by 6 ft. wide or larger, where the rock is an exceedingly hard phonolite. It will be noted that with the exception of the back holes 1, 2 and 3, all the holes point downward. This round will break between 5 and 6 ft. of ground.

Fig. 5 shows the round of Fig. 4, modified for a smaller drift, one 7 ft. high and 5 ft. wide. It consists of but 11 holes and is used for drilling in brecciated formation and in vein matter.

The ordinary double-screw column with one set-up is used for both rounds. Of course, the arm is shifted from side to side and lowered as occasion requires, the holes being drilled from both above and below the arm.

These rounds are varied slightly with the nature of the ground; fewer holes are sometimes drilled, but never more.

THE LUCANIA TUNNEL

Fig. 6 illustrates a round used several years ago in driving the Lucania tunnel at Idaho Springs, Colo., put in with Leyner machines. This tunnel is 9 ft. 6 in. high by 8 ft. wide, and the advance averaged between 7 ft. 6 in. and 8 ft. per round.

The set-up involved the use of two columns, one carrying two arms and the other one arm, making a total of three machines. Short cut-holes 1, 2 and 3 were drilled 6 ft. deep; long cut-holes 4, 5, 6, 7, 8 and 9, 9 ft. 6 in. deep; relievers 10, 11, 12 and 13, 8 ft. deep; back holes 14, 15 and 16, 8 ft. deep; side holes 17, 18, 19, 20, 21 and 22, 8 ft. deep; lifters 23, 24 and 25, 8 ft. deep. Holes 6, 2, 3, 9, 11, 13, 23, 24 and 25 were drilled by the bottom machine; the rest were drilled by the two top machines. The round was shot in the order numbered, the two cuts being loaded and fired first. The balance of the round was then loaded and fired.

During 1911, when the tunnel was being driven on contract by Claypole & Hauser, the work was remarkable for rapid progress and low costs. During June of that year a careful record was kept of all expenditures, and it was found that the tunnel was being driven its entire cross-section for $15.93 per ft. This figure included everything but depreciation on the power plant, *i.e.*, compressor and blower, which was furnished by the Lucania Co.

The figures for the month of June follow:

JUNE PERFORMANCE AT THE LUCANIA TUNNEL

Nature of ground—hard pegmatite.
Total progress—232.5 ft.
Number of shifts—30 eight-hour shifts.
Advance per shift—7.75 ft.
Drill labor—3 runners and 2 helpers.
Outside labor—1 trammer, 1 trackman, 1 blacksmith and 1 day and 1 night engineer.
Mucking—contracted at $2.65 per linear ft.
Machines used—three water Leyner drills.
Depth of holes—6 ft., 8 ft. and 9½ ft.
Powder—1¼x8-in. du Pont 50%, Repauno, German ZL fuse and 6X du Pont caps
Outside equipment—Leyner 180-ft. belted air compressor; Leyner drill sharpener and Connersville blower.

COST DISTRIBUTION

Classification	Labor	Live Stock	Material and Supplies	Freight and Handling	Total	Per Ft
Superintending	$150 00				$150 00	$0 6151
Engineers	240 00				240 00	1 0322
Excavation[1]	480 00		$1056 61	$13 21	1579 82	6 7949
Day tramming[2]	105 00	$12 75			117 75	0.5061
Track	105 00		11 87	0 49	117 36	0 5048
Blacksmith	150 00		16 80	0 70	167 50	0 7204
Mucking					616 12	2 6499
Power					515 86	2 2187
Lighting			14 85	0 60	15 45	0 0661
Drill repairs					21 30	0.0916
Miscellaneous supplies			159 40	5 08	164 48	0.7074
Totals	$1230 00	$12 75	$1259 53	$50 08	$3705 64	$15 93+

[1] Includes all steel received to that date.
[2] For handling supplies, etc., owing to the mucking being done on subcontract.

COST RECAPITULATION

Classification	Total	Per Ft.
Labor	$1230 00	$5 2903
Live stock	12 75	0 0548
Material and supplies	1259 53	5 4137
Drill repairs	21 30	0 0916
Freight and handling	50 08	0 2137
Mucking	616 12	2 6499
Power	515 86	2 2187
Total	$3705.64	$15 93+

MICHIGAN COPPER ROUNDS

Fig. 7 exhibits a round employed in the Michigan copper country for what is known as drift stope, the width of which varies according to the width of the lode; the object is to take out all of the rock between the foot and hanging walls, the holes being pointed in some cases toward the foot and in others toward the hanging. The round as illustrated would do for an 8x14-ft. drift. The set-up consists of a double-screw column with arm.

Fig. 8 shows the method in use at the Quincy mine for small drifts; it works satisfactorily in this particular case owing to the fact that the driving is done entirely through trap, there being no copper to contend with. This round is not good, however, in ground that is heavily charged with copper, since great difficulty would be encountered in getting the cuttings out of the holes. In such cases the direction of the holes should be reversed so as to point upwards. The round is shown for a 6x7-ft. drift and is drilled from a column with arm.

The holes are drilled to the following depths: 1, 2 and 3, 2 ft. 6 in. deep; 3, 4, 14 and 15, 3 ft. 6 in. deep; 19, 20 and 21, 4 ft. deep; 5, 6 and 16, 4 ft. 6 in. deep; 9, 10, 11, 12 and 18, 5 ft. 8 in. deep; 7, 8 and 17, 6 ft. deep.

MICHIGAN IRON ROUNDS

In Fig. 9 is shown a round of holes for an 8x12-ft. drift as used in the Dober mine near Iron River. The ground was a gray slate. The holes were drilled from a column and arm and required two set-ups, owing to the wideness of the drift. All holes were drilled to a depth of 5 ft. with the exception of those numbered 5, 6, 15 and 16, which were drilled 5 ft. 6 in. deep.

Fig. 10 shows a round of holes employed in medium-hard iron ore at the Cary mine, Hurley, Wis. The size of the drift is 8x8 ft.

All holes with the exception of 18, 19 and 20 look up a little above the horizontal. Holes 1, 2, 4, 5, 9, 10, 12, 13 and 17 are drilled 5 ft. deep; 18, 19 and 20, 5 ft. 6 in. deep; 3, 6, 7, 11, 14 and 15, 5 ft. 8 in. deep; 8 and 16, 6 ft. 6 in. deep. This cut breaks well and lengthens the drift 4½ ft. with each round. The round is drilled with column and arm set-up.

THE ROOSEVELT TUNNEL

The Roosevelt drainage tunnel at Cripple Creek, Colo., is believed to have been about the hardest tunnel driving ever encountered. Three sets of contractors successively undertook the job and failed. The rock is that designated by the government geologists as Pike's Peak granite. In some parts the rock has a gneissic or schistose structure, but in the main it is characterized and made notorious by the lack of seams or joints. Thus, while the rock itself is hard, the lack of lines of fracture and planes of seaming is doubtless responsible for the poor rate of progress made by the first contractors. The tunnel was started 10 ft. high and 7 ft. wide, but in the final contract this was changed to 10 ft. wide by 6 ft. high over the rails, and a 3x6-ft. drainage ditch was added.

After the trial of several systems of placing the drill holes, that shown in Fig. 11 finally proved to be best adapted to the tough nature of the jointless rock. Water-Leyner drills were employed. In attacking the ordinary rock, all holes were drilled 8 ft. except the cuts and relief cuts, Nos. 1 to 8, inclusive, which were drilled to a 10-ft. depth. In tougher ground, these depths were each cut down 2 ft., and in addition to the 22 holes used on the ordinary rock and numbered in Fig. 11, the six extra holes X were put in.

At first, even with the use of from 300 to 350 lb. of 60% dynamite, great difficulty was experienced in properly blasting the eight cut-holes, sometimes several loadings being necessary to blow out the cut. Finally, however, after putting in the two extra cuts shown, even the toughest ground yielded. The system of placing the holes was evolved with a view not only to blasting the rock to the best advantage, but also to allow the greatest economy of time in drilling. These ends proved to be best effected by mounting the two Leyner drills on a single, horizontal crossbar, instead of on the more usual two independent vertical columns. In this way even the maximum number of 28 holes required but two set-ups of the bar. It will be readily understood that this way of placing the bar eliminated the necessity of mucking out to the bottom before starting drilling, as when vertical columns are used.

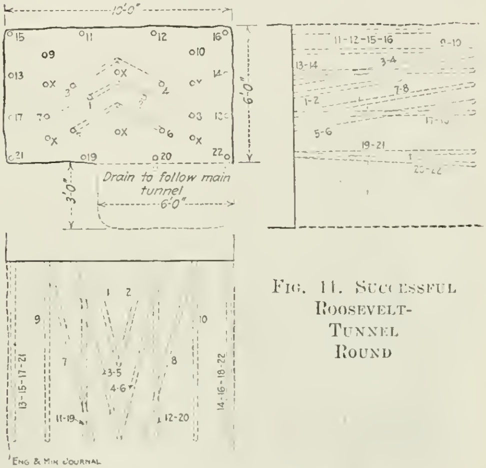


FIG. 11. SUCCESSFUL ROOSEVELT-TUNNEL ROUND

The grade line was carried about 18 in. below the top of the bore and about 8 to 12 in. below this was placed the bar. From this, the center and corner back holes were drilled, and then by revolving the drill around and beneath the supporting bar, all of the remaining holes except the center lifters and bottom corners were put in.

It will be understood that the difference in the level of the drill bit between its position on top of the bar, and below the bar, amounted to about 2 ft. By using proper judgment in placing the horizontal bar, therefore, the feat of putting in 18 holes from one set-up was easily accomplished. The bar was then shifted to its second position, usually about 18 to 24 in. above the floor, and the last four holes put in. In tough ground an extra center-cut hole *X* was also put in from this set-up.

The bits used at the start of a hole were 3 ft. in length, with a diameter of 2¾ in. Each succeeding steel was 2 ft. longer than the one before, the 11-ft. cut holes requiring six steels to a hole, while the others required five steels each. The diameter of the hole bottom averaged about 1½ in. The number of steels was carefully determined so that as fast as one became dulled it was replaced by a sharp one. While this may seem a minor point, experience proved it to be a potent factor in influencing the speed of drilling and increasing the rate of progress made in driving the tunnel.

The ditch was kept back of the breast about 150 ft. and taken out at convenient intervals by placing vertical 3-ft. holes spaced on 2-ft. centers along the intended center line of the ditch, an ordinary tripod being employed for this work.

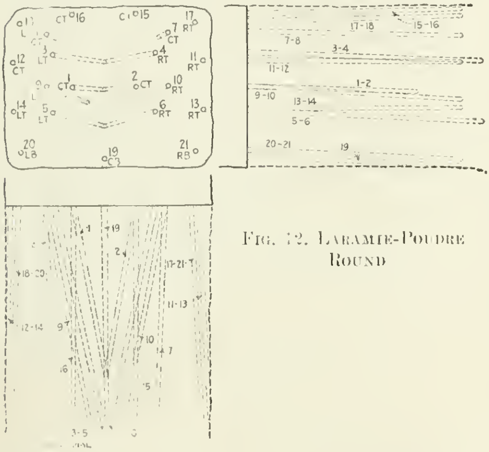


FIG. 12. LARAMIE-POUDRE ROUND

THE LARAMIE-POUDRE TUNNEL

The Laramie-Poudre tunnel at the beginning of the year 1911 held the best two American tunnel-driving records: 609 ft. in January, 1911, and 653 ft. in March. Fig. 12 shows the layout of the holes in regular work. The holes were drilled and shot in the succession numbered in the cut, requiring two set-ups of the tunnel bar, no column being used. The upper set-up was drilled on top of the muck pile, and in the meantime the muck was cleared away, when the bar was lowered and the lifters put in. Holes were started 2⅛ in. in diameter and bottomed at 1⅜ in.

Two water Leyner machines were used, drilling 10-ft. and 12-ft. holes. In case of extremely hard rock a third machine was mounted, each machine drilling holes as follows: Those lettered *LT* were drilled by the left-hand machine on the top set-up, those marked *CT* by the center machine on the top set-up, and those marked *RT* by the right-hand machine on the top set-up. The bar was then lowered and each machine put in a lifter, lettered *LB*, *CB* and *RB*. The blasting charge for a round generally consisted of about 100 sticks of 100% gelatin, 150 sticks of 60% and 250 sticks of 50%.

Chapman & Tucker Flotation Patents

George A. Chapman and Stanley Tucker have patented (U. S. Pat. 1,102,873, assigned to Minerals Separation Ltd., of London) a modified flotation process which consists in first agitating a quantity of water with an emulsifying agent, out of contact with the ores so as to form an air emulsion, and thereafter adding the ore and the frothing agent, and separating in the usual manner. They report having found that the efficiency of the flotation process may be greatly improved by agitation of the water with one or more modifying agents before the ore is added to the water. They cite a test on a 2.33% chalcopyrite ore crushed to 80-mesh. A preliminary agitation of the water with 0.022% of cresol and subsequent agitation of ore, together with 0.13% Texas fuel oil and 0.01% of wood-tar oil. This gave a recovery of 86.5% of the copper. A similar test in which the water received no preliminary treatment, but in which the same agents were added, showed a recovery of only 73% of the copper.

With ores containing gangues of a slimy nature, such as clay and chlorite, when the ordinary process is used, there is a tendency for the gangue to become included in the concentrates, but it is found that if the water be submitted to a preliminary treatment with a modifying agent, this tendency is diminished or obviated. Where the ore contains acid consumers, such as carbonates, the ordinary process may not be applicable, but by using this invention, in many cases sulphuric acid, or its usual equivalent, may be dispensed with and good concentration obtained. The process is also claimed to be applicable to ores containing gangues which are readily oiled, or where there are nonfloatable metalliferous constituents, such as oxidized minerals.

The substances suitable for use as the preliminary modifying agents are essential oils, such as eucalyptus, phenol, cresol, amyl alcohol, amyl acetate, wood-tar oil, wood alcohol, etc. These are used in minute quantities, such as from 0.001% to 0.1% of the weight of ore. The modifying agent is said to alter the internal, molecular, physical or capillary properties of the water, and it is generally found that the modifying agents are such as on violent agitation with water bring about an emulsification of air in the water, rendering the water milky for an appreciable time.

The frothing agents may be any of the mineral frothing agents hitherto employed in flotation processes, generally about 0.002% to 0.4% of the weight of the ore. When a mixture is employed as a frothing agent, the lighter part thereof is preferably amyl acetate, eucalyptus oil, wood-tar oil, amyl alcohol, American turpentine or similar substances; as the heavier part, Texas fuel oil, oleic acid and Russian crude petroleum have been found to be suitable. In certain cases it was found that the same oil may be used as a modifying agent and as the lighter part of the mixture for the frothing agent. Allowing the water to stand after treatment with the modifying agent appears to be beneficial rather than otherwise, so that no difficulty is anticipated in cyclic operations, so long as the circuit water contained sufficient of the modifying agent. It was found that the preliminary agitation of the water with the modifying agent reduced the quantity of frothing agent required.

Cyanide Development at Porcupine, Ont.—II

By Herbert A. Megraw

SYNOPSIS—The Porcupine Crown mill, a new one, has been constructed so as to make maximum use of the counter-current decantation system. Pulp receives short agitation and is passed through the continuous thickening series which accomplishes the remainder of the extraction, and delivers a pulp washed free from dissolved value without the use of a filter. At the McIntyre mill a simple and effective system is followed with good results.

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The most recently erected mill in the Porcupine district is that of the Porcupine Crown Mines, Ltd., formerly known as McEnany. The mill has been built particularly to take advantage of the principles of counter-current decantation, and successfully accomplishes the desired results. The ore from the mine is passed over a grizzly which bypasses the fines around a 3-D Gates gyratory crusher, the oversize of the grizzly going to the crusher. A bucket elevator elevates this ore and delivers it to a belt conveyor, which places it in a 270-ton ore bin at the mill head.

Twenty 1050-lb. stamps are installed to crush the ore, and these deliver the pulp to two Dorr classifiers, one a simplex machine and the other a duplex. The product of the two tube mills goes directly to the amalgamating plates and the tailings from the plates are sent back to the classifiers again, so that any sand which is oversize is taken out by the classifiers and returned to the tube mills for further grinding. In this way it may be said that the classifiers, tube mills and amalgamating plates are in a closed circuit, from which nothing can find outlet unless it is fine enough to be considered as slime and treated as such. The combined slimes from the two classifiers are taken through the first Dorr thickener, which is 30 ft. in diameter and 12 ft. deep.

The overflow from this thickener is taken to a clarifier, which is built on the leaf-filter principle, the clear solution going to a 14x12-ft. tank, whence it is extracted by a triplex pump having a zinc feeder in the suction, which delivers to two Merrill precipitating presses. The precipitate is taken to an acid-treating tank, is steam dried, briquetted and melted in two Rockwell furnaces into bullion. The barren solution from precipitation presses is received in an 18x12-ft. barren-solution tank.

Counter-Current Decantation

The underflow from the first thickener is elevated by a diaphragm pump to a Dorr agitator, 16x16 ft., where the pulp receives agitation and proceeds continuously through another identical agitator. These two machines give the pulp all the agitation it needs and recover an economically satisfactory proportion of the gold in solution. It is true that in the further progress of the pulp through the thickeners, which wash and clean the pulp, a slight further extraction is secured, but its extent can be forecasted with great accuracy and is without doubt the cheapest way of securing it. In the series of thickeners, about 92 to 96% of the total gold content is obtained. While in the agitators cyanide is added to bring the strength up to the required mill standard. From the second agitator, the pulp goes to another Dorr thickener, known as No. 2. This is also a 30x12-ft. machine, identical in size with No. 1. Its overflow is led to a 12x14-ft. solution storage tank, from whence it is pumped either back to the first agitator or to the solution storage tank,

The Porcupine Crown Mill, Near Timmins

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*This is the fourteenth of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvements. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, Jan. 31, Mar. 7, Mar. 21, Apr. 25, May 23, June 20, July 25 and Aug. 29. The next article will deal with "Development of the Counter-Current Decantation Process," and will appear in the issue of Oct. 17, 1914.

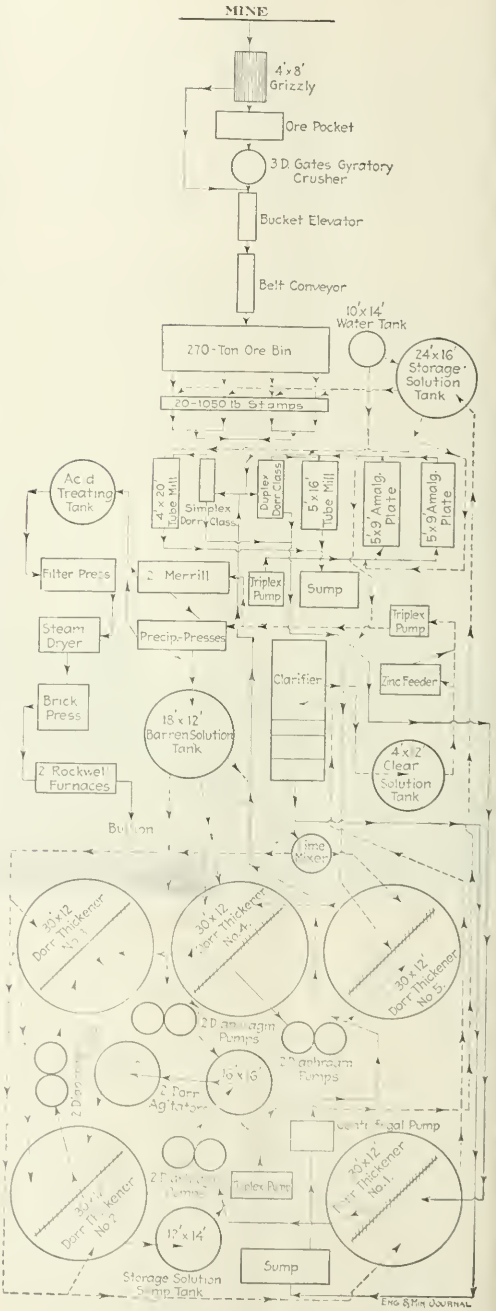
which is a 24x16-ft. tank, situated in the upper part of the mill, and feeds by gravity to the stamp battery. A small lime-mixing barrel is charged with lime and fed with barren solution from the barren-solution tank and fed to all of the thickeners, so that alkalinity can be applied at any point, or all points, whenever required.

The underflow from the Dorr thickener No. 2 is received in diaphragm pumps and elevated to thickener No. 3. The overflow from thickener No. 3 goes back to dilute the inflow into thickener No. 2. The underflow from thickener No. 3 goes to thickener No. 4, whose overflow goes back to dilute the inflow into thickener No. 3. Thickener No. 4 underflows to thickener No. 5, its overflow going back into No. 4. The thick pulp inflow to thickener No. 5 is barren solution from the tank which receives the precipitated solution from the Merrill filters. In this way, it will be seen that, beginning with the final one which receives barren solution, the overflow of each thickener in succession proceeds to dilute the thick pulp inflow of the preceding one. Thus, the procedure is from the last thickener of the series back to the first, dilution always being with weaker solution than that with which the pulp enters, and naturally solution containing much less precious metal is dissolved. The final outflow from the final thickener is discarded without any filtering.

Thickness of Underflow from Thickeners

The thick pulp, underflow from each of the Dorr thickeners installed in the mill circuit contains from 30 to 40% of moisture. By careful manipulation and close watching the underflow may be kept continuously at very nearly 30% of moisture. It will be readily seen and understood that by successive dilution and thickening of this kind, practically all of the gold-bearing solution may be displaced by weak, low-gold solution, a small portion of which may be discarded with impunity. This obviates the large installation expense attendant upon filter installations, and also the operating cost of such machines. Another advantage, which is of no small importance, particularly in the smaller mills, such as the Porcupine Crown, is the fact that attendance is largely reduced. As a matter of fact, the cyanide circuit in this mill requires only one man to look after it at any time. Three men look after the entire mill without difficulty.

The Porcupine Crown mill treats about 150 tons per day and is an example of about as near automatic working as one could possibly imagine in a metallurgical plant. Its entire dependence upon counter-current decantation, with a very short agitation period, is an extremely interesting experiment which has tended to increase confidence in the counter-current decantation idea. It is the first mill in Canada to depend entirely upon that principle, but in this it will probably not by any means be the last. The ore is said to be particularly adapted for such treatment, in that it slimes readily and the slimes settle without a great deal of difficulty. It is, of course, true that not in every case could a 30% underflow from Dorr thickeners be obtained, but thickness is a matter which depends largely upon careful watching in addition to the ore character itself, so that in any case, even where ores do not settle with ease, it is only necessary to multiply the number of settlers to such an extent that the same results may be obtained as with the few in use at the Porcupine Crown mill. The ore is clean and contains no elements which would unduly complicate treatment. The accompanying flow sheet shows in detail the system of mill operation.



Flow Sheet of Porcupine Crown Mill

Crushing Without Stamps at the McIntyre Mill

At Schumacher, just below Porcupine, the extremely interesting mill of the McIntyre Porcupine Mines, Ltd., has continued to expand and has attained remarkably good results under adverse conditions. The McIntyre company has taken over the Pearl Lake mine on a lease and is now adding ores extracted through that shaft to their mill run of ores extracted from their own shaft. The ore is received in the mill in a 200-ton bin. Ore reaching the bin has already been broken so as to pass a 2-in. ring.

The crushing department of this mill is worthy of particular notice. There are no stamps in use, but the ore is crushed through a series of rolls and ball mills. While it is stated that the ores from the McIntyre are particularly suited for such reduction, it has nevertheless not been demonstrated that the other ores of the camp are too hard to successfully work in the same way through the same system of crushing machines, or perhaps some modification of it. The other mills in the camp are using stamps, and although results are altogether satisfactory, as far as the department of mechanics and metallurgy is concerned, there seems to be no valid reason why the system as applied at the McIntyre, about to be described, would not prove a money saver for perhaps some others.

McIntyre Mine and Mill, Schumacher

From the ore bins, the material is passed through a set of rolls, then elevated to a hopper which feeds the second set. In the second set of rolls the crushing is through a ½-in. ring. From this second set of rolls an elevator lifts the ore into the storage bins, having 500 tons' capacity. From this ore bin, which corresponds to the battery bin in the ordinary mill, the ore is taken to Hardinge ball mills. There are two mills installed, but as a rule only one of them is used. They are 6-ft. mills, and it is rather remarkable that, under ordinary circumstances, 150 tons are crushed from ½-in. size down to the consistency of the average stamp-mill product, with one of them. When the ore character is such that one mill cannot handle the entire daily run of 150 tons, the second mill is put to work.

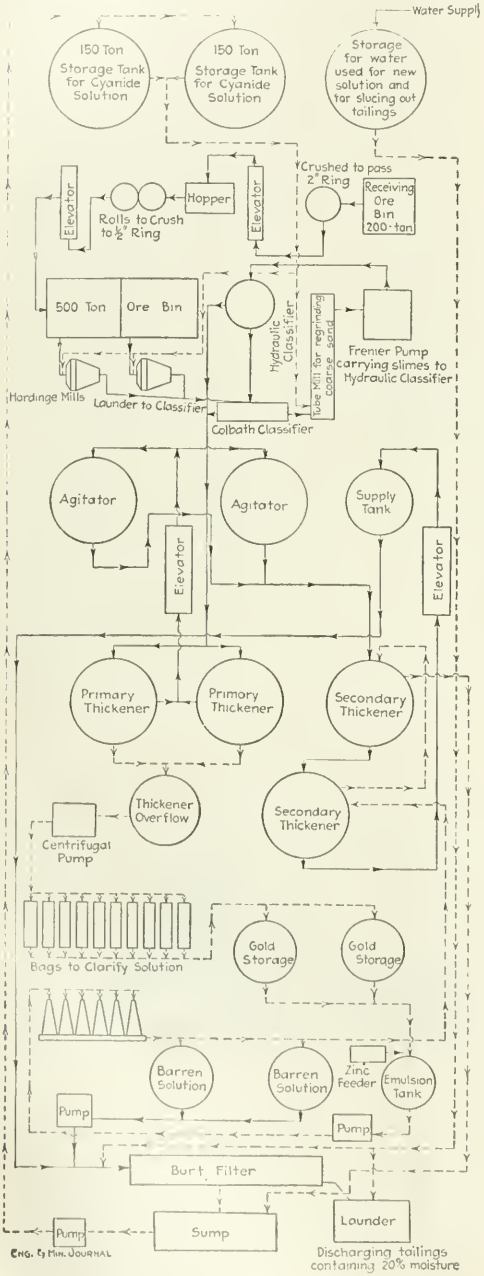
The crushing in these mills is done in cyanide solution, and the product from them is taken to a Colbath classifier. This classifier is a double spiral-screw machine, somewhat similar to the Akins classifier, since the fine slime overflows from the deep portions, while the sand is elevated by the spiral screws and raised out of solution and discharged from the high end of the incline. This classifier takes out all sands which are over 100 mesh, and delivers them to the feed end of a 5x20-ft. tube mill. From the tube mill a Frenier pump elevates the pulp into a hydraulic classifier, where the +100-mesh material is discharged at the apex and sent back to the classifier, thence to the tube mill for regrinding. The overflow from the classifier, an entirely —100-mesh product, goes to the cyanide department for treatment. Cyanide is added to the tube mill in order to bring solutions all up to the standard of 1¼ lb. KCN per ton of solution. The solutions are carried at 1 lb. lime per ton. The breaking, crushing and grinding circuits here described have proved eminently satisfactory on these ores and consume much less than were a stamp installation at work, treating the same quantity of ore. The run-of-pulp for treatment, that flowing from the hydraulic classifier, is sent to two primary Dorr thickeners. In these thickeners the pulp is reduced to a high proportion of solids, a product containing between 35 and 40% moisture being obtained from the underflow. The overflow from these thickeners is taken to an overflow-receiving tank, whence it is pumped to the clarifying system and from there to storage tanks and to the precipitation department. The thickened underflow is elevated to two agitators. In these machines the pulp receives a short treatment by agitation, sufficient to dissolve the greater part of the gold contained, and it is then sent to a secondary thickener. The solution from this secondary thickener goes to a sump and is then pumped back to the head of the mill, where it is used to pulp the ore in the ball mills or is added to the flow in the tube-mill feed entrance.

Counter-Current Treatment of Slimes

From this secondary thickener the pulp goes to another identical machine whose overflow goes back to the first secondary thickener, and whose thickened underflow is elevated into a supply tank which feeds the filter. The final secondary thickener is fed, together with the thickened pulp from the first secondary thickener, with barren solution from the precipitation department. It will thus be seen that the cyanide treatment is practically a counter-current decantation system, in which barren solution enters the final thickener and progresses back to the other until it reaches a point where it has been sufficiently en-

The Colbath Classifier

riched to be precipitated. The pulp from the final thickener has, therefore, already been washed fairly efficiently so that no great effort is required in the filters to recover gold and cyanide-bearing solutions. As a matter of fact, the filter is more efficient in recovering cyanide than in recovering gold, the latter having already been rather fully saved in the thickener system.



FLOW SHEET OF McINTYRE MILL

The filter used is a Burt revolving-tube machine, such as has already been described in a recent issue of the JOURNAL.[3] The pulp is fed into the machine and a cake about 2½ in. thick made, which is lightly washed. The cake is then pulped up with water for discharge, no effort being made to discharge the dry cakes because there is plenty of water available, and it is cheaper to discharge the cake in a pulped condition, besides being easier to retire a pulp from the immediate proximity of the mill than when it is in a more solid condition.

UNUSUAL PRECIPITATION SYSTEM

Zinc dust is used as a precipitant at this plant, and the method of its use is worthy of particular notice, since the system used is that already described in the JOURNAL,[4] as used at the Lluvia de Oro mill, in Mexico. Solutions for precipitation are also clarified by the same system. Solutions are pumped up to the clarifying system and through a series of long bags attached to pipe nipples, as described. The solution is satisfactorily clarified and goes to the gold-storage tanks, whence it goes to an emulsifying tank, where zinc dust is mixed with it, and it is then pumped by centrifugal pumps through a series of filter bags attached to pipe nipples, according to the Lluvia de Oro method. This method has been extremely satisfactory at the McIntyre mill, since it entailed a very low cost of installation and is cheaply operated. The bags are double, the inner one being taken out with the precipitate at the time of melting, while the outside canvas bag is retained until it is destroyed by the pressure from within.

The McIntyre mill works well and succeeds in extracting about 95 per cent. of the total gold content of the ore. A great deal of credit is due to R. J. Ennis, the manager, who had succeeded in making a technical success out of a proposition that is said to have been poorly financed.

The Vipond mill is in course of reconstruction. This mill was operated for some time as a purely amalgamating mill, but it was found that too great a proportion of the values was going out with the tailings, and the process was not profitable. A cyaniding addition is being built, so that the amalgamation tailings can be treated.

Originally the mill was equipped with rolls and Hardinge mills, and this machinery will be retained and used, the cyaniding equipment being added to it.

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Safety of Miner's Place of Work

By A. L. H. STREET*

The legal principle that an employer is bound to use a reasonable degree of care to see that the places where his employees are required to work are kept reasonably safe does not apply to cases where the employees are engaged in making the place of work, as where miners and trammers are engaged in taking ore from a stope; and, hence, in such a case the mining company is not liable for injury to a miner on the theory of failure to provide a safe place of work. (Michigan Supreme Court, Kochin vs. Superior Copper Co., 148 *Northwestern Reporter* 252.)

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[3] "Eng. and Min. Journal," June 13, 1914.

[4] "Eng. and Min. Journal," May 17, 1913.

*Attorney, St. Paul, Minn.

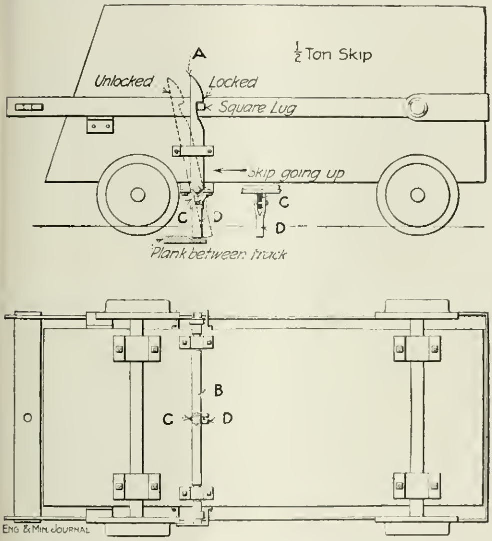
Details of Practical Mining

Skip-Bail Lock and Release

By S. S. Jones*

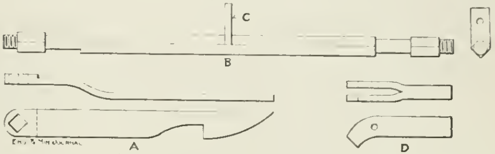
The safety device illustrated here is one designed to prevent overturning of the skip in the shaft. It was developed by W. H. Flannigan, foreman of the Tom Reed mine.

Two notched bars or latches, *A*, are normally caught over a square lug on each side of the bail and are rigidly connected to a square shaft *B* under the skip, turned for two bearings. A lug *C* projects from the middle of this shaft and a trigger *D* forked at the top is pinned to this. This trigger is of the shape shown. When the skip arrives at a point near the dump, the trigger is caught by a 2-in. plank covered with sheet iron and spiked between the rails. This forces the trigger to revolve until the upper part presses on the shaft, when it becomes in effect rigidly connected with it and the shaft is revolved sufficiently to release the latches *A* from the bail lugs. The trigger remains in contact with the plank after the skip starts on its dump. On the return, it again comes in contact with the plank, but is free to revolve in the opposite direction. The latches are thus allowed to fall by gravity on the lugs. They are tapered at the top so that the bail can slip into place. This return of the latches might be made more positive by the use of a spring, but, as a matter of fact, this has not been found necessary.



The Device Applied to the Skip in Locked and Unlocked Positions

The mine shaft in which this is installed has a dip of 73°. The dimensions of the ½-ton skip and the parts of the device are not given, inasmuch as these would vary with every installation. The revolving shaft is made of 1¼-in. square shafting; the latches and the trigger of ⅜x2-in. bar iron.



Some Details of the Device

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Low-Pressure Air Locomotive

The first compressed-air locomotive constructed in Marquette and also the first low-pressure air locomotive ever built for use in the mines of the Lake Superior region has been delivered to the Victoria Copper Mining Co., of Victoria, Mich., by the Lake Shore Engine Works. The machine was designed especially to meet the needs of the Victoria company and its peculiar hydraulic air-compressing system. The air tank of the locomotive must be refilled every 6000 ft. traveled. This is done by means of a hose. One important feature of the locomotive is the introduction of differential gears, similar to those used in automobiles. This makes it possible to have the chain propelling power on both axles and at the same time makes the engine especially adapted to the short and frequent curves in the tracks in the mine.

The air tank, placed on the locomotive frame, is 4 ft. in diameter by 10 ft. long and has a capacity of 125 cu.ft. of air at a pressure of 116 lb. per sq.in. One charge is sufficient to enable the locomotive to haul three loaded 4-ton cars a distance of 3000 ft. and return with the empty cars to the charging place. The average speed is five to seven miles per hour.

The frame of the locomotive is built of heavy 10-in. channels, well braced with cross channels and corner gusset plates. On each side of the frame at the rear end are the air cylinders, 6½ in. in diameter by 9-in. stroke. The crankshaft is beneath the frame and approximately in the middle of it. The power is transmitted from the crankshaft to the driving wheels by means of heavy chains. The driving wheels are 20 in. in diameter.

The valve gear is of the Baker-Pilliod locomotive type, specially designed to give a large range of cutoff in the cylinders. At the beginning of the run, when the air pressure in the tank has its maximum pressure of 116 lb. per sq.in., the air admitted is only approximately one-tenth of the stroke, but as the air pressure gradually decreases the cutoff in the cylinders is lengthened until, when at the end of the run the pressure in the tank has been lowered to 15 or 20 lb. per sq.in., the cutoff in the cylinders has been lengthened to almost full stroke.

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*Superintendent, Tom Reed Gold Mines Co., Oatman, Ariz.

The approximate weight of the locomotive is five tons. The overall length is 12 ft. The total height from the top of the tank to the rail is 5 ft. 10 in. and the maximum width is 5 ft. The locomotive was designed from specifications submitted by Superintendent George Hooper, of the Victoria company.

⁂

Rope Idlers for Incline Shaft*

The shaft of the Raven mine, Butte, Mont., is an incline 1700 ft. long and with various dips. At the top the dip is 70° and gradually flattens until at the 300-ft. level it is only 47°. This dip continues to the 1100-ft. level, below which it curves with a 125-ft. radius to 78°. The shaft, furthermore, does not lie in one vertical plane, so that the hoisting rope not only rubs at intervals on both the hanging and foot walls, but presses strongly against the west dividers near the collar, while 300 ft. below, it runs close to the east end plates.

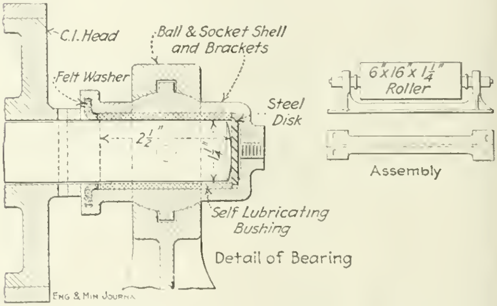
The early operators used no idlers, and wall plates cut 6 in. deep by the rope resulted. Later operators first attempted to overcome the excessive friction, and the wear of rope and wall plates, by introducing solid cast-iron idlers, 3 in. in diameter. To allow for the travel of the rope from side to side, some of these had to be 3 ft. long and were extremely heavy. Judging from the appearance of the old idlers of this type found at the mine, they often failed to turn in the bearings, which is not surprising when it is considered that they would have to make 1000 r.p.m. under ordinary hoisting conditions.

The next rolls were of wood, 6 in. in diameter, with an iron band about each end, and a pintle of 1-in. round steel driven in at the ends to serve as a shaft. These wore rapidly, and were soon replaced by rolls made from water pipe, 5 or 6 in. in diameter, cut to the desired length and fitted with a wooden cylinder into which the pintle was driven. Where the idlers were used on the hanging wall of the shaft the original bearing was simply a piece of ½x1½-in. strap iron, 10 in. long, turned up at the end in a circle of 1⅛ in. in diameter. A small hole served for oiling, and common black oil or filtered oil from engine bearings and compressor bearings was used. When the rolls were to be placed on the foot wall, the bearings were made from two pieces of 1x3-in. steel, 6 in. long. A half cylinder was cut from a side of each piece and the two spaces together formed a bearing. Oil holes were provided, and in some cases holes were bored through the two pieces, so that they could be screwed or spiked to the wall plates. The later practice was to forge the bearings from 1x3-in. steel, and to drill two holes at each end for ¾-in. lagscrews, by which the bearings were fastened to the timbers. These bearings were finally used on both foot and hanging wall. Similar idlers were so placed as to protect the dividers and end plates.

The difficulty of proper oiling presented the greatest obstacle to satisfactory results from this type of idler. As the clearance between the skip and the hanging-wall plates was sometimes less than an inch, there was not room for large oil or grease cups. In addition, the bearings were liable to get full of grit, especially when wet ore was being hoisted. Grease cups were generally unsatisfactory, although several kinds of grease were tried, and especial attention was paid to having that which was suited to the temperature of the shaft. In any event, it was necessary that the rolls be examined and the oil cups filled every two days, which meant the cessation of hoisting for two hours. The bearings wore rapidly and the rollers tended to get out of line. The full skip weighed over three tons, and where the shaft flattened near the surface, the pressure against the idlers was heavy. It was only by distributing this weight over idlers placed but 5 ft. apart that anything approaching satisfactory service could be obtained at this point.

To obviate the necessity for so much attention, an idler was devised by the Robins Conveying Belt Co., following my suggestions. This idler is shown in the drawing. The roller is extra-heavy 6-in. pipe, ⅜ in. thick, 20 in. long, in each end of which is pressed a cast-iron head, and through which passes a 1¼-in. steel shaft. This turns in a self-lubricating bearing carried by a bracket in a ball-and-socket shell, which prevents cramping.

As a preliminary to adopting these bearings, two types of graphite and bronze self-lubricating bushings were tried side by side in the incline for three months. The one proving most satisfactory had cylindrical bodies of graphite ¼ in. in diameter set in the bronze, or "metalline," bushing at about ¾-in. centers. One end of the bearing is entirely closed, the end thrust being taken by a steel disk, which also serves for forcing out the bushing when it is worn. The other end of the bearing is protected from grit by a felt washer. This, however, also retains the fine particles of metal and graphite, and in time this gummy matter causes the bearings to bind. Occasional cleaning of the bushings with kerosene obviates this trouble. The cap is hinged at one side and fastened at the other with a hinged bolt so the roller and bushing can be easily removed. The bearings can be turned through 90°, and the roll turned end for end, permitting the advantage of full wear. The whole is carried in a casting which is fastened to the wall plates with ¾-in. lagscrews. These idlers have been in use nearly a year and are satisfactory. While with rapid and continuous hoisting the bearings become quite hot, they do not bind if they are cleaned occasionally.



Improved Roller and Its Bearing

For the lower part of the shaft, where the rope runs true and the inclination is 78°, the idlers are merely common sheave wheels, cast solid and keyed on a shaft of 1-in. cold-rolled steel. This has a total length of 13 in. These sheaves are 9 in. in diameter, with a 3-in. face, having a groove 1½ in. deep, 1 in. wide at the bottom. The bearings are maple blocks, 4x4x6 in., bored to receive the shaft, and provided with an oil hole. These are fastened to the wall plates with six spikes.

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*From a paper by George A. Packard in the A. I. M. E. "Bull.," August, 1914.

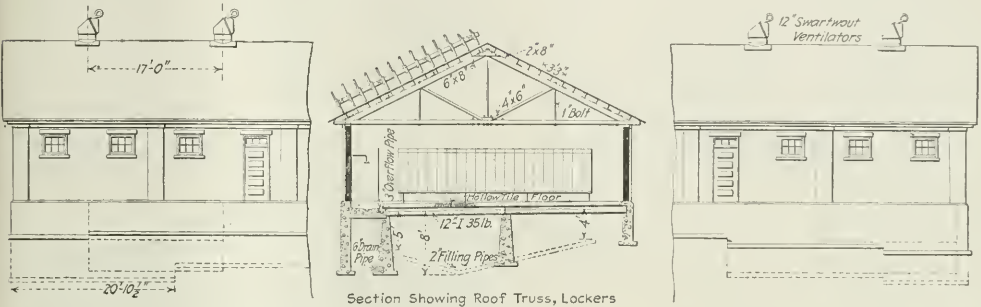
The wood-filled pipe idlers with forged bearings cost at Butte about $8 each, including bearings. The idler with the self-lubricating bearings costs $15, but the difference is quickly saved in decreased cost of attention. The solid cast sheaves weigh 26 lb. They cost, when fitted with a shaft, but excluding the maple bearings, $2.75 each.

⁂

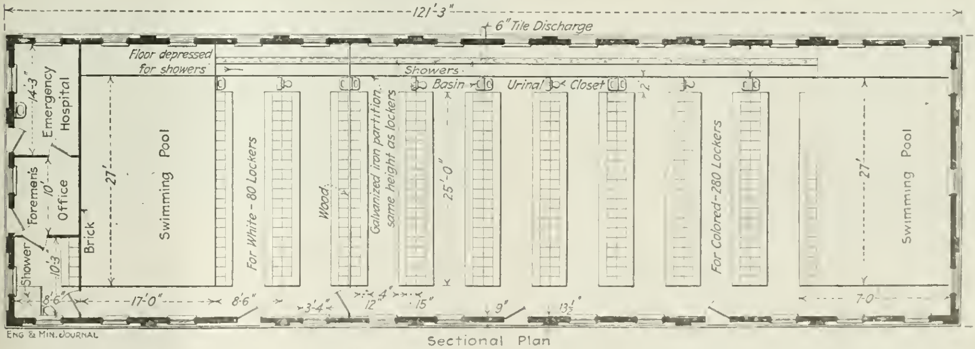
Change House with Swimming Pools

By A. H. Sawyer*

A new change house has recently been completed at the Raimund Mines of the Republic Iron & Steel Co., near Bessemer, Ala. It has some novel features which should make its description interesting.



Section Showing Roof Truss, Lockers Floor & Swimming Pool



Sectional Plan

A Southern Change House with Separate Accommodations for White and Negro Employees

The building is constructed of concrete and brick, 121 ft. 9 in. long by 37 ft. 3 in. wide and contains 365 lockers, 280 of which are for colored employees and 85 for white employees, including 5 in the foremen's office. The dimensions of the building give 11.5 sq.ft. per man. If the portion occupied by the offices and swimming pools be excepted, the space per man is 7.3 sq.ft. which is less than in most change houses.

The swimming pools, one for white and one for colored employees, are 27 ft. long and 17 ft. wide with a maximum depth of 8 ft., and hold 21,292 gal. up to the overflow. The water is heated by live steam admitted through pipes into the bottoms of the pools. At one end of the pool and at the water line there is imbedded in the concrete a 3-in. pipe with a slot running its entire length. This serves as an overflow pipe and also as a means to cleanse the surface of the water. No one will be allowed to use the swimming pools unless he has the permission of the mine physician and has previously taken a shower bath.

The lockers are 15x15x60 in., with perforated bottoms, arranged in rows of 20 each; they rest on wrought-iron supports which also carry seats 12 in. wide. Under each double row of lockers, extending its full length, is a radiator made of eight 1¼-in. pipes, giving a total of 1300 sq.ft. of radiating surface for heating the building. Live steam under 3-lb. pressure is used.

Each pair of rows of lockers has wash basins, closet and urinal at the rear, separated from the shower-bath compartment by galvanized-iron partitions. Two sanitary drinking fountains are provided, one in the white and one in the colored section.

There are 19 showers; the water enters a mixing chamber through hot- and cold-water pipes, fitted with lock valves, below which are stop and waste cocks, so that the quantity of water for each shower can be regulated by the attendent, preventing the use of an excessive quantity of water. Above the mixing chamber is a valve for turning the water on and off. In the main part of the change house, there is one shower for every 20 men. It is estimated that eight gallons of hot water will be sufficient for each bath. This water is heated by live steam, in a closed heater situated in the basement of the building. Room has been allowed here for the installation of an independent boiler if it should at any time seem desirable.

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*Mining engineer, 412 American Trust Bldg, Birmingham, Ala.

The building is lighted by incandescent lamps, 12 in the large room and a drop light in each of the small rooms.

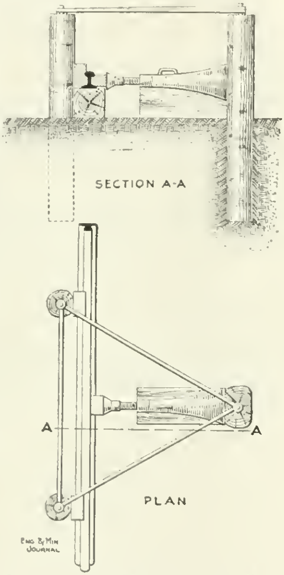
An emergency hospital 14 ft. 3 in. x 8 ft. is situated just off the foremen's office and is fitted with a wash basin, a first-aid outfit and an ambulance which can be handled easily by one man.

⁂

Bending Rails with Screw-Jack

By A. Livingstone Oke*

There is illustrated herewith a method for bending rails, consisting of the use of a screw-jack in conjunction with three upright posts planted in the ground to form the apexes of an isosceles triangle, as shown. The rail to be bent is placed across two of the posts and the jack is footed against the third. To facilitate the manipulation of the jack and rail, it is desirable to use three blocks of wood, the longer one slightly inclined on its upper surface to form a rest for the jack and the other two, notched to receive the side of the rail and give a steady support. To prevent the movement outward of the tops of the posts, three links are made, with eyes at the extremities which drop over round iron dowels driven firmly in the tops of the posts. The lower ends of the posts are sunk from 1 to 2 ft. in the ground.



Posts and Rests for Screw-Jack Rail Bender

I have found this device useful in mines, as it is possible to place posts arranged in this manner at entrances and at suitable points underground, where frequent rail-bending is necessary, and thus avoid the transportation of the usually heavy jim-crow, the lighter screw-jack being all that it is required to carry about.

⁂

Underground Copper Precipitation Launder

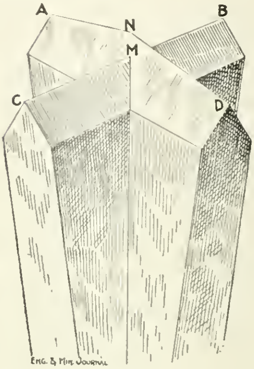
In the Lowell division of the Copper Queen properties, an old fire extends from the 1000 to the 1300 levels, according to the A. I. M. E. *Bulletin* for August, 1914. Water is being run into this fire area and after it penetrates the hot zones, it becomes charged with copper salts. On the 1300 level, there is a concrete precipitating plant. 500 ft. long and 4 ft. wide. In this the acid waters percolate among tin cans and scrap iron, and thus deposit their copper content.

⁂

A New Design in Bits

By Frederick W. Foote*

The bit here illustrated was designed by H. Emens and has been used exclusively for the last two years at the Portland mine, Victor, Colo. During the year after its use, there were 34,000 fewer bits sharpened than during the preceding year, while 7% more drilling was done. These bits are made of the same steel as the old ones, the only difference being in the fact that one set of wings is raised in the center. The raised part acts as a guide for the rest of the bit and causes the cuttings to come out coarser. The wear on the bits comes at the edges, the centers not being worn appreciably.



Bit with One Edge High Center and One Edge Straight

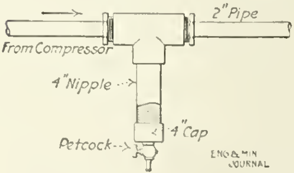
The points *A*, *B*, *C*, *D*, are in the same plane. On 1½-in. bit *N* is $\frac{3}{16}$ in. above *M*.

⁂

Home-Made Water Trap for Air Line

By A. L. Lamb†

The illustration represents a device for freeing an air line of water which is easily applied and which I have found satisfactory. It consists of a tee larger than the line to which it is applied and a nipple screwed to the bottom. A petcock or other valve is attached to the bottom of the nipple to permit discharge of the accumulated water. For a 2-in. air line, a 3-in. or 4-in. tee should be used.



Water Trap Consisting of Tee, Nipple, Cap and Petcock

All or most of the water in such an air line is dragged along the bottom of the pipe and is caught by the trap.

⁂

The Evils of Speiss Formation in lead smelting are summarized by Irving A. Palmer in his paper before the Salt Lake Meeting of the American Institute of Mining Engineers, as follows: "The formation of arsenical speiss consumes iron, reduces the furnace speed, increases the volatilization of lead, causes trouble in the crucible and settling boxes, and constitutes a troublesome byproduct which has to be rehandled. It is the accompaniment of low-silica slag, low sulphur in the charge, and powerful reducing action.

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*3 Marine Terrace, Penzance, Cornwall, England

*Britannia Beach, B. C.

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Details of Milling and Smelting

The Buffalo High-Grade Mill, Cobalt

Treatment of high-grade silver ore in a plant designed for such work is practiced at the Buffalo property, at Cobalt, Ont. This plant was built after the success of the somewhat similar one operated by the Nipissing Mining Co., also of Cobalt. The essential difference between the two is that the Buffalo mill undertakes the treatment of the concentrates made at the main plant, while at the Nipissing the material treated is solely the high-grade ore from the various mines.

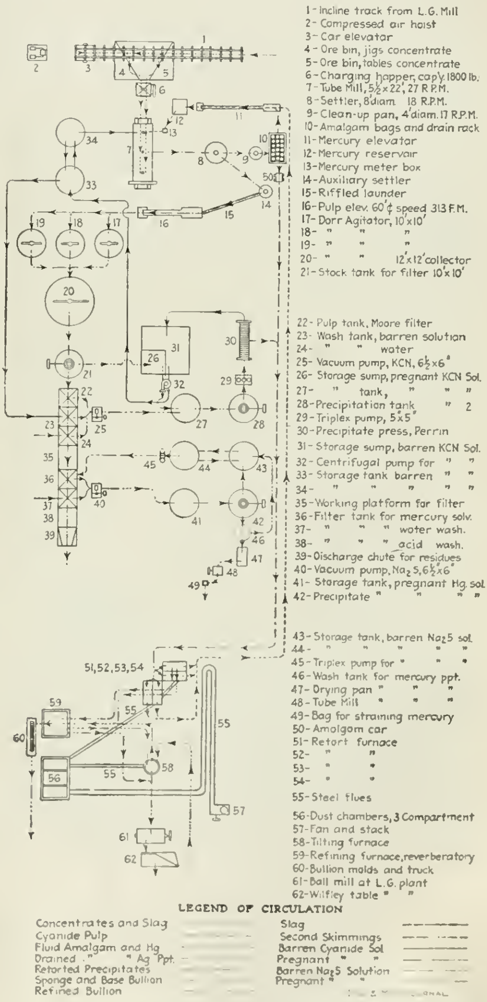
Buffalo High-Grade Mill, Cobalt, Showing Incline from Low-Grade Plant

At the Buffalo plant, the material to be treated, table and jig concentrates, is brought from the mill in cars, raised by an air hoist, and dumped into separate bins. It is then treated with mercury and cyanide solution in a 5½x22-ft. tube mill, making 27 r.p.m., essentially as is done at the Nipissing plant.[1]

After recovery the amalgam, the tailings from this process are taken to one of three Dorr agitators, operated on the charge system, where the recovery of the remaining silver is effected with strong cyanide solution. The treatment is not widely different from that followed at the Nipissing high-grade mill, although the apparatus is of different make and arranged differently, as is shown clearly in the accompanying flow sheet.

A departure at the Buffalo mill is the additional treatment given to the cyanide residues to recover the mercury from them. The residues are filtered through a Moore filter in the usual way, washed, and then, without dropping the cake, the basket of leaves is passed to an additional tank, and a solution drawn through it which takes the mercury into solution. This is later precipitated and the mercury recovered.

Precipitation is effected with aluminum dust, and the precipitate is retorted to recover what mercury it carries. Both amalgam and silver from the precipitates are finally melted in the reverberatory furnace and cast into bars


1-Incline track from L.G. Mill
2-Compressed air hoist
3-Car elevator
4-Ore bin, jigs concentrate
5-Ore bin, tables concentrate
6-Charging hopper, cap'y. 1800 lb.
7-Tube Mill, 5½×22', 27 R.P.M.
8-Settler, 8' diam. 18 R.P.M.
9-Clean-up pan, 4' diam. 17 R.P.M.
10-Amalgam bags and drain rack
11-Mercury elevator
12-Mercury reservoir
13-Mercury meter box
14-Auxiliary settler
15-Riffled launder
16-Pulp elev. 60' ¢ speed 313 F.M.
17-Dorr Agitator, 10'x10'
18- " " "
19- " " "
20- " " 12'x12' collector
21-Stock tank for filter 10'x10'
22-Pulp tank, Moore filter
23-Wash tank, barren solution
24- " " water
25-Vacuum pump, KCN, 6½x6"
26-Storage sump, pregnant KCN Sol.
27- " tank, " " "
28-Precipitation tank " 2
29-Triplex pump, 5"x5"
30-Precipitate press, Perrin
31-Storage sump, barren KCN Sol.
32-Centrifugal pump for " "
33-Storage tank barren " "
34- " " " " "
35-Working platform for filter
36-Filter tank for mercury solv.
37- " " " water wash.
38- " " " acid wash.
39-Discharge chute for residues
40-Vacuum pump, Na2S, 6½"x6"
41-Storage tank, pregnant Hg. sol.
42-Precipitate " " " "
43-Storage tank, barren Na2S sol.
44- " " " " "
45-Triplex pump for " " "
46-Wash tank for mercury ppt.
47-Drying pan " " "
48-Tube Mill " " "
49-Bag for straining mercury
50-Amalgam car
51-Retort furnace
52- " "
53- " "
54- " "
55-Steel flues
56-Dust chambers, 3 Compartment
57-Fan and stack
58-Tilting furnace
59-Refining furnace, reverberatory
60-Bullion molds and truck
61-Ball mill at L.G. plant
62-Wilfley table " "
LEGEND OF CIRCULATION
Concentrates and Slag
Cyanide Pulp
Fluid Amalgam and Hg
Drained " " Ag Ppt.
Retorted Precipitates
Sponge and Base Bullion
Refined Bullion
Slag
Second Skimmings
Barren Cyanide Sol
Pregnant " "
Barren Na2S Solution
Pregnant " "
51, 52, 53, 54

Flow Sheet of Buffalo High-Grade Mill, Cobalt for shipment. The plant is running steadily and giving results satisfactory to the operators.

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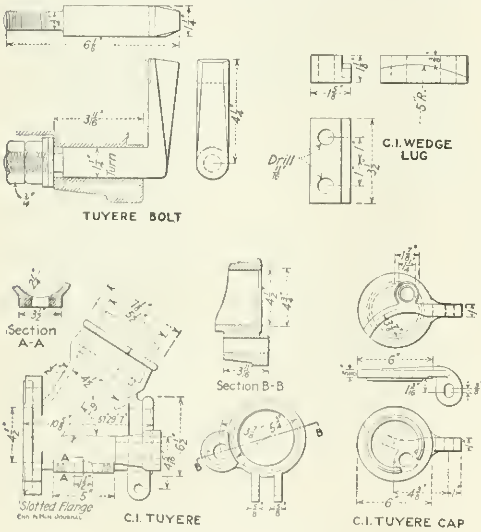
[1] Eng. and Min. Journ., Nov. 7, 1912.

* * *

The Detroit Tuyere

The tuyere used by the Detroit Copper Mining Co. at Morenci, Ariz., is shown in detail in the accompanying drawing. Tuyeres embodying the finger principle for holding the tuyere cap in place are used by several smelting plants in the Southwest, having originated at the Shannon works. In the Shannon tuyere, however, the cap revolves on the bolt of the finger; when a tuyere is slagged the cap must slide over a face of solidified slag, which is sometimes difficult. In the Detroit design the cap is free to drop out of the way as soon as the finger is lifted. The tuyere cap is attached at the bottom by a loose fitting hinge. The faces of the cap and tuyere box are machined; when in use they are held together by a revolving finger which intercepts a wedge on the outer surface of the cap and makes a tight joint.



THE DETROIT TUYERE

There is a raised ring left on the inner surface of the cap so as to center it on the tuyere in case the hinge becomes very loose from wear; this insures a tight joint at all times and while slightly more expensive at the start, it has the advantage of not wasting compressed air. A wooden plug is used in the cap to close the peep hole, and for the slag escape a wooden wedge is provided on the bottom of the tuyere. The wedge burns out more quickly than a plug in the event of the tuyere slagging, and is cheaper and easier to make.

The tuyeres used by the Detroit Company have an air opening 1½ in. in diameter. The tuyere pipes are simply thrust into the stuffing box of the tuyere and packed with asbestos. The tuyeres are attached to the furnace jacket with slotted flanges, so that by loosening the nuts of the holding bolts the tuyere and tuyere pipe may be quickly removed when it is desired to change a furnace jacket.

Clean Lead Slags and Metal Losses

With the introduction of baghouses, better methods of smelting, and the general use of the wet assay for lead, a much closer check can now be made upon the efficiency of lead-smelting plants. These refinements have shown that, in most cases, the metal losses are greater than formerly supposed. They have also led the metallurgist to modify his views as to what constitutes a good economical slag, said Irving A. Palmer, in a paper before the Salt Lake meeting of the American Institute of Mining Engineers. Twenty years ago it was usually the aim of the lead metallurgist to produce slags and matte containing the lowest possible percentages of the valuable metals. Comparatively little attention was given to any other feature.

The evils of over-reduction was recognized by some, but not clearly. The character of the work done was judged mainly by the slag and matte assays. About 10 years ago a lead-smelting plant in Colorado was noted for the extremely clean slag which is was producing. The average lead content of the waste slag for one year was 0.67%. The mattes also were low in lead. The metallurgist congratulated himself upon the figures. There was no baghouse at this plant, but careful determinations of the lead smelted for the period showed that the lead losses really were high. This was confirmed later by analyses of the flue gases.

At another plant operating on the same class of ores, the speed of the furnaces was greatly increased by screening most of the oxide ores and briquetting the fines. The slags and mattes were unusually clean. A low-silica slag was made and a considerable production of speiss showed a condition of strong reduction all the time. Yet the lead losses were extremely high, as shown by the balance sheets at the end of each month. The work not improving, experiments were begun for the purpose of determining the flue dust and volatilization losses. The dust at the foot of the blast-furnace stack was found to contain 60% lead, and analyses of the gases passing out of the stacks gave similar indications of where the lead was going. These illustrations show the fallacy of depending entirely on slag and matte assays as criteria of the metallurgical work that is being done.

* * *

Treatment of Tin-Wolfram-Bismuth Ores

The treatment of this type of complex ores by magnetic separation is strongly recommended by Loftus Hills (*Mining & Engineering Review*, July 6, 1914). On the treatment of concentrate containing: Sn, 40%; WO_3, 22; and Bi, 6%; it was possible to remove first a magnetite concentrate; second, a pyrite concentrate, both together containing less than 1% of the three valuable metals; third, a product assaying WO_3, 70%: Sn, 0.77%; and a residue: Sn, 56.3%; Bi, 8%, and WO_3, 0.77%. While some other ores and concentrates did not yield as good results, the experiments seem to point out a valuable method.

* * *

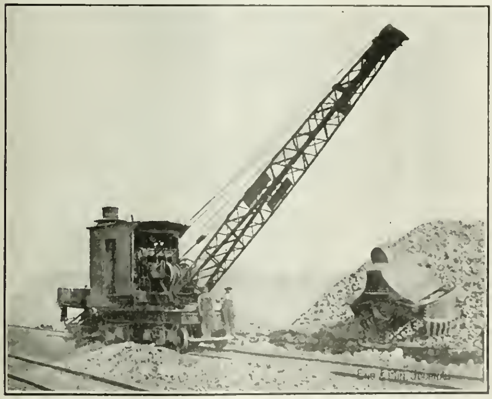
The Abandonment of Buddles at a tin-dressing plant in Cornwall is interesting. At the Hobbs Hill mine, managed by David Draper, near St. Neots, there are no buddles or frames, such as are seen on other tin-dressing floors, says the "London Financial Times," of Aug. 13, 1914. The plant at this mine where the production of tin commenced recently, comprises four Nissen stamps, Kirk-Lavelle classifiers, James sand tables, cone thickeners and James slime tables.

Mining & Metallurgical Machinery

Brownhoist Special Grab Bucket

The Mond Nickel Co., Coniston, Ontario, is using two standard Brownhoist locomotive cranes, at its operations at Coniston, which were furnished by the Brown Hoisting Machine Co., Cleveland, Ohio. These are 15-ton cranes. With one there is being used a standard 40-cu.ft. clam-shell grab bucket, to which the Mond company has had small teeth fitted, and with the other crane the Brown Hoisting Machinery Co.'s special toothed, 40-cu.ft. grab bucket is being used. This type of bucket has only recently been placed on the market.

In the roasting system used by the Mond company, the ore is first dumped from side-bottom dump railway cars, into a ditch between two tracks, 20 ft. center to center, one side of the car being dumped from each track. The locomotive cranes handle it from the ditch to the roast beds. After roasting, it is loaded by locomotive cranes from the beds into standard open-top railway cars. Each crane has an engineer, a fireman and two bucketmen, who swing and place the bucket, and one watchman looks after the two cranes at night. The ore averages about 16 cu.ft. per ton. Of the tonnage handled 50% is ¾- to 4-in. lump, 40% is roasted ore of all sizes from 12 in. down, and 10% is fines through ¾-in. The small bucket averages about one ton per grab, and the larger one about 1½ to 2 tons. The speed with the smaller one is about one grab per minute, and somewhat less with the larger one. The two cranes, working 10 hours each, handle about 500 tons to the beds and 500 tons from them.



Brownhoist Crane Handling Lump Ore, Coniston, Ontario

Special Bucket

The special bucket is unusual, in that it is equipped with round, cast-steel spades; each spade is fitted with a row of manganese-steel teeth, each tooth being attached separately to the bucket, so that it may be replaced when worn. The opening and closing of the bucket is effected by a crosshead that slides up and down on the guide rails on the inside of the shell, the spades being attached to the crosshead. The crosshead is operated by a closing rope, which is attached to the hoisting drum on the crane. The crosshead on this special bucket is also equipped with five rope sheaves, giving the bucket great digging power. The bucket itself has three sheaves at its top, one of which is for the holding rope. The bucket is closed by drawing in on the closing rope, and is opened by holding the holding rope and paying out the closing rope. The accompanying illustrations show the crane and buckets in operation at Coniston, Ontario.

During the last year these two cranes moved about 260,000 tons of material at the property of the Mond Nickel Co. This amount is the sum of the tonnage handled to the roastbeds, tonnage loaded from the roastbeds, and the various tonnages handled to and from stockpiles. The cost per ton of moving this tonnage was approximately as follows:

Labor	2.95 cents
Coal at $4.50 per ton	1.20 cents
Supplies, renewals and repairs	0.65 cents
	4.80 cents

⁂

Two Morris Centrifugal Pumps

The Morris Machine Works, Baldwinsville, N. Y., has furnished at various times a number of pumps for use in the Southern phosphate fields, the general type being shown in Fig. 1.

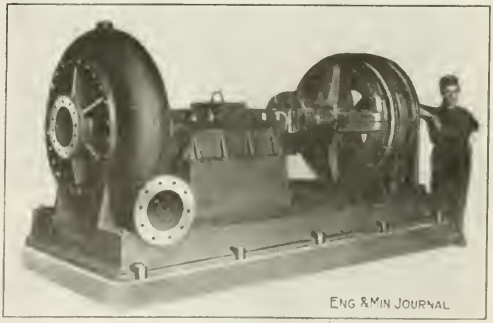


Fig. 1. Heavy-Duty, 10-In. Dredge Pump

In the Florida fields, the pebble-phosphate stratum, which is from 12 to 15 ft. thick, is covered by an overburden of about the same thickness; the latter is stripped by means of steam shovels or dredges. After the overburden is removed, the common method of mining is about as follows: A pit is first made with a hydraulic jack, which washes the material down in a manner similar to that used recently on the Cuyuna iron range in Minnesota and described in the JOURNAL, Jan. 17, 1914. A pump, similar to that shown in Fig. 1, then pumps the material to the washers. This pump is a 10-in., heavy-duty, dredging pump, generally direct-connected to a 125-hp. electric motor, and is double inclosed, with a long thrust bearing running in oil.

If the pit is unusually deep and the pipe line long, booster pumps are used, one pump elevating the material to the top of the pit, where it enters a second pump and is passed through the pipe line and up to the washers.

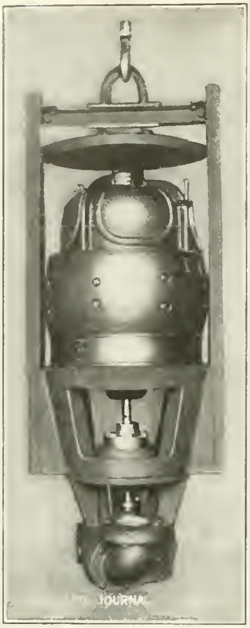


FIG. 2. A MORRIS SINKER, 5-IN. SINGLE STAGE

Fig. 2 shows a Morris 5-in., single-stage, sinking pump for dewatering mines, assembled in a compact structural framework which can be operated by a cable. The pump has a capacity of 700 gal. per min. when operating under 130-ft. head; for higher heads, the pump is built in stages and can be obtained for various capacities.

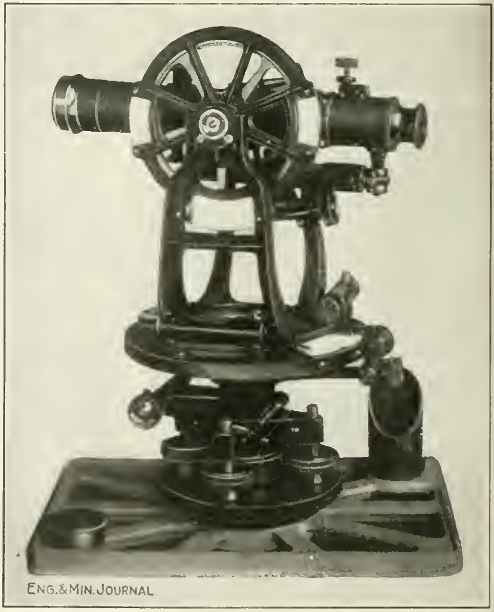
New Gasoline Locomotive

The possibility of gasoline locomotives for use in and around mines has received the attention of a number of manufacturers within the last few years, with the result that a variety of types have been produced, and probably more will be. Some of these have been successful, while others have not. In any event, however, their use is questionable in certain mines where ventilation is not all that it might be, because of the gasoline fumes of the exhaust. Another possible objection to their use in some mines would be the presence of an additional explosive in the form of the gasoline. There would, however, seem to be no real objection to the use of such locomotives around the surface of mines, mills and smelting plants provided the machine is a satisfactory one otherwise.

The J. D. Fate Co., Plymouth, Ohio, has recently placed on the market a gasoline locomotive of a new design, which would seem to be adapted to such work. The engine is a two-cylinder, air-cooled Monarch motor, without gears, differential nor clutches. The friction-drive transmission permits of a great number of forward and reverse speeds, and the tractive effort is the same in either direction. The final drive is transmitted to all four wheels by chains and sprockets. The wheelbase is 38 in. and the machine is built in gages from 24 to 36 in. The weight of the locomotive is from 2½ to 3 tons. For a 2½-ton machine, the drawbar pull is 800 lb. at 6 miles per hour, and the hauling capacity, allowing 40 lb. to the ton, drawbar pull, is said to be 18 tons on the level, or 4¼ tons on a 4% grade in addition to the locomotive. In point of fuel consumption, it is said that this locomotive has handled 2510 tons of clay and coal in seven days, during which it used 41 gal. of gasoline and seven gallons of lubricating oil. In this connection, the makers say in their catalog, that one gallon of gasoline per hour should be ample to operate the locomotive continuously, although actual tests have shown that only ½ gal. per hour is required, as 14 hp. is the maximum power required to operate it.

Stadia Reading Reduction on Transit

The Keuffel & Esser Co. offers a new device for facilitating the operations involved in the stadia method of surveying. It consists of two segment markers applied to the vertical circle, by one of which is read the percentage of the rod interval representing the horizontal component, at the angle at which the telescope is inclined, and by the other, the percentage representing the vertical component. The arrangement of these is shown. The transit itself thus automatically performs one of the operations in reducing the stadia readings.



TRANSIT EQUIPPED WITH REDUCTION SCALES ON SIDES OF VERTICAL CIRCLE

Suppose the observed stadia distance to be 480 ft. and the telescope when sighted to be inclined at such an angle that the reading at the horizontal percentage scale is 0.97 and at the vertical is 0.17. Thus the correct horizontal distance is 480 × 0.97 = 465.6 ft. and the difference in elevation is 480 × 0.17 = 81.6 ft.

Draining Kerr Lake*

SYNOPSIS—Workings of Kerr Lake and Crown Reserve mines largely underlay Kerr Lake at Cobalt, Ontario; safety and economy required draining the lake. Pipe line laid to neighboring lake, and water and mud pumped by four centrifugal pumps on a scow. Some mud still left in bottom of lake. Detailed description of construction of pumping plant and pipe line.

⁂

Kerr Lake, in the Cobalt district, Ontario, Canada, originally covered 45 acres owned by the Kerr Lake Mining Co., the Drummond mine and the Crown Reserve. The property of the latter was entirely under water until, in 1908, a trench was blasted out which deepened the outlet and lowered the lake 8 ft.

Conditions Existing

As many of the rich veins of the Crown Reserve and Kerr Lake companies were under water, mining was pursued at a disadvantage. There was always danger of encountering open seams, through which too large a flow of water for comfortable working might come, and although careful soundings were made over the veins, by means of steel-shod pipe, through mud and water to bedrock, it was sometimes uncertain whether actual bedrock had been reached. Furthermore, large quantities of ore were tied up, unavailable for mining.

The Crown Reserve and Kerr Lake companies gave serious thought to the subject of draining the lake, and came to the conclusion that if the dewatering were to be done, it could be accomplished more cheaply and easily by pumping rather than by tunneling. Preliminary surveys were made over the route the water was to follow, i.e., through the Kerr Lake outlet to Glen and Giroux Lakes, and thence by the outlet stream of the latter to the Montreal River, a total distance of eight miles.

After an act of Parliament had made permissible the draining of such bodies of water, and the seven acres owned by the Drummond interests were purchased, permission was granted by the mining commissioner in May, 1913, and work was begun at once.

Kerr Lake at this time covered an area of 30.35 acres, with no inlets of importance and one outlet which carried off water at the rate of 300 gal. per min. in the freshet season and was dry in the dry season. It was not thought that the lake was spring fed to any extent, but that it maintained its level simply from rain and melting snow. Soundings had established its greatest depth at 100 ft., nearly 20 ft. of which was soft mud. It was estimated that it contained 100,000,000 gal. of water and liquid mud in all. The mud had to be removed, as with a large deposit left behind, matters would be in as bad shape as ever for mining purposes.

Plans for Work

It had been planned in the first surveys to pump the water through the old outlet and allow it to run through natural channels to the Montreal River, but the problem involved by the disposal of the mud prevented the adoption of this scheme. Hence the final surveys were run for a pipe line in a direct line from Kerr Lake to Giroux, crossing the Kerr Lake property, the township highway, the tracks of the Temiskaming & Northern Ontario Ry. and several rights-of-way of power and compressed-air lines. The greatest elevation of the line above Kerr Lake was 53 ft., and the linear distance from lake to lake was 2400 ft. The difference in elevation between the two lakes was 20 ft. Giroux Lake covers about 230 acres, is deep and has an ample outlet, so that the possibility of blocking channels and flooding other properties was done away with.

It was necessary that the pumping plant handle both water and an indeterminate amount of solids against a static head varying from 53 ft. at the start to 153 ft. at the end of operations, through a pipe line large enough to keep the friction factor low, yet small enough to give sufficient velocity to mud-laden water. With an ample friction factor, it was estimated that the total static and dynamic head would approximate 185 ft. The pump had to be movable and the shore and bottom of the lake were steep and irregular; a plant mounted on a movable base ashore presented obvious disadvantages, so it was decided to place the pumps upon a scow. This scow was to be kept near the shore, so that many pontoons would not be necessary to support the pipe; furthermore, it would have been difficult to anchor both scow and pontoons so as to be flexible enough and yet not too susceptible to wind and movement of the waters, and constant changing of mooring cables at many points would have been necessary as the level of the lake changed.

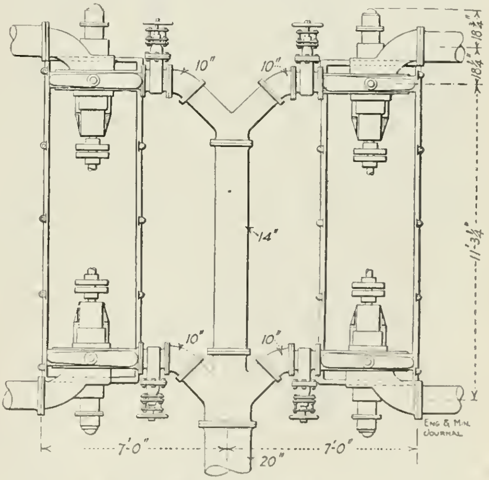


Fig. 1. Arrangement for Parallel Operation

Since the neighboring mines all took their water from Kerr Lake, it became necessary to erect an auxiliary water-supply pumping plant at Giroux Lake.

The Scow

The scow was designed by the Kerr Lake's engineer and built by the Crown Reserve at its shops on the lake shore. Compactness, commodiousness, stability, rigid construction, light draft and carrying capacity up to 70 tons displacement were all essential, and were taken into account in the plans.

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*An abstract from an article by Robert Livermore, presented at the Salt Lake meeting of the A. I. M. E.

The hull was of Western fir, 40x20 ft. over all, with sides 4 ft. deep and a bottom 31 ft. 6 in. long, allowing an overhang at bow and stern. For the bottom, 3-in. planks laid lengthwise were used; across these, other 3-in. planks were laid at 2 ft. 3 in. centers, as sills for the uprights supporting the deck timbers. The boat was divided longitudinally into four sections; the sides and the intermediate divisions were of 6x6-in. timbers. The uprights were 6x6-in. posts set on the bed planks at 2 ft. 8 in. centers and bolted to the longitudinal timbers. The 6x6-in. deck beams rested on the latter and were bolted to them and to the supporting posts. Deck and sides were of 3-in. plank laid lengthwise, and spiked and bolted to the frame. A 2-in. flush was given to the deck, and hatches provided fore and aft for entrance to the hold. The whole boat was thoroughly calked with tar and oakum. Two anchoring spuds were placed at each side of the stern. These were 16x10-in. fir timbers, 30 ft. long, iron shod and held in place by 14x10-in. guides, which were tied to each other by iron rods above and below the water. The spuds were raised and lowered by rack and pinion with spoke attachment. Besides the spuds, $\frac{5}{8}$-in. wire hawsers were provided, to connect with the shore at each corner of the scow. In practice it was found that on account of the shifting nature of the mud and the difficulty of finding firm bottom for the spuds, the hawsers were more useful, and with the aid of small yacht capstans set up on the boat and on the shore, were ample to hold the scow in any desired position.

After launching, the boat was ballasted with about 10 tons of bagged gravel. A temporary crane was rigged on deck for handling the pumps, motors and heavier pipe and valve fittings. The pumps and motors were assembled on their base, the bed plates of each unit bolted through 8-in. sills to the deck and the pipe and valve connections were made between the pumps. A weathertight house of light construction was erected, to cover all of the deck except a small space at the end, where room was needed for operation of the spuds and capstans.

PUMPING EQUIPMENT

The plant consisted of four single-stage centrifugal pumps, arranged in two units (Figs. 1 and 2). Each unit comprised two pumps, direct connected by a flexible coupling to a motor placed between them. These had 12-in. side suctions leading outboard and 10-in. discharges facing inboard, shells 1½ in. thick with removable side disks, and heavy inclosed runneds capable of delivering solids up to 1 in. in diameter.

Each unit was designed to deliver not less than 3000 gal. per min. at the greatest elevation encountered during operation, with a minimum mechanical efficiency of 60%. At the start, the four pumps were to work in parallel, as shown in Fig. 1. All pipe connections on the scow were specially cast for the work. Gate valves were set in between each discharge and the main line, so that by disconnecting the motor and closing the valve any one pump could be closed off without affecting the others.

A change from parallel to series operation could be made at whatever point in the undertaking the increase of head and density of material made it advisable. The arrangement for this is shown in Fig. 2. By this arrangement two units, each consisting of a two-stage tandem pump, were obtained at some sacrifice of volume, but at a decided gain in efficiency.

For priming and keeping pressure on the impeller bearings, a $5\frac{1}{4}$x$3\frac{1}{2}$x5-in. air-driven plunger pump was installed on the scow, which took its power from the mine compressed-air supply and its water from Kerr Lake at the start, and after that water became too muddy, from the auxiliary supply from Giroux Lake. The main suction pipes were connected to the pump shell by 90° elbows, and extended to the water's edge, where 8 ft. lengths of smooth-bore suction hose continued the intake. The suctions were fitted with flat foot-valves and strainers having 3-in. apertures, and were arranged on loose threads to act as a swivel joint, which, with the aid of a tackle, allowed them to operate at any desired depth up to 8 ft.

The motors to drive the pumps were 250-hp., squirrel-cage, synchronous, induction machines, operating at 1200 r.p.m. on a 2200-volt, three-phase, 60-cycle current. Power was obtained from the line of the Northern Ontario Light & Power Co., which passes through the property. A 2200-volt line was carried without transforming, to a switch house built for the purpose on shore near the scow, where oil and knife switches, meters, etc., were installed; hence heavily insulated copper cables were led to the scow and connections on the scow were made through oil-switch, panel-mounted knife switches, and starting compensators for each motor. Lightning arresters were placed outside the deckhouse. Cables inside the house were carried in pipe, and below deck, where possible, to the various connections.

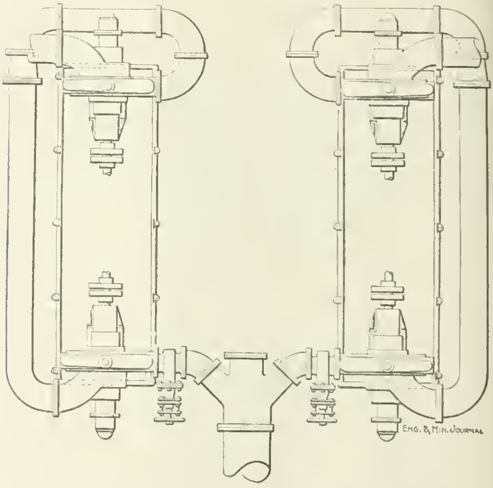

FIG. 2. ARRANGEMENT FOR SERIES OPERATION

THE PIPE LINE

A 20-in., 14-gage, spiral-riveted pipe was used for the main discharge line. Bolted steel joints were used, except for a few flanged lengths on angles and between the scow and shore. This joint has great flexibility and capacity for taking up expansion and contraction, qualities desirable here, where extreme changes of temperature occur, and where portions of the line, both at the feed and discharge ends, had to be shifted from time to time. This pipe was supplied in 32-ft. lengths, weighing 1500 lb. to the length. It was laid either on the ground or on simple bents, two to a length, keeping it in as straight a line and as free from hollows as possible. What few angles there were, were calculated in the survey, and were met by specially cast flanged elbows, to which lengths of pipe flanged at one end were bolted. A little ditch work and rock drilling and blasting were necessary, especially where the line crossed under the main highway by culvert, but in the main, inequalities of the ground were made up by the bents. The chief difficulty was carrying the pipe over the Temiskaming & Northern tracks at the minimum height allowed above rail, namely, 22 ft. 6 in.; this was necessary to avoid the low point in the line, which would result if it were carried under the tracks. Two wooden towers were erected, and the pipe suspended from two cables stretched over them and anchored to the ground.

The Kerr Lake end of the pipe, which reached shore at an angle of 15°, was anchored by straps and bolts set in a cement pier at water line. The end of the pipe facing the water was flanged, and to this was bolted a 20-in. flexible ball joint having a maximum swing of 27°. To this joint in turn two expansion joints giving a lateral play of 16 in. were bolted. At the start, one 32-ft. length of flanged pipe was connected to these, and to a similar ball joint coupled inboard on the scow at the main discharge. A 12-in. bypass, with a gate valve, was inserted on the flanged length, for draining the line.

Operations

The pumps were started on Aug. 28, 1913. It was found that too sudden stopping of the pumps caused vacuums to form, which made one or two lengths of pipe show a tendency to collapse; this was remedied by the insertion of check valves at threatened points. A tendency of the pipe to sag after receiving the full weight of water was observed on the span over the railway, and the structure was strengthened by the addition of two more suspension cables and by the construction of arm props on each tower, which shortened the unsupported span of pipe by 24 ft.

The water was lowered steadily until the depth under the scow became too shallow for convenience, when a new flanged length of pipe was inserted, and the scow moved out a corresponding distance. The extra length was supported by trestle bents having an adjustable block-and-tackle sling to allow for the falling level of the pipe. The operation was repeated as often as it became necessary to make a move until the suspended line became too cumbersome, when the shore ball joint was moved out to a new pier and the connecting pipe shortened accordingly.

It had been intended to stir up the mud as much as possible by agitation while there was plenty of water in the lake, so that the mixture flowing through the line might be as liquid as possible. Various methods were tried, such as directing a stream, pumped from the lake by an auxiliary plunger pump of 300-gal. capacity, through a 4-in. hose with monitor attachment, into the mud, both from shore and from a small scow, but it was found impracticable, since the mud was of such consistency that although the bulk of that exposed by the lowering of the water flowed into the deeper part almost without sluicing, that under water had a glue-like tendency to stay in banked masses near the shores as long as any water remained in the lake to hold it back. The mud left above the water soon dried and became compact to a short depth, so that it offered little difficulty to mining or prospecting, but that in the center of the lake constantly increased in depth with the influx from the sides, and as rapidly diminished the clear-water area. Tests made on this mud showed that its water content was high, nearly 80%, so that it was decided to pump out the remaining water entirely, and with the suctions resting in the mud, trust to the pumps handling it with the aid of the small streams of water flowing into the basin from the mines and mills. The change of the pumps from parallel to tandem operation, provided for as above described, was made in order to obtain better efficiency with the heavier material, and after some experimenting with the proper mixture of mud and water, and with the size of the strainer openings, a fairly steady stream of liquid mud varying from 6 to 20% solids was maintained through the line.

To avoid muddying the water in Giroux Lake near the pumps for the local mine supply, it was found necessary to carry the pipe line to a wooden flume, built along the shore, to a remote cove of the lake.

The pumps were run through September and October and at intervals during November, until increasing cold made operation difficult because of the freezing of valves and of the surface of the mud, and work was stopped for the season. The water had been removed from the greater part of the important reserves of the mines, thus leaving them free for stoping and development. About 325,000,000 gal. of mud and water were pumped, at an average of 6000 gal. per min. for 38 actual working days. It was demonstrated that the liquid mud lying in the deeper parts of the lake could be pumped and the ground underlying these deeper parts could be prospected and mined.

Cleaning Dredge Buckets with a Monitor

By W. H. Wright*

Many mechanical devices for freeing dredge buckets from clay and material that will not fall out of the bucket as it passes over the upper tumbler have been tried. Success has been claimed for a few, but the majority are but makeshift devices at best. The problem of dumping sticky material has been successfully solved on Natoma No. 9 dredge of the Natomas Consolidated of California, in the Natoma field of the American River district.

Encountering a large area of clay that gave great trouble by refusing to dump and plugging the bucket line, all devices of which the management had ever heard, or that the engineering staff could invent, were tried without success. Finally, the idea of turning the powerful stream of the monitor into the buckets occurred to someone, and the problem was solved. A nozzle was placed in the hopper and directed into the dumping bucket. A powerful 1½-in. stream of water playing through this nozzle into the clay never fails to dislodge it. There has been no further trouble from this source, and the other dredges will be similarly equipped when necessary.

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Jacob Langeloth

The many friends of Jacob Langeloth were shocked and saddened by the announcement of his death at his home, in Riverside, Conn., on Aug. 14. He had been apparently in excellent health and succumbed to a sudden attack of heart failure, which came on after he had retired for the night.

Mr. Langeloth's death removes from the mining and metal industries one of its best known and most highly respected figures. Born in Mannheim, Germany, in 1852, he was educated in German schools and universities, and served in the German army, being honorably discharged after his term of service with the rank of lieutenant. In 1886, while traveling in England for the Metallgesellschaft, of Frankfurt am Main, the great German metal house, his attention was directed to the wonderful development then being made in Montana and Arizona, from which states numerous shipments of copper matte and blister copper were being made to Liverpool. In the spring of the following year, he came to the United States as the representative of the Metallgesellschaft, and soon after organized the American Metal Co., Ltd., of which he first became treasurer and soon afterward president.

His wide knowledge of the metal business, coupled with his active experience both in German and English metal houses, gave him a grasp of the essentials of the industry, which soon placed his company among the leaders and led to his being recognized as one of the strongest and most conservative men in the metal field. He soon became connected with the firm of E. Balbach & Son (now the Balbach Smelting & Refining Co.), which was the first company to introduce into the United States the electrolytic process for refining copper, and through his foreign connections he was able to give that concern the benefit of many new and valuable discoveries in smelting processes which had been made in Germany.

Later Mr. Langeloth became engaged in the importation of ores from Mexico, and after a visit there he became interested in several Mexican mines from which copper and lead were shipped to New York. These Mexican interests he maintained up to the time of his death, and he always had the keenest sympathy for the Washington government in its efforts to cement friendly relations with that troubled country.

During recent years, Mr. Langeloth became interested in the zinc industry, and entered upon it with the same thoroughness and zeal which had characterized his efforts in connection with copper. It seemed that he kept constantly before his eyes a mental picture of the whole metal world and that his mind instantly grasped the significance of every change in supply and demand, together with its effect on economic conditions. It was this penetrating vision which distinguished him and gave him his exceptional standing as a foreign merchant and financier among the leading Americans in the metal industry.

Personally, Mr. Langeloth was noted for his exquisite consideration for the feelings of others, for his "live and let live" policy; and throughout the entire organization in which he has been for more than a quarter of a century such a potent force, there are abundant evidences of the simple and genuine manner in which he practiced these precepts. He was always interested in the personnel of the various companies with which his organization was associated, and at the time of his death he was engaged in preparing plans for a new city to be built at Burgettstown, Penn., renamed Langeloth. This is the site of the new plant of the American Zinc & Chemical Co., which is just nearing completion, and it was Mr. Langeloth's purpose to lay out a village for employees in accordance with the most modern sociological ideas. He has provided in his will for the creation of a fund to be used by his trustees in carrying out not only this project, but also another and much greater one, which will still further demonstrate his deep and abiding interest in those whose lot in life has not been so fortunate as his own.

The diversity of Mr. Langeloth's business interests can best be judged from the following list of companies in which he was either an officer or a member of the directorate: The American Metal Co., Ltd.; Corn Exchange Bank; Balbach Smelting & Refining Co.; Miami Copper Co.; Metallurgical Co. of America; Mexican Bank of Commerce & Industry; Compañia de Minerales y Metales; Bartlesville Zinc Co.; American Zinc & Chemical Co.; Wetherill Separating Co.; Compañia Minera de Peñoles.

Jacob Langeloth

About two years ago he resigned the presidency of the American Metal Co., accepting instead the office of chairman of the executive committee of the board of directors, with the idea of gradually retiring from active participation in business, to live quietly at the beautiful home he had just built at Riverside, Conn., on Long Island Sound. But the constant attention to detail had become so much a matter of habit to him that there was no appreciable moderation in his work up to the day of his death.

In 1903, Mr. Langeloth married Miss Valeria Knapp, who alone survives him. To her and to his immediate associates a host of sorrowing friends extend their sympathy over the loss of a broad-visioned, high-minded merchant and a warm-hearted, generous gentleman. Among a host of friends in financial and mining circles, who knew his sterling worth, his loyalty and integrity, and his courtly character, his untimely demise is regarded as a personal loss.

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Lake Superior Mining Institute

Special Correspondence

On Tuesday, Sept. 1, a special train left Marquette, Mich., at 6 a.m., with the 140 members and guests of the Lake Superior Mining Institute who had elected to take the trip to Detroit. The S. S. City of Detroit II left St. Ignace with this party at 11 a.m. of the same day and arrived at Detroit the following morning at 7:30. On board the boat, en route to Detroit, two business meetings of the Institute were held in the forward cabin.

The afternoon meeting was called to order by Pres. W. H. Johnson, who delivered the opening address. Among the guests were 10 members of the American Association of State Geologists, who had recently visited the Michigan copper country. In a brief address, Mr. Emmons, geologist from Minnesota, said he had been particularly impressed with the stability of the mining industry in the Lake Superior ranges, and the regularity of the deposits, as compared with those in the West, with which he is more familiar. He believes that a great responsibility rests on the members of the Institute because the low point of the great synclinal deposits of Lake Superior is being approached, and more attention must be paid to mining and treating low-grade deposits. Mr. Wolfe, State Geologist of Illinois, brought out the important features of the Curran-Foster bill, pending in Congress. He explained that the bill provides for 15 additional Bureau of Mines cars and 10 additional experiment stations, to be distributed over the country and to aid in the various mining districts. The bill carries with it an appropriation of $15,000 per car per year and $25,000 for each of the stations. It is intended that these cars and stations shall coöperate with mining schools, safety stations, and similar institutions in their vicinity. It is not expected that the bill will pass this session of Congress, but the Association of State Geologists hopes to see it passed next session, and to further this, has appointed a committeee of five to coöperate with the Bureau of Mines. Mr. Wolfe asked the Lake Superior Mining Institute to deliberate and act on the proposed bill.

William Kelly, Vulcan, Mich., replied to Mr. Wolfe and said that while the Institute takes great interest in first-aid work and heartily approves of extending the Government work broadly through the country, nevertheless, it is outside the function of the Institute to indorse the movement; that its constitution is similar to that of the American Institute of Mining Engineers, and no means are provided to take the consensus of opinion in such a case; but that every individual effort possible will be taken. Following this the reading of papers was commenced.

The first paper, "Use of Electricity at the Penn and Republic Iron Mines, Michigan," by William Kelly and F. H. Armstrong, Vulcan, Mich., was read by title only. Mr. Kelly stated that the paper was of such a nature that it should be read in leisure time at home. Lucien Eaton, Ishpeming, Mich., did not read his paper, "Methods of Stocking Ore on the Marquette Range," but emphasized a few points he had made. He stated that he had tried to determine, with a stop watch, the efficiency and reliability of different systems and had paid no attention to costs. He described the two systems in general use as one with hand-dump cars and short-length trestles, and the other with mechanical power cars from permanent or temporary trestles. In comparing the two, he remarked that the hand-tram system is good only for a small production, while the power tram is reliable and good for any capacity. Personally, he said, he had tried to eliminate car-riding, as a safety measure, as there is abundant evidence that it has been responsible for many accidents.

As Joseph Park Hodgson, Bisbee, Ariz., was absent, his paper, "General Outline of Mining Methods Used in the Copper Queen Mine, Bisbee, Ariz.," was read by title. The paper on "The Sinking of a Vertical Shaft at the Palms Mine of the Newport Mining Co., at Bessemer, Mich.," by Frank Blackwell, Ironwood, Mich., was read by title only, but was followed by some discussion. Mr. Blackwell stated that the universal practice on the Gogebic iron range is to sink inclined shafts in the foot wall, and that this is the first vertical shaft in the foot wall. He added that by the use of the blasting box, described in the paper, the speed of sinking had been increased 55%, with a saving also in fuse. The box has been used successfully in high raises. In reply to a question by Mr. Eaton as to whether the studdles are heavy enough, Mr. Blackwell stated that the shaft is concreted; that the concrete takes all the weight and the studdles act as reinforcements. The paper on "Mining Methods on the Marquette Range," contributed by a committee consisting of H. T. Hulst, G. R. Jackson and W. A. Siebenthal, was read by Secretary Yungbluth. The shrinkage stope system, in use at the Lloyd mine of the Cleveland-Cliffs Iron Co., was described first and led to some discussion, in the course of which it was brought out that all the ore in that mine of one grade, a low-grade bessemer, and does not require sorting for phosphorus. Prof. F. W. Sperr, of the Michigan College of Mines, suggested that a definition of "shrinkage stoping" should be given, and the following was brought out: In this method, the stope becomes larger in dimensions as the work progresses, but it fills more with loose material which must be pulled or "shrunk" to enable the men to go back to work after blasting.

In the discussion of the stoping system at the Hartford mine of the Republic Iron & Steel Co., Professor Sperr defined it as a modified block-caving system. The last method described in the paper is the one used at the Republic mine, Republic, Mich. In commenting on this paper, which described four mining methods, Professor Sperr said they are the best papers he had ever seen on mining methods. In referring to the method used at Sec. 21 mine of the Oliver Iron Mining Co., he said he did not understand how the dirt comes off the foot wall after the last slice. C. A. Barabe, Ishpeming, who is familiar with that mine and the method, stated that the dirt must be shoveled off the foot wall after the last slice, if the foot wall is especially flat, and that some remains anyway. It was stated by one of the mining captains present that the loss due to this cause is estimated at not more than 5%, and that what is left from one level is drawn down to the next. Mr. Kelly added that the Republic orebodies are of various sizes, and that the method must be varied and modified accordingly.

A paper on "Steel Stocking Trestle at No. 3 Shaft, Negaunee Mine," by Stuart R. Elliott, Negaunee, Mich., was read by title and was thoroughly discussed. It was brought out that the use of this type of trestle entails no additional handling of the ore near the columns or elsewhere, that no trouble has been experienced with the ore freezing around the columns, and that it does not stick. It has been found possible to blast near the columns without injuring them. Mr. Kelly pointed out that this type of trestle eliminated the danger to life involved in drawing trestle legs, necessary with the usual type of trestles. P. S. Williams, Ironwood, Mich., was interested in knowing why an endless-rope system had been used on this trestle rather than motors, and if the cost had governed the decision. Mr. Elliott explained that motors would have been cheaper but more dangerous, and that this was the principal objection. Mr. Kelly added that there was a saving in power by the use of trolleys, but that the labor cost was higher. With an endless rope, one man at the shaft runs out the rope and tends the bells. Mr. Elliott remarked that the use of motors would increase the cost of the trestle, as they would increase the moving load, and this would require heavier construction. Mr. Williams said that this experience would tend to show that the endless-rope system is cheaper for the work than electric motors. Lucien Eaton, Ishpeming, Mich., stated that according to his experience, a 40-hp. corliss engine and rope will handle two loaded cars and two empties, whereas a 50-hp. motor has hard work with one. The final verdict seemed to be that for trestle work, of the nature being discussed, the endless rope is less expensive than electric motors.

"Ventilation in the Iron Mines of the Lake Superior District," by Edwin Higgins, of the Bureau of Mines, was not read. Mr. Higgins, however, gave a short résumé of the paper and stated that its object was to set forth the conditions of ventilation in the Lake Superior iron mines, and that he had tried to observe the effect of hot air on miners and on the cost of mining. Doctor McNair inquired for some specific suggestion as to any method of lessening the production of carbon dioxide from decaying timbers. Doctor McNair wished to know also if treatment of timber to prevent vitiation of air would also preserve the timber and so reduce the cost of treatment by the mining companies. Mr. Higgins, in reply, stated that any such treatment would simultaneously prevent vitiation of air, the rotting of timber and would reduce the heat. An interesting example was cited by one of the Institute's guests, who said that a coal mine, near Peoria, Ill., had used treated timbers for six years in an entry mouth, where untreated timbers had lasted only 18 months to two years. The preservative used had a creosote base, and tests on the treated timber showed increased strength after a few years' use. In reply to a question by Mr. Eaton as to the practicability of using artificial pressure to keep back the carbon dioxide, as in the Cripple Creek district, Mr. Higgins said he believed this method could be used to some extent in the Lake Superior iron mines, that it would keep back the gases, but would not reduce the heat.

At this point, Professor Sperr remarked that a new era in Lake Superior mining has come; that 20 years ago the caving or top-slicing method was just coming in and that it is now passing out. New methods must be found for the greater depths of the present and future. Also, a method must be found whereby less timber and less shoveling of ore are necessary. In this development, he stated that the use of "yielding supports" must come. It is his opinion that steel and concrete supports will be tried and will fail; that their use will be found to be a mistake. Mr. Williams inquired if it would be proper to use a concrete shaft through a dike at 2000-ft. depth in order to keep air away from the dike rock which disintegrates on contact with air. Professor Sperr was of the opinion that this plan would work temporarily but that the dike rock would yield when pressure comes, and would injure the shaft.

EVENING SESSION

The paper on "Follow-Up System and Method of Recording Injuries in Compliance with the Workmen's Compensation Law," by Herbert J. Fisher, Iron River, Mich., was read by title at the evening session. F. C. Stanford's paper on the "Electrification of the Mines of the Cleveland-Cliffs Iron Co." was not read, but led to some interesting discussion. Mr. Stanford remarked that only within the last few years have hoisting and underground pumping been undertaken by the electric drive, and that contrary to the general impression among operators, the Cleveland-Cliffs company has had no trouble with electric hoisting, and it has been found reliable.

Mr. Kelly gave a very interesting talk on the use of electricity at mines. He said that the major uses are for pumping, hoisting and compressing.

Dwight E. Woodbridge's paper on "Titaniferous Ores in the Blast Furnaces—a Recent Experiment" was read by title. Mr. Yungbluth read Mr. Channing's paper on the caving system, and subsequent discussion brought out a variety of dates and places where this method of mining was supposed to have been used first on the iron ranges. There seems to be evidence that the method was used in the north of England as early as 1877; that it was introduced at places in the Cleveland hematite mine, Michigan, from 1882-87.

On Wednesday morning, the steamer, while yet some distance from Detroit, was met by a launch containing members of the Detroit Board of Commerce, who entertained the Institute for the following two days. They had made all arrangements for showing the visitors the points of interest they wished to see. Luncheon was served at the Board of Commerce dining room on Wednesday and a chartered steamer took the party to the Detroit Copper & Brass Rolling mills and Semet-Solvay Co.'s coke ovens in the afternoon. Tickets were provided for the theater in the evening. Thursday was spent in visiting the Ford Motor Co.'s factory in the morning and the Chalmers Motor Co. in the afternoon. The visitors were guests of the Detroit Boat Club at luncheon on Thursday. Those of the party who went north, returned by steamer in the evening.

Correspondence and Discussion

A Comparison of the Huntington-Heberlein and Dwight Lloyd Roasting Processess*

W. W. Norton's interesting paper in the August Bulletin of the A. I. M. E. (abstracted later in the Engineering and Mining Journal of Aug. 15, 1914, p. 297), comparing the H. & H. and D. & L. processes, no doubt reflects with a high degree of accuracy the behavior of these two roasting methods, as he has found it at the Murray plant, in Salt Lake Valley, Utah.

Up in Montana, however, we are working with somewhat different conditions, and as we have been a little more favorably impressed with the relative merit of the Dwight-Lloyd sintered product, it may be of interest at this time to describe the behavior of these two processes at the East Helena lead plant of the American Smelting & Refining Co.

The reason for a difference in performance of these roasting processes at Helena and at Salt Lake undoubtedly lies in the rather unique roasting and smelting practice at the former plant, where all operations are on charges carrying an abnormally high lead and zinc content. Helena mixture beds contain approximately 80% Cœur d'Alene lead sulphides and average 160 to 180 lb. per cu.ft. The local significance of this high percentage of heavy leady material can readily be seen when it is remembered that the processes under discussion involve the blast-roasting principle. This density, together with the ready fusibility of such a lead-bearing charge, presents a set of conditions at East Helena that gives rise to peculiar problems at both roasters and blast furnaces.

Certain it is that with both the H.-H. and Dwight-Lloyd products in excellent physical condition, our East Helena blast furnaces run at higher speeds and with distinctly lower coke when dominated by the Dwight-Lloyd sinter. All those daily observations, recorded and unrecorded, that the metallurgist makes as he guides his blast furnaces through their various ailments and difficulties, have for several years past confirmed us at East Helena in the feeling that the more Dwight-Lloyd material we can get on our furnaces in place of H.-H. product, the lower is the percentage of coke required and the faster do the blast furnaces run. That we have dealt with extremes as well as averages in these matters, may be seen from the fact that the East Helena furnaces have carried upward of 90% roast on charge for long periods, with smelting tonnages of 475 to 575 tons per 100 sq.ft. tuyere area. An average of 219 tons per furnace day, maintained during the month of March, 1913, figures 549 tons per 100 sq.ft. tuyere area.

In December, 1912, one of our blast furnaces was run for seven days on a charge containing H.-H. roasted product and no Dwight-Lloyd; a furnace alongside of it running on Dwight-Lloyd product with no H.-H., the idea being to note the tendencies of the two roasted products as to speed and reduction. The composition of the two charges used is shown in the following:

	H.-H. Charge Lb.	Dwight-Lloyd Charge Lb.
Siliceous bed ore	1580	176
H.-H. roast	5264	. .
Dwight sinter	.	7010
Limerock	1076	322
Scrap iron	80	80
Golden Curry iron ore	....	382
	8000	8000

The results of the week's test are shown in the following tabulation:

Huntington-Heberlein

Date December 1912	Furnace	% Coke	% F.C.	Tons Wet Chge.	Slag % Zn	Slag Oz. Ag	Slag Wet Pb	% Pb. on Ch.	% Roast	% S on Ch.	% Matte Fall	Matte Pb	Matte Cu
5, 6, 7, 8, 9	1	13.75	10.9	210	5.0	0.29	1.99	30.1	66.2	4.2	15.3	24.6	9.9
3, 4	2	12.50	9.8	208	4.9	0.26	1.47	30.4	67.9	4.2	16.8	18.8	10.9
Av'ge		13.39	10.6	209	5.0	0.28	1.84	30.2	66.7	4.2	17.9	22.9	10.2

Dwight-Lloyd

Date December 1912	Furnace	% Coke	% F.C.	Tons Wet Chge.	Slag % Zn	Slag Oz. Ag	Slag Wet Pb	% Pb. on Ch.	% Roast	% S on Ch.	% Matte Fall	Matte Pb	Matte Cu
3, 4	1	11.57	9.0	216	5.1	0.21	0.72	30.6	88.8	3.7	15.4	9.8	8.1
5, 6, 7, 8, 9	2	11.39	9.0	224	5.1	0.25	1.48	30.2	87.6	3.8	15.9	17.8	9.4
Av'ge		11.52	9.0	218	5.1	0.22	0.94	30.5	88.4	3.7	15.6	12.1	8.5

This tabulation indicates that 2% less coke-on-charge, better reduction, and higher speed attended the use of Dwight-machine product. It is to be noted that the Dwight-machine charge was run part of the time on one furnace and part of the time on the other, in order to make a fair comparison of the Dwight-Lloyd and H.-H. products regardless of local furnace conditions. In every instance except one, the Dwight-Lloyd product gave a more favorable showing than the H.-H.

It was found, in fact, that with furnace No. 2 doing poor work on the H.-H. charge, it was possible to straighten out both the tonnage and assays by switching to the Dwight charge. In all cases we had good crucibles, bright tuyeres, and cool tops, but it was found necessary repeatedly to take off considerable amounts of coke on the Dwight furnace, on account of persistent over-reduction.

It was found in general that our mechanical feeding arrangements were more favorably adapted to the proper distribution of the Dwight-machine product. As fast as they were indicated, however, changes were made in the distribution of both charges, and it was felt that each one of the changes made was in the nature of an improvement at the time. The test was too short, however, to permit these changes in feeding arrangement to proceed to a point at which the H.-H. product was distributed to absolutely the best advantage. In fact, had we been able to prolong the test, we could undoubtedly have made a more favorable showing for the H.-H. by further changes in feed-floor arrangement. It is true, however, that the over-reduction on the Dwight furnace prevented the large tonnages that were clearly indicated for the Dwight charge under proper conditions.

It should be noted that in these tests both charges involved larger percentages of roasted product than were used in the Murray trials—65.8% and 88% as against 37.5% and 60%.

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*Discussion of W. W. Norton's paper before the Salt Lake meeting of the A. I. M. E.

In Mr. Norton's recapitulation, five items are set down, two in favor of H.-H., two in favor of Dwight-Lloyd, and one with honors even. These same five items viewed in the light of East Helena operations, compare as follows:

(1) *Cost of Installation*: Regardless of location, this is, of course, in favor of the Dwight-Lloyd apparatus.

(2) *Cost of Roasting*: During the year 1913, the Dwight-Lloyd plant at East Helena accomplished a sulphur elimination of from 10.9% to 4.6%, while the H.-H. converter pots during the same period reduced from 10% to 5.1% sulphur. In this narrow range of sulphurs is seen the deterrent effect of the heavy dense lead charge at East Helena on both methods of blast roasting. The roasted material at present turned out in the H.-H. department averages 38% lead, while the Dwight-Lloyd sinter carries 43% lead. The H.-H. process is also favored to the extent of receiving the coarser Cœur d'Alene products while the Dwight-Lloyd beds take care of the slimes and fine concentrates. The average figures for the 12 months of 1913 show a cost per unit of sulphur eliminated, the same within a fraction of a per cent. for both processes. Three hundred tons per day are handled in the H.-H. plant, and about 400 at the Dwight machines.

(3) *Adaptability of Charge*: As at Murray, we recognize as greater leeway on the Dwight-Lloyd process in the physical and chemical variations possible in the charge.

(4) *Metal Losses*: Repeated tests on East Helena flues indicate, as at Murray, that lead losses are practically the same on both processes.

(5) *Physical Condition of Product*: An abundance of experience and testimony concerning the important part in reduction played by ascending blast-furnace gases makes it seem entirely logical and proper to us at East Helena to attribute the beneficial effect of Dwight-Lloyd product on our smelting procedure to its peculiarly cellular structure, allowing the reducing action of the gases to proceed over a maximum area of contact from the moment the charge begins its downward journey from the furnace top.

The dangers from the fusing of such predigested material (either Dwight-Lloyd or H.-H.) at too low a temperature in the furnace, should be and is offset, at East Helena, at least, by the faster descent of the charges containing these roasted products. Although 85% to 90% of our smelting stock is made up of roasting product (50% Dwight-Lloyd, 35% H.-H.), hot tops are practically unknown.

Recent years have found us gradually and steadily increasing the amount, and improving the character, of the roasted product on charge at East Helena, and with each step in the process, better blast-furnace results have been noted. In short, it is to the roasters and not the blast furnaces that we are inclined to give credit for accomplishing a notable improvement in smelting speed and general metallurgy during the last few years all over the country, and the Dwight-Lloyd process has played such an important part in this at East Helena that we are glad to add our word to the approval expressed by Mr. Norton. In going a little further in our appreciation and acknowledging a distinct superiority of Dwight-Lloyd over H.-H. product, we fully realize that the handling of 35% to 40% lead charges may present a rather extreme smelting procedure, and that these opinions as to the relative merits of Dwight-Lloyd and H.-H. roasted products may simply reflect local Montana conditions.

A summary of Murray and East Helena experience with these two roasting processes would appear, then, as follows:

	Advantage in Favor of	
	(At Murray)	(At East Helena)
Cost of installation	D-L	D-L
Cost of roasting	H.-H.	Even
Adaptability of charge	D-L	D-L
Metal losses	Even	Even
Physical condition of product	H.-H.	D-L

G. C. Riddell.

Superintendent, East Helena Smeltery.

East Helena, Mont., Aug. 27, 1914.

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Mine Taxation

Mr. Steele in the Journal, of Aug. 29, sets forth some interesting views on mine taxation. I shall not quarrel here with his general conclusions, but if they are based on conceptions no more accurate than some of his incidental ideas, I consider them untrustworthy. Have we not had enough of this thoughtless coupling of mining and agriculture, "the two basic industries?" In the first place, mining is not basic; in the second place, if it were, other industries than agriculture should be classed with it. Man can exist without mining. I have no doubt some Esquimaux do it today. Nor can he exist by mining alone. Therefore, mining is not basic. Agriculture or fishing or the chase are basic industries, because at least one of them is necessary for existence and any one is sufficient. Mining is a great aid to these other basic industries; so is transportation, with which it is most logically coupled; and so is lumbering which it closely resembles in its essential operations.

If we do adopt Mr. Steele's implied definition of a basic industry as one that creates new wealth, by what process of reasoning can we exclude lumbering, fisheries, the fur trade, many chemical industries such as nitrogen fixation, and a great number of minor lines of human activity?

I have no mind to decry the too-little recognized importance of mining, but let us not try to bolster it with statements that are wholly incorrect.

Robert Olds.

New York, Sept. 7, 1914.

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Pyritic Smelting

Referring to the excellent article on pyrite smelting in the Journal of May 2, it seems to me that the moisture contained in the charge, which must escape in the form of vapor, should account for some of the heat. The fumes, too, contain CO and SO_3 as well as the other gases mentioned. I have known sulphur to volatilize at a high temperature in the presence of free oxygen, so that quite possibly more than 10% would be driven off in that form. It is questionable, too, whether the smelter fumes passing through a flue are of uniform composition; I think the gas near the center will be found to vary from that near the outside.

W. H. Mawdsley.

Rockhampton, Queensland, June 29, 1914.

Editorials

The Labor Trouble at Butte

The labor war in Butte resembles the great war in Europe in that each was so long expected that fears had been allayed in the idea that neither would ever really happen. In both cases the wolf finally appeared at the door.

As for Butte, the explosion could hardly have happened at a more opportune time or with more auspicious circumstances. If the miners do not want to work it makes no great difference to the Anaconda company, which will be entirely satisfied if it can during the present period of distress keep its thousands of men from starving even if it makes no money itself.

The present trouble at Butte is not like the ordinary labor dispute which is between the employer and the employee. There are here none of the elements of self-interest that there were in the Lake Superior strike. At Butte it is primarily a fight between two labor unions, one of which does not want to let the other one work. Incidentally one has dynamited property of the other and there has been some murdering, not of "scabs" but of members of a labor union in good standing.

In the meanwhile, the company has stood aloof except for some concern lest the combatants should destroy some of its property, the remarks of one labor leader to the effect that he was going to run the mines and things in Butte generally being of threatening nature.

However, since martial law was declared and troops appeared on the scene, insuring the safety of the property of the mining companies and other citizens, there has been a feeling of relief and a willingness to see tested the principle of the right to work and whether that right belongs alone to members, not merely of a union but of one particular union. Thus is there a prospect of a great labor question being fought out without any participation by the employer and without any interest in making political capital on the part of the cheap politicians.

Potash Supply

The Journal has, upon sereval occasions, during the last two or three years published reports of potash discoveries in Spain. It now appears upon no less authority than the American Agricultural Chemical Co., that some of these deposits are of unmistakable promise and that it is now engaged in their exploration. They are said in the last report of that company to be similar in character to the German deposits, but richer in quality and probably more easily worked. It is hoped that these will be a commercial source of potash in the near future. In the meanwhile the company owning the deposits in southern California is actively pushing its operations, but it hardly expects to be a producer this year. The potash developments are encouraging, offering a distinct promise of relief from the German monopoly which has been oppressed for many years. However, it will take time to develop the new mines and pending the war potash is likely to be a scarce commodity.

Paying Wages in Mining Camps

A strong effort is being made in Arizona and southern California, emanating especially from Los Angeles, to abolish the payment of wages by checks on local banks. This is a good move. It is more convenient for an employer to pay by check, but manifestly it is less convenient for the employee. The upshot of the practice is that such checks are to a large extent cashed by the saloons, and the result is too often like this graphic narrative of the *Los Angeles Express:*

> Supposing, for example, a man goes into a saloon and gets someone to identify him so he can cash his check. The bartender hands out the money and looks inquiringly at the man he has "accommodated." What does the man do? Does he walk out and go home? Well, if he does he will never get another check cashed in that saloon, you may be certain of that. No; he says to his friend who has introduced him or vouched for him:
>
> "What'll you have?"
>
> And to the bartender and possibly others he says:
>
> "What'll you have, boys?"
>
> And then and there the trouble starts. Possibly he will leave immediately after one round of drinks, in which case he has only spent 30c., we will say, but even 30c. every Saturday night means $15.60 a year.
>
> How many, though, stop at one drink? And when they do, if the bartender is "onto his job," they are invited to take another at the expense of the house. This opens the way for other drinks—delays things, you might say—until one or more of the other boys drop in, and then the check-cashing is repeated and the drinking goes on.

In the big mining and smelting towns of southern Arizona there are hundreds of saloons, many of which derive a large part of their revenue from the cashing of checks and what naturally follows. Nobody supposes that the saloon man posts the notice "Checks cashed here" out of any altruistic motive.

True, the local banks keep open for the cashing of such checks, but the local bank, with perhaps a single paying teller, is not equipped to pay off promptly a large number of men, and the latter do not like to have to stand tediously in line. Nobody does. Nor is it right to compel the workman to incur inconvenience in order to get his money. Many of the largest employers of labor in the United States, including the Steel Corporation, the biggest of all, pay cash. All ought to. There was a time when the transportation of currency in the mining regions was attended with some risk. Every mine manager of 45 or 50 recollects carrying the monthly pay roll out to his mine with a guard, or with fear and trepidation, but those days passed long ago.

Anyway, the saloon is the curse of the mining camp, and of the mining company most of all. The saloons of Dublin Gulch, in Butte, are a parasitic pest upon the mining industry of that great center. Equally pestiferous are the saloons of Bingham and Bisbee. When a population of 1000 workingmen undertakes to support 10 saloons, with 30 to 50 barkeepers and their families, they put on their shoulders a heavy load. They would be better off if they supported the same number of idlers who neither toiled nor spun, since then the resultant mischief of the saloon would be cut out. The saloon everywhere works against thrift. Whatever works against thrift is contrary to the interest of the employer. The companies may not be able to vote their towns dry, but at least they can abolish the practice of paying wages by check and thus cease from playing into the hands of the saloon men.

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Attend to Making Improvements

The producers of copper and silver who are now operating on a reduced scale but are maintaining their technical staffs, abiding the time when conditions may become normal, may well make use of the opportunity to try out new ideas that may reduce the cost of production or improve metallurgical extraction. Every works has its enthusiasts among its staff who have some pet scheme they would like to experiment with, but when things are going full blast the general manager is likely to frown upon diversions from the regular routine involved in maintaining production. The condition is now different. So let the boys have a chance to work in the laboratory or in a corner of the works and let them have a little money even if the general policy be retrenchment. Similarly, let the young mining engineers have an opportunity to make some desirable changes in the mines. All hands can profitably spend their leisure time in studying out new systems of economy. Attend to making the mines safe and reduce the cost of accidents. In general, do all those things that ought to be done before the rush begins again.

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American Sheet Zinc

The shortage in the supply of sheet zinc is likely to be felt even more keenly than the shortage in spelter, a singularly large proportion of this supply having heretofore come from the Belgian and Silesian mills. In this form of metal, America can be less helpful than in spelter, our own rolling capacity being relatively small, probably not more than 35,000 tons per annum. Previous to Aug. 1, even that small capacity was only partially in use, business in sheet zinc having been very poor. We have no doubt that this situation has been totally changed of late. Anyway, the manufacturers have withdrawn their regular price lists and now quote only in a private way. In the early part of the year there were some importations of sheet zinc from Germany, which alarmed Lasalle and Peru considerably. That dread has, of course, now disappeared.

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Mr. Casey's Bill

The bill to transfer the safety work of the Bureau of Mines to a proposed new bureau in the Department of certain Mr. Casey has come forward with a bill (H. R., Labor appears to have died a natural death; but now a 18,500, introduced Aug. 21) to transfer the Bureau of Mines *in toto*. This is a bold conception; so bold, indeed, as to be humorous. However, it will not do to assume that this bill is a joke which will be killed in committee. No stone should be left unturned to defeat it overwhelmingly and decisively. Let imagination picture the fate of the Bureau of Mines under the direction of Brother Wilson.

No Check to New Metallurgical Construction

Most of the big new metallurgical constructions are going on uninterruptedly. These are especially the Inspiration, Chuquicamata and Juneau plants. None of them is yet a producer, except Inspiration in a very small way, all of them are financed and there is, of course, no reason why construction should be checked in their cases. With a producer that is engaged in new construction the situation is quite different. A producer is apt to have a large part of its surplus in the form of unsold metal. When conditions arise, as they did in August, which prevent the normal sale of such metal, the management has to think about the conditions of carrying it and ordinary prudence decrees the suspension of outlay on new construction until the sky becomes clearer. This is one of the ways in which the war has seriously affected the mining industry.

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Paying Wages for Keeping the Working Place Safe

The Calumet & Hecla Mining Co., according to the testimony of its manager, Mr. MacNaughton, before the Congressional Committee investigating the recent mine strike, insists that each miner, whether on contract or not, keep his working place safe by barring off the loose hanging, and puts no limit whatever on the time thus occupied. If the miner is on contract, and has to do an unusual amount of barring down, such as to detract from the time of his contract to an appreciable extent, say half a day or three-quarters of a day, he is allowed company time for this. If the work is such that it is impossible for one man to do it, he has the right to call in a neighboring miner or a timberman to help him, and if such a one should be on contract, he is also recompensed by the company. The company considers it cheaper to allow unlimited time for this work rather than to run the risk of injury to an employee. As Mr. MacNaughton put it, the company pays in one case wages for a shift or two and in the other compensation for an injured or killed employee, one being a matter of from $3 to $10 and the other several hundred dollars This point of view, perhaps, is not strictly correct, since the one case is a certainty and the other at most a possibility Nevertheless, the cost of time spent in cleaning off a back is cheap insurance against the risk of accident by a fall of ground

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James MacNaughton, manager of the Calumet & Hecla, was questioned before the Congressional Committee investigating the recent strike, in regard to the appointment and competency of hoisting engineers. Mr. MacNaughton recalled the fact that the only hoisting engineer of whom complaints had been made was a socialist. When asked whether the men had thought that his belief might jeopardize them while being hoisted or lowered, Mr. MacNaughton replied that he did not think they objected to his being a socialist so much as to his being prone to preach socialism instead of attending to hoisting. We can easily conceive that miners would prefer to be hoisted by men with their attention fixed on the signals and the levers rather than on means of promoting a more equitable distribution of this world's wealth.

Trade Posibilities with Brazil

By Henry C. Carr[*]

The general war in Europe, with the subsequent stoppage of export, should prove the golden opportunity for American manufacturers. In the past the manufacturer in the United States has seemed content to let business come to him or to be perfectly satisfied with having a representative, who also represented a great many others in Rio Janeiro. Perhaps he did not realize the fact that Brazil is larger than the United States and that Para is 11 days away from Rio Janeiro by the fastest boat. At any rate, the business, or at least the greater part of it, is in the hands of the Germans and English. This hardly seems a fair proportion when the United States takes at least 75% of both the rubber from the North and coffee from the South.

Personally, I think that there are two reasons: First, that both the Germans and English have direct steamboat lines running to Brazil, and secondly, the Germans especially go after the business. A German is a born linguist and it is safe to say that every one of them that goes to Brazil, talks the language fluently before his arrival. The fact of being able to talk the language is one of the greatest assets one can have, as no matter how good a line of goods a man may have, still he will find that the preference is given always to the man who can speak the language. Again, German firms keep representatives on the ground, that is, in each city of any size, the Brazilian can order direct from a German representative. Now that this war is proceeding, it is certainly the chance for American manufacturers, especially for iron and steel products, lead, zinc, paint, etc. The American is supreme in only three things in Brazil, flour, shoes and Collins hardware. He may get a small part of the other things but it would be small. For instance, the government is building a railroad from Maranor to Baxias, 468 kilometers. There are an immense number of bridges required on this road, from 10 m. up to 40 m. in length, as many in fact as 14 in 40 km. in one section. They are all ordered in Belgium, but I do not see any chance of either manufacture or delivery, and there is a golden opportunity. The same way with rails, railroad equipment, locomotives, portable railways, pipe and all the lead and zinc products, and paint. Now is the time to go and get this business and keep it. The same way with coal. All the gas plants, river steamboats on the Amazon, the Lloyd Brazileiro running all around the coast to Rio, the Madeira Marmoré R.R., all burn Cardiff coal when Norfolk, Va., is almost as good and is directly in line.

The German, when he gets an order from Brazil, is punctilious about his shipment. He has it put into boxes that the damp will not affect, as everything gets moldy in a week in the north of Brazil. He is careful about his weights and measurements. I do not think in the United States we pay enough attention to these matters.

In concluding, I want to draw attention to payments. Generally payments are made by 60- or 90-day drafts against the bill of lading. The merchant will accept and, being honest at heart, will pay if he possibly can, still as there are few banks in the North, it will be found hard to discount these accepted drafts. In the South it is different, as the population is greater and there is a regular banking system. The Brazilians like the Americans and regard us as their very best friends. Now is the time to go and get business which really belongs to us.

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[*] 71 Broadway, N. Y.

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Legal Aspects of Mining Claims

The following principles of mining law were recently reannounced by the United States Circuit Court of Appeals for the Ninth Circuit, in the case of Mason vs. Washington-Butte Mining Co., 214 *Federal Reporter* 32:

A patent to a placer claim conveys to the grantee all mineral within the claim, including veins or lodes not known to exist at the time of the application for the patent.

"Discovery" means the acquirement of knowledge that a vein or lode exists within the limits of a claim. Although it is not necessary that pay ore be found, in order to make a valid discovery, it is essential that the indications be of such character that miners in the district would follow them in the expectation of finding such ore as would justify them in working the claim.

Before it can be held that veins or lodes are excluded from the grant of land included in a placer patent, it is not sufficient to show that the land does in fact contain valuable minerals, but it must be shown that, at the time of the application for the patent, more has been discovered than the indications of mineral which would ordinarily sustain a lode location, and that it was at that time known to the applicant for the placer patent, or known to the community generally, or else disclosed by workings and obvious to anyone making a reasonable and fair inspection of the premises, for the purpose of obtaining title from the government, that there was rock in place bearing minerals of such extent and value as would justify expenditures for the purpose of extracting them.

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Bureau of Mines Rescue Car No. 5

It is expected that the U. S. Bureau of Mines Car No. 5 will visit California mining districts from Sept. 9 to Oct. 31, the attendants giving training in mine-rescue and first-aid work in some of the mining districts. The itinerary, which will probably be adhered to fairly closely, follows: Sept. 9-19, Colfax; Sept. 20-27, Jackson; Sept. 28-Oct. 5, Angels Camp; Oct. 6-13, Melones; Oct. 13-20, Jamestown; Oct. 22-31, Kennett.

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Prospective Open Shop in Butte

The Journal is in receipt of a telegram from Butte, Mont., dated Sept. 8, to the effect that 13 of the mining companies operating there unite in declaring for an open shop because of the acts of the new miners' union and the helplessness of the remnant of the old union with which the companies had working contracts. The statement issued by the companies declares that hereafter nobody will be permitted to visit the mines for the purpose of inspecting working cards. The only company not subscribing to the statement is the Davis-Daly, which was not represented at the meeting.

PERSONALS

C. F. [illegible], president of the Spanish American Iron Co., is in Cuba on business.

H. D. McCaskey, U. S. Geological Survey, left San Francisco recently for Salt Lake and Denver on professional business.

Frederick D. S. Robertson, mining engineer, of Toronto, Ont., has gone to the war in Europe with the 48th Highlanders in the British Army.

Edward E. Free, late of San Francisco, will after Oct. 1. be with the Department of Plant Physiology, Johns Hopkins University, Baltimore, Maryland.

R. G. McConnell, of the Canadian Geological Survey has been appointed to the position of Canadian Deputy Minister of Mines in place of Prof. R. W. Brock, who recently resigned.

J. B. Tyrrell, of Toronto has been making an examination of the lower portion of the Valley of the Fraser River in British Columbia with the object of determining the probability of the occurrence of oil in paying quantities.

H. W. Hardinge has just returned to New York from an extended western trip which took him up as far as Dawson. Mr. Hardinge has now gone on a trip to Porcupine and will return to New York about the middle of September.

Thomas H. Leggett, who has been in charge of the mining interests of the American Smelting & Refining Co., has severed his connection with that company and has resumed practice as consulting engineer, with offices in the Singer Building, New York.

Samuel Mather, senior member of the firm of Pickands, Mather & Co.; William G. Mather, president the Cleveland-Cliffs Iron Co., and E. W. Oglebay, senior member of the firm of Oglebay, Norton & Co., all of Cleveland, Ohio, have returned from Europe.

P. R. Conlin, superintendent of Dover furnace of M. A. Hanna & Co., Cleveland, at Canal Dover, O., has been appointed general superintendent of the United Iron & Steel Co., Cleveland, to succeed B. J. Mullen, resigned. Mr. Conlin will have charge of Cherry Valley furnace at Leetonia, O., and Fannie furnace at West Middlesex, Penn.

Gould, Free & Ash, chemical engineers, announce that on Aug. 31, Edward E. Free retired from the firm. The business will be continued by Ralph A. Gould and Charles S. Ash under the firm name of Gould & Aash with offices as formerly in the Monadnock Building, San Francisco.

E. Harms, general superintendent of the Cia. Metalurgical de Torreon, Torreon, Mexico, had the misfortune to be in a railroad accident near Chicuahua, while enroute from Torreon to El Paso with his wife. Mrs. Harms was killed and he sustained severe injuries. He is now recovering. The plant will soon start operations after a shut-down of more than a year.

R. A. Kinzie, Superintendent for 14 years; E. P. Kennedy, assistant superintendent for eight years; W. P. Lass, superintendent of the cyanide plant for seven years, all of the Alaska Treadwell Gold Mining Co., and G. C. Jones superintendent of the Alaska Juneau Gold Mines Co. for five years, resigned to take effect Sept. 1. Their resignations were accepted. Mr. Kenzie will go to California with his family, Mr. Lass and Mr. Kennedy will open offices in Juneau in connection with the Speel river electric-power project, and Mr. Jones will live in the states. No successors have been named but it is generally understood that Philip Bradley will be in charge of the Alaska Juneau operations.

OBITUARY

John Armstrong Rollins, member of the firm of Naylor & Co., New York iron and steel merchants, and vice-president and director of the American Grondal Co., died at the Nassau Hospital, Mineola, N. Y., Aug. 27, from injuries sustained in playing polo. Mr. Rollins was a native of London, and was 43 years old.

James M. Frink, for 32 years president of the Washington Iron Works Co., Seattle died at his home Aug. 31, of heart failure. Mr. Frink was prominently identified with the iron and steel industry on the Pacific coast. He has been affiliated with the United Metal Trades Association of the Pacific Coast in various official capacities for many years, and it was through his efforts that the Washington Iron Works Co. grew from small beginnings to one of the largest manufacturers of logging equipment in the northwest. Mr. Frink is survived by his two sons, Gerald and Francis G. Frink, who will continue actively in charge of the business of the Washington Iron Works.

SOCIETIES

American Society of Mechanical Engineers—As heretofore announced the preliminary work of the Committee to Formulate Standard Specifications for the Construction of Steam Boilers and Other Pressure Vessels and for the Care of Same in Service, was completed last February and placed in the form of a tentative report of limited edition for critical study and improvement. It is now to be submitted to public hearing for further suggestions and improvement. A hearing is to be held Sept. 15 in the rooms of the Society, No. 29 West 39th Street, New York.

American Association of State Geologists—The summer meeting of this association convened at Houghton, Mich., on Aug. 27, with 18 members in attendance. On the afternoon of that day, an hour was spent in inspecting the Michigan College of Mines, after which some geological formations in the vicinity of the Isle Royale mine were examined. The latter inspection was made under the guidance of Dr. L. L. Hubbard, former state geologist, and W. E. Hopper, assistant professor in geology at the Michigan College of Mines.

A business meeting, held on the evening of that day, at the Houghton Club, was devoted to the relation of the geological surveys of the various states and the Federal Government. Dr. Allen, state geologist for Michigan, explained the method by which the Government appropriates money to the various states, in proportion to the money appropriated by the state itself, this money to be used in preparing a topographical map by states. The discussion at the evening meeting was in connection with the proposal that Federal aid should be based on area and population, rather than on the amount that each state appropriates. The matter has a direct bearing on the State of Michigan, which at present has only completed about 11% of its map, while other states have completed as much as 43%. The proposed change would enable Michigan to obtain more money to prosecute the work, and is especially desirable because of Michigan's importance as a mineral state. It is hoped the discussion will result in some congressional action being taken on the matter.

On Aug. 28, part of the morning was spent at Eagle River, in Keweenaw County. This is at the north end of Keweenaw Point, north of the Calumet district. Some of the interesting geological features of the vicinity were viewed by the visitors, and the balance of the morning was spent in examining some of the surface plants of the Calumet & Hecla Mining Co. After luncheon the outcrops in the Houghton Douglas ravine were examined, and from there the party continued to the Calumet & Hecla regrinding plant at Lake Linden and the smelters at Hubbell. The party expected to leave Aug. 28 for the Marquette iron range, where the meeting will be continued. No election of officers took place as that is done at the winter meeting of the association, usually held in the East.

Iron & Steel Institute—A circular from the secretary's office in London says: "In consequence of the war, the Comité des Forges de France has been obliged to cancel all arrangements for an autumn meeting of the Institute in France this year. Under the circumstances, the Council has decided that it would be advisable to postpone for the present the organization of any alternative arrangements for an autumn meeting for the reading and discussion of papers. A number of papers have been submitted with a view to their presentation at the meeting which was to have been held at Paris, and the Council proposes to print in the usual way advance copies of those papers approved for publication and to invite discussion thereon by correspondence. It is expected that the copies will be ready for issue about the second week in September."

The following is the list of papers that have been submitted:

1. E. D. Campbell, "Note on the Theory of Hardening and on the Constitution of Steel.
2. G. S. Cooper, "By-product Coking Industry and Its Relation to the Manufacture of Iron and Steel."

3. L. Dufty, "Determination of Cobalt in High-speed Steels."
4. L. Guillet, "Electrolytic Iron, Its Manufacture, Properties and Uses."
5. G. Hailstone, "Transverse Testing of Cast-iron."
6. W. L. Johnson, "Utilization of Heat Contained in Slags."
7. N. G. Kapp, "Mechanical Charging of Blast-furnaces."
8. P. Nicou, "Iron Ore Deposits of Lorraine and the West of France."
9. H. de Nolly and M. Veyret, "The Transformations of Steels."
10. J. A. Pickard and F. M. Potter, "Oxygen Content of Openhearth Steel."
11. A. M. Portevin, "Decarburisation of the Steels in Salt Hardening Baths."
12. A. M. Portevin and V. Bernard, "Influence of Coalescence on Mechanical Properties of Steels and Alloys."
13. A. Sahlin, "Use of Liquid Ferromanganese in the Steel Processes."
14. A. Spannagel, "New Process for Heating Blast-furnace Stoves."

El Paso School of Mines—Faculty for school, which is a branch of the University of Texas, has been selected. First semester commences Wednesday, Sept. 23, with encouraging enrollment for the new institution. The installation of an ore testing plant is proposed. S. H. Worrell is dean of the school.

INDUSTRIAL NEWS

The International Steam Pump Co. went into receivership on Aug. 27. The business of the subsidiary companies will not be affected.

Luitwieler Pumping Engine Co., Rochester, N. Y., Catalog; The Luitwieler System of Non-Pulsating Triplex Pumps, 32 pp., Illus., 9x6 inches.

The appointment of A. H. Whiteside as vice-president and general sales manager of the Goulds Manufacturing Co., of Seneca Falls, New York, manufacturers of hand, triplex and centrifugal pumps, has just been announced.

The Bell Development Co., Duluth, Minn., has contracted with the Mesaba Boiler & Manufacturing Co., of that city, for a furnace designed to treat the manganiferous ores of the Cuyuna range. The company adds that it will manufacture spiegeleisen and ferromanganese and that it expects to have the furnace in operation about Sept. 15, with a capacity of 50 tons a day, says the "Iron Age." This seems rather an early date to set.

Two 1250-hp. (sea-level) Carels-type Diesel engines have been built for Phelps, Dodge & Co., for the central power plant of the Burro Mountain Copper Co., Tyrone, N. M. The plant is situated at an elevation of 6700 ft., at which height the normal power developer will be 1000 hp. Each engine is direct connected to an 815-kw.-a. G. E. 60-cycle, three-phase alternator. One engine is now ready for operation, the other practically erected in the power plant. They are two-cycle engines, with five power cylinders, and a scavenging air cylinder, driven directly from the main crankshaft. These engines were built by Usines Carels Freres, of Ghent, Belgium. As already noted in these columns, the Usines Carels Freres have concluded exclusive arrangements with the Nordberg Co., of Milwaukee, Wis., to build the Carels-type Diesel engines in this country.

TRADE CATALOGS

The Ruby Manufacturing Co., Jackson, Mich., Bulletin. Ruby All-Steel Sectional Buildings 12 pp. Illus. 9x6 inches.

Western Electric Co., New York, N. Y. Catalog. Magneto Telephones and Supplies. 40 pp., illustrated, 10½x8 in.

The American Rolling Mill Co., Middletown, Ohio. Pamphlet. Iron Roofs That Resist Rust. 18 pp., illustrated, 6x9 in.

National Tube Co., Frick Bldg., Pittsburgh, Penn. "National" Bulletin No. 7D. 5th Edition. N. T. C. Regrinding Valves. 8 pp., 1 Illus., 8½x11 inches.

Alberger Pump & Condenser Co., 140 Cedar St., New York. Catalog E. Alberger centrifugal pumps, Alberger-Curtis steam turbines. 56 pp., illustrated, 6x9 in

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALLOY-STEEL SCRAP—Method of Treating. Paul P. Reese and Emory L. Diehl, Munhall, Penn. (U. S. No. 1,108,235; Aug. 25, 1914.)

ALLOYS—An Improvement in the Production of Metal Alloys. L. Goldmerstein, New York. (Brit. No. 7103 of 1913.)

BIN. Wilbur E. Sanders, Sonora, Calif., assignor of one-half to Annette J. Chamberlain, Berkeley, Calif. (U. S. No. 1,107,846; Aug. 18, 1914.)

CONCENTRATION—Belt Concentrating or Vanning Machine for Separating Pulverized Ores and Similar Material. Orrin H. King, Chicago, Ill., assignor to United States Concentrating Co. (U. S. No. 1,108,186; Aug. 25, 1914.)

CRUSHING MACHINE. Thomas Leggett Sturtevant, Quincy, and Thomas Joseph Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co. (U. S. No. 1,105,713; Aug. 4, 1914.)

CRUSHING MILL. Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. Nos. 1,105,712; Aug. 4, 1914, and 1,107,373; Aug. 18, 1914.)

DRILL—Fluid-Operated Drill and Handle Therefor. Caid H. Peck, Athens, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,105,998; Aug. 4, 1914.)

DRILL—Rock-Drill. George J. Beaudin, Flat River, Mo. (U. S. No. 1,106,537; Aug. 11, 1914.)

ELECTRIC FURNACE. George Hillard Benjamin, New York, N. Y. (U. S. No. 1,106,486; Aug. 11, 1914.)

ELECTRODE for Furnaces. Carl Hering, Philadelphia, Penn. (U. S. No. 1,106,381; Aug. 11, 1914.)

FLOTATION—Separation of Zinc Blende and Other Metalliferous Constituents from Ore Concentrates and Slimes by Flotation or Granulation. Edward James Horwood, Broken Hill, N. S. W. (U. S. No. 1,108,440; Aug. 25, 1914.)

FURNACE WALLS AND TUYERES—Improvements in and Relating to the Walls and Tuyeres of Furnaces. W. Piernay, Stettin, Germany. (Brit. No. 7206 of 1914.)

GALVANIZING MACHINE. Miles W. Trout, Youngwood, Penn. (U. S. No. 1,107,464; Aug. 18, 1914.)

HARDENING FURNACES—Apparatus for Automatically Charging Hardening and the Like Furnaces. Robert Röntgen, Remscheid, Germany. (U. S. No. 1,107,449; Aug. 18, 1914.)

HOISTING—Controlling Apparatus for Hoisting Engines. Clarence R. Welch, Scranton, Penn. (U. S. No. 1,108,044; Aug. 18, 1914.)

INGOTS—Method of Treating Ingots. Herbert C. Ryding, Birmingham, Ala. (U. S. No. 1,108,243; Aug. 25, 1914.)

INGOTS—Method of Treating Ingots. George C. Crawford, Birmingham, Ala. (U. S. No. 1,108,862; Aug. 25, 1914.)

IRON ALLOYS—Process of Manufacturing Iron Alloys. George M. Colvocoresses, New York, N. Y. (U. S. Nos. 1,106,785 and 1,106,786; Aug. 11, 1914.)

JIG PLUNGER. Guy H. Elmore, Swarthmore, and Horatio V. Croll, Philadelphia, Penn. (U. S. No. 1,108,558; Aug. 25, 1914.)

LEACHING—Agitator and Filter for Treating Ores. John D. Fields, Maxville, Mont. (U. S. No. 1,107,922; Aug. 18, 1914.)

OPEN HEARTH FURNACES—Charging Apparatus for Open-Hearth Furnaces and the Like. John Albert Swindell, Pittsburgh, Penn. (U. S. No. 1,106,988; Aug. 11, 1914.)

ORE-CONCENTRATING MACHINE. George W. Burnhardt, Ward, Colo., and Albert Krieg, Kansas City, Mo. (U. S. No. 1,106,923; Aug. 11, 1914.)

ORE TREATMENT—Metallurgical Process for Ores Containing Arsenic and Nickel or Cobalt, Especially those of the Temiskaming District. W. McA. Johnson, Hartford, Conn. (U. S. No. 1,107,310; Aug. 18, 1914.)

POTASH—Process of Extracting Potassium Compounds from Siliceous Minerals. Thomas B. Stillman, Hoboken, N. J. (U. S. No. 1,106,984; Aug. 11, 1914.)

RESCUE APPARATUS—Smoke Mask for Respiration Apparatus. Alexander Bernhard Dräger, Lubeck, Germany, assignor to Drägerwerk Heinr. und Bernh. Dräger, Lubeck, Germany. (U. S. No. 1,105,127; July 28, 1914.)

RIFFLEBOX. Karl F. Nelson, Kellogg, Idaho. (U. S. No. 1,104,919; July 28, 1914.)

ROASTING FURNACE. Albert Zavelberg, Hohenlohehütte, Germany. (U. S. No. 1,107,006; Aug. 11, 1914.)

SEPARATOR. John M. Allen, Anaconda, Mont. (U. S. No. 1,107,472; Aug. 18, 1914.)

TIN—Process of Manufacturing Stannic Chloride from Materials Containing Oxide of Tin. Hans Goldschmidt, Essen-on-the-Ruhr, Germany. (U. S. No. 1,105,902; Aug. 4, 1914.)

TUNNELING—Process for Moving Material. William Cooper, Denver, Colo. (U. S. No. 1,106,863; Aug. 11, 1914.)

URANIUM—Incandescent Body for Electric Lamps. William G. Hughes, Pittsburgh, Penn. (U. S. No. 1,106,384; Aug. 11, 1914.)

VANADIUM—Process for Extracting Vanadium from Vanadium Ores. Harold Boericke, Newmire, Coro. (U. S. Nos 1,105,241 and 1,105,215. July 28, 1914.)

VANADIUM ALLOY—Alloy of Vanadium and Precious Metals. Felix Freiherr von Oefele, New York, N. Y., assignor of one-half to Heinrich Schweitzer, New York, N. Y. (U. S. No. 1,107,180; Aug. 11, 1914.)

ZINC—Process for the Extraction of Zinc from Zinc-Bearing Refuse. Ralph R. Parish, Waterbury, Conn., assignor to Chase Rolling Mill Co., Waterbury, Conn. (U. S. No. 1,104,922; July 28, 1914.)

Editorial Correspondence

SAN FRANCISCO—Aug. 27

The U. S. Bureau of Mines has arranged for a first aid field meet at Jackson, Amador County, on Labor Day, Sept. 7. Mr. Krogdahl will be in charge. Fifteen first-aid teams from the Mother Lode region will enter the contest. Prizes are to be awarded winning teams by the American Mine Safety Association and operators and owners along the Mother Lode. As a result of Mr. Krogdahl's work in coöperation with the California Industrial Accident Commission a great deal of interest has been aroused in first-aid practice in the mining district of the state. The meet at Jackson should, and no doubt will, create a greater interest and result in permanent good.

Closing Down of the Balaklala Mine at Coram, Shasta County, is reported. Four men remain at the mine and four at the smelting plant. The buckets have been removed from the aërial tramline, the ore cars and locomotives housed and the mine placed in order for indefinite shut down or for immediate resumption, as may be decided upon. The mine was shipping 250 tons of ore per day, part to the Mammoth plant at Kennett and part to Yerington, Nev. The Hall process plant, built for experimental purposes, had not been in recent operation, and the resumption of smelting was awaiting the results of this experiment or some other method of neutralizing the fumes. Prior to the outbreak of the European war the Balaklala was in fine shape for resumption of complete operation of mine and plant, and the partial operation of the mine was on a profitable basis, even though all the ore extracted was shipped. But the continued operation of the mine on a further reduced scale would evidently have been unwarranted.

The New Orebody Recently Disclosed in the Belcher on the Comstock is stated by Whitman Symmes to have the appearance of being the greatest strike made on the Comstock in the past 30 years, because of the probability that it will develop into an extraordinarily large body of good grade. The ore is on the foot wall, and on the 1500-ft. level appears to be 60 ft. wide, averaging probably $8 per ton. Values improve on the 1600-ft. level, car samples going as high as $15 per ton from a raise being driven. Even before stoping has begun the Belcher is making expenses out of the ore extracted in development. When direct connection is made with the shaft the ore can be mined and milled for less than $5 per ton. Similar ore was mined above the Sutro tunnel level several years ago, which averaged $20 per ton, and was known as "the gold rock," differing in appearance from the silver ores. Stocks of the Gold Hill group of mines furnished the leading features of trading at the short sessions of the San Francisco Mining Exchange on the strength of the report of Symmes and the further report that those properties have become self-supporting.

The Situation at the Zeila Mine in Amador County indicates the probable resumption of operation within the next year. Dismantling of the worn-out surface and removal of equipment from the old underground workings have been completed, leaving the hoisting machinery, boilers and compressor intact. The property is in fine condition for renewed development of the orebodies disclosed in the north end of the mine by the latest operation of the owners and further proved by the extensive examination made by Robert E. Cranston for Breitung & Co. The ore is low-grade, probably under $4 per ton, and the situation of the orebodies will necessitate sinking a new shaft to a depth of 1500 ft. in order to bring the cost of development and extraction within a figure that will admit of profitable operation. This condition is largely responsible for failure to sell the mine to prospective purchasers who have made examinations within the past two years. The question of terms may have been partially responsible. Large investors in new and old mines in California have repeatedly declined to make any cash payments. Large bodies of low-grade ores may unquestionably be mined and treated at a profit, even in the Mother Lode region where the ores are not generally amenable to cyanidation. But where the ore is wholly low-grade and the initial cost of entire new equipment must be added to the purchase price of the mine, and the sinking of 1500 ft. of new shaft must be added to the cost of mining, the condition does not lend encouragement to the prospective purchaser, particularly in the absence of liberal terms of purchase. That a more liberal management may succeed the present is not at all probable. Rather, the present management is more likely to gain complete control. It is this probability that lends color to the belief that the Zelia will resume operation without being sold to a new company. The purchase of sufficient stock to entitle the management to undisputed control and to enjoyment of the largest share of the profits of operation would require a much smaller investment than the purchase of the entire property outright; and there is no reasonable doubt that it would be a safe investment.

BUTTE—Sept. 4

Butte Business Men Asked to Aid Prospectors—The Butte Chamber of Commerce being in receipt of numerous requests from all parts of the state asking the organization to take up the matter of the present laws governing location and working of mining claims with a view to securing an extension of time and a lessening of the amount of development work now required of the prospector. The Butte men are urged to coöperate with other commercial bodies in the state in asking members of congress to support a bill providing for a suspension of the requirement of $100 worth of work each year on each claim held. Secretary Austin of the Butte Chamber of Commerce announced that the importance of the mining industry and its relation to other industries is realized by Butte business men and that the matter of proposed legislation to aid the prospector will therefore be taken up at once by the Butte chamber.

Mine Workers Union—The proposal was submitted that all miners employed in the Butte mines should be forced to become members of the new union and wear its button. This was first carried into effect at the Anaconda mine on the morning of Aug. 26. On that day a committee of 20 representing the new union called at the Anaconda shaft and notified the miners employed there that they would be expected to secure, and wear the union's button, thereby indicating membership, or they would not be permitted to go underground. The men were given 24 hr. in which to join the union and secure the button. At 5 p.m., after a special meeting of the union, a parade consisting of about 300 men marched up to the Anaconda mine to inform the night-shift men of the demands made to the day shift. On the following morning the jurisdiction committee assisted by members of the new union took from their work at the Anaconda mine, 34 miners who had failed to obey the order, and led by President Muckie McDonald marched them as prisoners to the union hall and thence to a vacant lot, and there tried them in informal fashion on the charge of being enemies to the new union. By a vote of the miners assembled, 31 of the prisoners were given until seven o'clock in the evening to join the union; the other three were expelled from Butte. Suspcted of being gunmen and friends of Moyer and the old union, they were escorted to a point beyond the city limits and ordered to keep going and never to come back to Butte. It is reported that they returned to town under the protection of Sheriff Driscoll.

As this act of the union reduced the crew of men employed at the Anaconda mine below the required number, the mine was shut down for the time being. Five members of the old Butte Miners Union No. 1 thereupon called upon Mayor Duncan, demanding protection for the miners who were forcibly taken away from their work and from their homes by members of the rival union. One member of the committee stated that the Mayor on that occasion remarked that he was "absolutely powerless" to do anything.

On the morning of Aug. 28 the committee charged with the work of enforcing the exclusive jurisdiction of the Butte Mine Workers' Union in all mines of the camp, repaired to the St. Lawrence mine where the same demand was made of the miners as was made at the Anaconda mine on the preceding morning. It was also announced that the committee would visit one mine after another for the same purpose. This caused a great number of miners, anxious to keep their jobs, to join the new union and secure the required buttons.

On the morning of Aug. 29 one miner who refused to join the new union was taken from the St. Lawrence mine by the jurisdiction committee and marched out of town to the west of the city limits and told not to come back. In the evening of the same day members of the new union held an open-air meeting in front of the Auditorium at which President McDonald declared that the new union would not submit to the arrest of its officers or members on account of their forcing miners into the union and deporting those who refused to join. He also emphasized the fact that "the union is running things in this city"; denied that the union had broken any law; promised that it intended to be peaceable but if molested would resist with force.

Numerous placards bearing the names of the executive committee were posted at all mines. The placard says:

> This is to notify you that your union has made arrangements with the companies whereby these conditions will be corrected at the earliest possible moment. And you are hereby notified that after this date there will be no more blasting at dinner hour or during the shift, and an infraction of this order must be promptly reported to the union. A water system will be installed as quickly as possible for dampening the rock before putting in the chute and the workings where needed, and fans installed where most needed. You are requested to report to the union any places which you consider wholly unfit to work, and the union will see to it that such condition is corrected. You are further notified that wherever water is now available to be sure, in interest of your own health as well as that of the rest of your fellow workers, to use it. Careless or indifferent workers failing to do this should be promptly reported to the union or your grievance committee on the job. The workers are admonished in the interest of health, sanitation and common decency to use toilet tanks wherever provided, and where there are none report that fact immediately to the union.
>
> Report to your grievance committee on the job any grievance which may arise and, in case you are unable to settle it, fail not to bring it before your union. Treat the boss in the mine upon that reciprocal basis and relation upon which should most justly rest the traffic between individuals and all mankind. Upon no other. Treat him as every man, who is a man, should treat every other man. Stand up in full dignity of real manhood and do not under any circumstances tolerate in the future, as in the past, from any boss, any bulldozing, brow-beating, bamboozling, or abuse of any kind, and if you receive any such treatment, do not be slow in letting it be known to the grievance committee or the union. If you feel you have been unjustly discharged without warrant or sufficient cause, do not be slow in letting it be known.
>
> And let us all pull and coöperate to build a union, for, by and in the interest of all workers.

The company's rules are that miners will blast two minutes before going off shift, which gives the mine time to clear of smoke before next shift goes to work.

At 1:30 o'clock on the morning of Aug. 30, the employment office of the Anaconda company, located at the Parrot mine, was dynamited and wrecked by unknown parties. This office was established some time ago by the company to carry on the hiring of men in a more efficient manner than had been the practice heretofore; any man who wishes to ask for employment at any of the company's mines must be provided with a "rustling card" which is secured at the employment office, where he has to give his name and a brief account of his previous employment and his fitness for the job applied for. The establishment of this office met with a good deal of objection on the part of the miners and efforts were made at various times to induce the companies to discontinue it. The dynamiting put the office out of commission for the time being. The Anaconda offered $10,000 reward for information leading to arrest and conviction of perpetrators.

Following this event, President McDonald issued a statement denying all rumors that members of the union had a hand in the outrage. He admitted, however, that it was the intention of the union to bring about a cessation of the rustling card system but not "in that way." The act of violence was attributed by the members of the new union of that union. No one was hurt by the explosion.

On the morning of Aug. 30, the jurisdiction committee of the Butte Mine Workers' Union appeared at the Tramway mine, a property of the Anaconda company and warned the day shift before going underground that they should strictly observe the new working rules recently promulgated by the organization. One of the delegates, pointing to the placard said to the men gathered at the top of the shaft: "You are expected to live up to these rules. There is to be no blasting between shifts. Any violation of these rules is to be reported." Thereupon the men were lowered into the mine and work was resumed without interruption or incident.

In view of the possibilities of further disturbances due to the labor situation, 300 citizens organized under military rules and secured the necessary permits to carry arms to protect the homes and business interests in the city of Butte. The organization is entirely separate from the mines and the forces of the mining companies and from Sheriff Driscoll's force of 200 deputies. The cause for the formation of the organization was the reports from authentic sources of the threats being made in certain quarters. Men who were supposed to be I. W. W. agitators speaking on street corners, were reported as urging the looting of stores. Other threats of direct action, of dynamiting and of all kinds of violence emanating from men supposed to be leaders among the miners, added to the feeling that citizens should take measures to protect the city.

The water company and the Montana Power company both made arrangements to protect their properties from any attack that might result in the city being without water or light.

Governor Stewart, in order to be prepared for emergencies assembled at Helena 10 companies of the National Guard of Montana 600 strong, ready to move at any moment to Butte. He also asked President Wilson for Federal troops.

On Aug. 31 the Butte Mine Workers' Union held two meetings at which it was announced that they would proceed with their original program according to which all miners must join the new union and abide by the rules promulgated by that union. A communication was sent to Sheriff Driscoll asking him to deputize 250 members of the union. It was promised and guaranteed that these deputies would preserve order at all times and in all parts of the city. At these meetings many suggestions were made as to what should be done to prevent troops from coming to Butte and what action should be followed if they did come. Business men were asked to sign a petition asking the governor not to send the militia. It is said that 160 signatures were secured. During the meeting President Muckie McDonald predicted that "there will be something doing" if troops came to Butte.

As previously reported in the Journal, martial law was declared the night of Sept. 1 and the National Guard was called to Butte. The establishment of martial law was attacked by union attorneys by means of a petition filed in the U. S. District Court. Attempts to find McDonald and other union officers were unsuccessful according to latest reports available. It is further reported that the militia taking its cue from Europe established a censorship on news.

SALT LAKE CITY—Sept. 3

The Salt Lake Stock & Mining Exchange has continued business in spite of the war, and is said to be the only exchange in the country which has done so. During August, a total of 192,715 shares was traded in, for which there was a market value of $54,930. During July there were 217,254 shares sold, having a market price of $64,188.

TORONTO—Sept. 3

A Novel Plan to Relieve the Unemployed has been adopted by the business men of Edmonton, Alta. The banks and sand-bars of the Saskatchewan River, which runs through Edmonton, contain small amounts of fine gold. Experienced men are showing the uninitiated how to wash out the gold. It is stated that they will be able to make from $1.75 to $2.50 a day and that there is a sufficient area over which gold can be obtained to take care of several thousand men.

The International Nickel Co. has made a big reduction in its output. Crane Hill, Nos. 2 and 3 mines have been closed down completely, while at the Creighton, the big producer, only one shift is being worked and the production is being cut from 40,000 tons per month to less than 30,000. At the smelting plant there are only two furnaces in operation instead of six as formerly and the reverberatory plant has been closed down completely. The company is, however, in a strong position, as the annual report issued a few months ago shows over $3,500,000 cash on hand together with large stocks of supplies and a large amount of matte in transit. The Mond Nickel Co. which has its largest market in England, has not effected any reduction. The International Nickel Co., however, sends a large part of its output to France, Germany and Italy where the market has been almost completely cut off.

The Improved Position of the Silver Market and the willingness of the smelters to accept shipments of high-grade ore together with the action of the banks in advancing cash on bullion, has resulted in much greater activity in the Cobalt district. The Seneca Superior and the Kerr Lake are being reopened and production will be maintained at normal. It is also understood that the Buffalo will shortly resume operations and it is possible that one or two of the other smaller properties such as the Beaver and Temiskaming will again start producing. Final arrangements have not as yet been concluded with the Dominion Government to guarantee the banks in view of their accepting bullion as collateral, but it is believed that this step will shortly be taken. The American Smelting & Refining Company which handles a considerable proportion of the output of the district, is paying in full on the official New York quotations established by Handy & Harmon. A short time ago a large number of men were out of employment in Cobalt, but these have been leaving the camp for other parts and at the present time, there is only a comparatively small labor surplus.

The Mining News

ALASKA

RECENT RECEIPTS at Seattle assay office include $150,000 from Nome and $500,000 from Seward, Valdez, Port Wells, Fairbanks, and other inland points.

SHUSHANNA GOLD FIELDS said to be living up to expectations of early days of discovery. First cleanup this year was made by Fletcher Hamshaw at mouth of Eldorado From 2700 ft. along bed rock he took out 272 oz. gold with value about $4300. Since discovery estimated there has been practically $180,000 taken from district and prospects for this season are for cleanups totaling $100,000 on Hamshaw claims and fully that much again on Range and Chisholm group of claims. Lack of water this season has been relieved somewhat and camp is running full pressure now and will probably do so for balance of season. District is widening out, reports coming to camp for some time of fairly good prospects in section to north. All creeks in immediate vicinity are being worked. There are good prospects on Dry Gulch and Alder, with a little pay on Big Eldorado, where they are now shoveling in. There is also pay on Nos. 7 and 8 and Nos. 7 and 8 fractions on Bonanza. Carl Whitham has five men working No. 2 Eldorado and expects to take out good pay. Nothing much discovered on Snow Gulch or Coarse Money Creeks. There was small stampede over to Canadian side and some work done on Bryan and Donjek Rivers without any results.

TREADWELL GROUP (Juneau)—Alaska Treadwell milled 81,340 tons in July, producing $115,543 worth of free gold and $111,565 worth of concentrates; Alaska Mexican milled 19,803 tons, producing $17,537 worth of free gold and $20,784 worth of concentrates; Alaska United milled 37,954 tons, producing $40,960 worth of free gold and $34,796 worth of concentrates.

ARIZONA

Pima County

SUIT HAS BEEN FILED in United States District Court at Tucson by John B. Wright of Tucson and James F. Mack of New York, attorneys for James B. Riley and J. Edward Michel, stockholders in Copper Bell Mining Co. of Cochise County against Shannon Copper Co., Leonard Copper Co., Copper Bell Mining Co. and N. L. Amster. Bill in equity alleged that defendants conspired to deprive minority stockholders of interests, and petitions court to be allowed to redeem property under foreclosure of mortgage held by Martin Costello; that Amster and Leonard Copper Co. be required to render accounting of all ores extracted from mines; and that defendants be required to convey their interests in property back to Copper Bell Mining Co.

Pinal County

KELVIN-SULTANA (Kelvin)—On 500-ft. level, No. 1 vein reached at point 135 ft. from station. Drifting begun to west. Last consignment of heavy equipment for mill received but considerable difficulty being experienced in getting it across Gila River which has been high for past month.

Santa Cruz County

MOWRY (Patagonia)—Fire recently destroyed concentrator at old Mowry property and endangered smelting plant near by. Fire caused by lightning; loss, $100,000. Property not in operation for about six years.

Yavapai County

RICH HILL PLACER (Stanton)—Stebbins dry concentrator having capacity of 12 tons per hour installed and 20 men at work under Shumate and Anderson. Gravels from test pits to be tested beginning at point about a mile and a half southwest of Stanton and working towards Weaver Gulch and Octave. Camp established near Stanton.

CALIFORNIA

Amador County

ARGONAUT (Jackson)--Work of erection of new 50-stamp mill expected to begin shortly.

PACIFIC (Plymouth)—First clean-up following 12-day run said to have shown good returns. Company expects to devote attention to milling reserves for present. Large screens used permit larger tonnage of ore to be handled in mill.

HARDENBERG (Jackson)—Survey being made of underground workings. Mine kept pumped out pending further developments. Present ore reserves not sufficient to keep mill running steadily and owners will not prosecute development at present.

KEYSTONE (Amador City)—Development on 2600-ft. level proves encouraging as orebodies appear extensive and good grade. Previous workings extended to 1200-ft. level. Present operators have deepened shaft 1000 ft., installed new machinery and are operating 20 stamps.

ORIGINAL AMADOR (Amador City)—Company has instituted suit to quiet title to valuable property in Amador mining district. Properties involved are Eclipse, Eclipse Extension and Last Chance, covering 18½ acres. Company is in active operation developing these properties.

Butte County

PACIFIC DREDGE on Butte Creek near Chico expected to go into commission in November. Pit completed and hull being constructed

Calaveras County

ROYAL CONSOLIDATED (Copperopolis)—This mine near Hodson has been sampled by new owners and arrangements made for extensive development. Stamp mill being overhauled and new equipment will be added.

LOCKWOOD (West Point)—Development work past two years shows encouraging results. Shaft deepened to 400 ft. Lane mill installed, gasoline engine furnishes power for mill and hoisting. Expected that cyanide plant will later be added.

Eldorado County

FARMERS along Cosumnes River have lodged protests that gold dredgers at Michigan Bar are making water muddy. Anti-Débris Association will investigate.

RYMAL (Pilot Hill)—Bert Rymal and Will Young, owners, contemplate erection of mill.

LUKENS (Pilot Hill)—Reported that operations will be resumed shortly.

HUNT (Pilot Hill)—Test run of ore will be made to determine advisability of erecting mill.

RUBY CONSOLIDATED (Georgetown)—Work has been resumed following shut-down on account of litigation.

Inyo County

SKIDOO (Skidoo)—Dividend was declared on July 25. Ten-stamp mill in active operation.

CASHIER (Ballarat)—Five-stamp mill being erected.

Kern County

GOOD HOPE (Randsburg)—Reported electric hoist will be installed.

AMERICAN TRONA CORPORATION (Searles)—Reported to Department of the Interior in Washington, D. C., that initial output ot potash will be only five tons but plant under construction will probably have capacity of 120 tons per day.

Mendocino County

MANGANESE DEPOSITS near Potter Valley being developed following high prices for ferro-manganese. Several shipments made to Heroult. Deposits reported to be extensive.

Nevada County

ACTION BEGUN by Anti-Débris Association against George Wright, E. F. Banning, the You Bet Mining Co. and others operating in Rough and Ready district, to restrain them from conducting hydraulic mining and dumping tailings in Greenhorn and Steep Hollow Creeks.

BRUNSWICK (Grass Valley)—Reported another dividend will be declared. Development work below 1250 level is encouraging.

UNION HILL (Grass Valley)—Work to be resumed by new owners. Mine kept pumped out during shut-down. Property well equipped with 20-stamp mill and modern hoist and pumps.

COLUMBIA CONSOLIDATED (Nevada City)—Company doing large amount of work developing Meister claims. Has installed 100-hp. Giant air compressor, and has built ¼ mile of flume for water power. Expected 200-ton mill will be completed Nov 1 It is C. O. Bartlett Co. type, crushing to 20-mesh with outside amalgamation; plate room has 14 sets plates 5x12 ft. Mine opened by adit giving 1200 ft. of backs.

Placer County

PROSPECTING of land along Bear River being carried on by Nevada capitalists who expect to erect gold dredge if conditions warrant.

MAGNESITE CLAIMS of Johnson and Sullivan near Towle being examined by New York interests with view to their purchase. Claims are extensive.

BANNER (Auburn)—Property being examined with view of resuming operations in near future.

CARDELLA DREDGE (Newcastle)—Materials for new dredge to be erected in Gold Hill district, are arriving. Machinery will be taken from dismantled boat at Oroville.

PLUMAS BONANZA (Quincy)—Fifteen stamps are to be added to present mill. Development work being pushed on new shaft.

ARCADIA (Greenville)—Property has been bonded by English syndicate which will begin active operations. New shaft will be sunk.

SENECA CONSOLIDATED (Seneca)—Milling operations expected to commence shortly. Property has been in litigation, recently settled by compromise. Twenty-five men are now employed.

San Bernardino County

GOLD MOUNTAIN (Victorville)—Cyanide process being used with good results.

GALLAGHER (Johannesburg)—Placer machine being installed by A. B. Call and W. R. Flint.

Shasta County

LAST CHANCE (Ingot)—Arrastre being erected by George Gilmer to treat large dump.

AMERICAN (French Gulch)—Property bonded by James and Harvey Sallee who are installing equipment to begin development work.

NOBLE ELECTRIC STEEL CO. (Heroult)—Reported company will start up two furnaces to handle manganese ore. Prevailing high prices for ferro-manganese should make it profitable venture.

MIDAS (Knob)—Operations resumed by new owners. Mine has been closed since underground fire in April. Tramway has been built to connect Midas workings with mill on Victor property. Treatment of impounded tailings by cyanide process will continue.

Sierra County

BALD MOUNTAIN (Forest City)—Vertical shaft will be sunk by new owners to tap gravel deposits formerly worked from tunnel.

TIGHTNER (Allegheny)—Reports that property had been closed down owing to European war, entirely erroneous. Large force employed and vigorous policy of development being prosecuted. Contracts made for 60,000 running feet round timbers for underground work. Mill running full time.

Trinity County

HEADLIGHT (Carrville)—Development work continues large tonnage ore being blocked out. Expected mill will be remodeled. Company attempting to develop process to treat ores so as not to conflict with Forest Service regulations.

GLOBE CONSOLIDATED (Junction City)—Twenty-stamp mill treating 120 tons daily with good extraction. New tunnel to tap orebodies 600 ft. below present workings, being pushed. New development shows orebodies to be extensive.

Tulare County

TULARE MINING CO. (Porterville)—Shipments of magnesite resumed following increased demand due to European war. Machinery being installed to produce epsom salts from material previously thrown away. Sixty-five men are employed.

Tuolumne County

MOHICAN (Jamestown)—Reported 3-ft. vein of good milling ore discovered.

TULLOCH (Columbia)—Mine is being reopened, reported milling will be resumed.

SANTA YSABEL (Sonora)—Mine being pumped out preliminary to an examination.

FOREST FIRES near Sonora burned bunk house and blacksmith shop at Valparaiso mine and house and blacksmith shop at Lawson mine. Hard fight saved surface improvements at Horse Shoe Bend mine. Crew from Springfield mine rendered valuable assistance in fighting flames.

COLORADO

Clear Creek County

ARGO MILL (Idaho Springs)—Having laid in good supply of cyanide, mill will not be in danger of shutdown from effects of European war and has assured supply of ore to keep going at rate of 65 tons per day indefinitely.

BIG FIVE TUNNEL (Idaho Springs)—Company is driving toward old shaft of Dove's Nest mine on Seaton Mountain which was big producer of galena-silver ore 25 years ago and closed down because of litigation with Comstock mine over convergence of two veins. Crosscut has 2500 ft. still to go. Klein and Williams, lessees, are shipping three carloads per week of $25 ore from newly developed ground in the East Bellman vein above the tunnel. Slate & Co. are sinking winze to work same oreshoot from lower level. Edgar that was formerly large producer as individual shaft mine is under new lease to Al Friedman, et al. who have opened shoot of good ore. Ranson, Thurston & Quaintance lease is taking ore from Lake vein.

Lake County

ROCKEFELLER TUNNEL (Leadville)—Work in this Evans Gulch property is going ahead. About 200 ft. more crosscutting will reach objective vein.

LOUISVILLE (Leadville)—Manager Ed. A. Hanafen utilized recent shutdown to make repairs to pumps and compressor; mine has resumed its normal activity and will so continue if silver maintains present prices.

DAMASCUS MILL (Leadville)—William J. Candlish has acquired this old mill in lower end of city and remodeled it to treat custom ores by a scheme of his own that is automatic in handling materials from the crude to finished products. Flow-sheet includes: Receiving bins; fine grizzlies; oversize to crusher and rolls; all to cylindrical drier; air-chamber, blast sizing, oversize going to fine crusher and Kent mill. Dry pulverized ore is next drawn through pipes by suction into air-tight box with four lower compartments or bins into which minerals of differing specific gravities will separate, finest siliceous dust being partially exhausted and delivered to waste in this step. Bottom of each bin delivers into pipe that conveys the air-separated products to new type dry jig. Jig products are carried by pipes to storage bins for shipment, while waste is taken on belt conveyor to dump. Mill is intended to handle 100 tons complex sulphides per day.

Routt County

ROYAL FLUSH (Columbine)—Large party of Wisconsin officers and stockholders of Hahn's Peak G. M. & M. Co. attended recent annual meeting. Management reported that development and construction has continued without interruption the past year and that good shoot has been developed. After few minor changes in mill, it will be put into service.

San Juan County

PRIDE OF THE WEST (Silverton)—John Giono, et al., have pushed their lease until they are now shipping rich ore to smelting plant.

SILVER LEDGE (Silverton)—Lessees Matties and Bonavida have finally unwatered and cleaned up this old mine at Chattanooga and are extracting ore. Expect to run continuously through coming winter.

San Miguel County

MOUNTAIN FLOWER (Telluride)—J. E. Souter has taken contract to push Delta adit and has installed gasoline rock drill. Small water-driven motor will provide fan ventilation.

MINNESOTA

NEW YORK STEEL CO.—At Duluth, Aug. 20, Federal court entered decree of foreclosure on all Minnesota assets of this company. Company formerly leased Roberts, Kellogg, Larkin and Knox mines, on Mesabi range; these allowed to revert to fee owners through nonpayment of annual minimum royalties for several years past. Company's assets consist mainly of mining machinery and equipment, together with some realty holdings in Mesabi range towns. New York properties of this company were sold for $770,000.

Cuyuna Range

CUYUNA RANGE POWER CO. (Brainerd)—Company, which supplies power to practically all mining operations on Cuyuna range, will add another unit to power plant, at dam on Crow Wing River near Brainerd, increasing capacity from 2000 to 3000 hp.

E. J. LONGYEAR CO. (Brainerd)—Explorations on Crow Wing County poor-farm have met with but fair results. Five holes have been drilled of the nine required by option agreement. Depth of surface of 240 ft. at this point would necessitate substantial showing of merchantable iron ore, and unless subsequent holes show great improvement property will no doubt be dropped, and Crow Wing County will be without county-owned iron mine so widely advertised.

Mesabi Range

HIBBING—Assessed valuation of this village (population 8832) fixed at approximately $80,000,000. Of this amount $79,000,000 is represented by unmined iron ore within village limits.

ADAMS (Eveleth)—Blasting in this openpit caused considerable damage to neighboring residences. Oliver company plans to remove nine such dwellings off property to Leonidas location.

INTERSTATE IRON CO. (Grand Rapids)—Dredge stripping operations started here last season discontinued, having been found not feasible for several reasons. Dredge dismantled.

GRAHAM (Aurora)—This property of Oliver company closed for season. Much development work was done this season underground; it is planned later to operate by openpit methods as well as underground.

SHIRAS (Hibbing)—This new property of Oliver company is hoisting first ore, and will ship probably 5000 tons this season. Was formerly known as Wanless No. 2, located in the Buhl district, an underground mine. Fee is owned by State of Minnesota.

LENOX (Calumet)—Actual stripping operations started by A. E. Guthrie Contracting Co. on this work, which is one of largest stripping contracts ever let on the Mesabi range, requiring upwards of two years to complete. Marion shovel in use is largest on range.

DUNWOODY (Chisholm)—G. N. Ry. completing trackage for this new pit of Arthur Iron Mining Co. Winston-Dear Co., stripping contractors, have been at work on job since June, 1912, and will finish before next year. Pit is 90 ft. deep. When completed will be one of big producers of the Mesabi range. Numerous buildings, including 18 dwellings, in course of erection.

Vermilion Range

SIBLEY (Ely)—New dry house, just completed, is one of most modern on iron ranges, containing 80 shower baths, four drinking fountains, toilets, laundry tubs, all of most approved type.

MONTANA

Silver Bow County

MOONLIGHT MINE—This Anaconda property shut down morning Aug. 27, when shaft of main engine broke, putting it out of commission. Repairs started at once but no prediction as to how much time work will require and how soon mine will resume. About 300 men are employed.

NEVADA

Esmeralda County

SANDSTORM-KENDALL (Goldfield)—An 18-in. shoot of ore, said to assay $32, struck on 350-ft. level. Shoot is downward extension of that on 200-ft. level.

Humboldt County

NEVADA SHORT LINE R.R. (Rochester)—Grading completed to mill site at lower Rochester and track laying will commence at once. Mill will be connected with mines by a two-mile aërial tramway.

CODD LEASE (Rochester)—Development work being done on new vein opened by crosscut on 350-ft. level, and oreshoot of shipping grade opened. Large tonnage of milling-grade ore is also developed.

Lincoln County

DAY-BRISTOL (Pioche)—Application for hearing to show cause why there should not be receiver's sale made by one of principal creditors of company. Debts total $90,000, it is stated. Sept. 9 set for preliminary hearing. Hoped that mines may be operated again.

Lyon County

NEVADA-DOUGLAS (Ludwig)—Some machinery for new leaching plant is arriving. Railroad spur finished and grading for ore bins started.

Mineral County

CONDITIONS AT RAWHIDE are good. Nevada New Mines Co. is operating 10-stamp mill steadily. Mine developed to 600-ft. level and good-grade ore being stoped on this level Black Eagle Co. is also operating. Stated that 500 men are employed in district.

THE WAGNER-AZURITE (Luning)—Leaching plant completed Trial runs proved success of process on Luning ores. Company experienced delays and trouble by breaking of filters, pumps, etc., which interfered with steady operations. These defects being remedied and plant will be running at full capacity soon.

Nye County

VICTOR (Tonopah)—North Merger vein was drilled into on 1550-ft. level, causing tremendous flow of water which flooded shaft; water rising 380 ft. All pumps and bailers are at work and 400,000 gal. water per day being lifted. Work in Merger mine had to be suspended and also in Midway, which buys air from Merger. No loss of life suffered.

White Pine County

GOLD STRIKE IN BULL CAÑON, north of Blain reported. Narrow shoot shows free gold.

NEW MEXICO

Dona Ana County

MORMAN MINE AND MILL (Organ)—Property under lease and bond to L. B. Bentley who contemplates sinking shaft 200-ft. deeper. If development work shows good value ore, mill will be repaired and operated. C. M. Lerchen has lease and bond on Sunol group, same vein with Morman mine.

TURGITE MINING CO. (Las Cruces)—Judgment was rendered defendant in civil suit of Robert Railey vs. The Turgite Mining Co., involving title to iron mines situated in Picacho Mountains owned by El Paso, Tex. men. Title contested by plaintiff on grounds that property had been located as placer ground instead of as lode claim. Evidence showed deposits of iron consisted of surface deposition, marine origin, lying horizontally in form and character similar to Lake Superior regions. Ore is principally hematite containing various hydrous oxides. Over 1,000,000 tons high-grade ore said to be exposed. Sulphur and prosphorus low; 480 acres in group.

Grant County

SILVER CELL MINE (Pinos Altos)—Stoping in drift from 135-ft. level of main shaft disclosed silver ore of high value on Sept. 5. Believed main orebody, lost years ago through fault, has been encountered.

CARLISLE MINES (Steeple Rock, via Duncan, Ariz.)—Jim Crow shaft has retimbered and unwatering is now under way. G. H. Utter purchased large consignment of machinery for all mines of group. Over 25 men employed in preparation for extensive work.

SILVER HILL MINE (Pinos Altos)—Property taken over by G. St. Clair Douglas and associates. Property is extension of Langston lode and is promising. Ore contains zinc, lead, gold and silver. Operators plan to install harz concentrators and construct aerial tramway to railroad at Silver City, nine miles distant.

CHINO COPPER CO. (Santa Rita)—No variation in production which was reduced to 50% usual out-put. Some employees discharged when reduction was effected given employment by government at Elephant Butte Dam; on Santa Fe railroad construction work, and in sugar beet fields in Colorado.

MOUNTAIN HOME GROUP (Hanover)—Shipment of silver-lead ore made from newly discovered deposit. Development work continues. Property under consideration of purchase by large syndicate. Thousands of tons, low-grade carbonate zinc ore blocked out in mine. Claims developed by adits and stopes.

Socorro County

ERNESTINE MINING CO. (Mogollon)—Maude S. mill destroyed Sunday, Aug. 23, when tailings dump of Little Fannie mine gave way and slid upon mill. Undermining of recent floods said to have been cause. Watchman killed.

SOUTH DAKOTA

Lawrence County

MONARCH (Deadwood)—P. N. Hanson and associates, who leased block of this ground on Two Bit Creek, are meeting with gratifying results. Two feet of ore is being mined from which shipping grade of $50 per ton is expected to be maintained. Ore shows some free gold, which is rare in shales.

HEIDELBERG (Deadwood)—Shaft work instituted in main adit indicates existence of additional strata of ore below present workings. At depth of 5 ft. a 3-ft. body was encountered, said to assay $30 per ton.

ORO HONDO (Deadwood)—Shaft work resumed, after installation of auxiliary hoist on 1000-ft. level. Hoisting engine on surface will handle rock excavated in shaft and raised to 1000-ft. point by this auxiliary. Pumps will not be used except in emergency, as Manager Talbert will use skips to hoist water from 1000-ft. level. Below this point little water encountered in shaft.

BRANCH MINT (Galena)—By placing on court calendar of number of suits in which J. D. Hardin is plaintiff, and affecting title to this property, legal controversy which delayed operations for some years, is resumed. Hardin, among other claims, protests he has prior lien against property for over $500,000, and seeks to be given title. In former litigation courts decided this lien was secondary to other claims against property

HOMESTAKE (Lead)—With gathering of audience said to be largest ever attending dramatic performance in Lead, Homestake opera house, in "Recreation" building was opened to public Aug. 31 Before opening of evening performance Superintendent Grier made brief address in which he said it gave him pleasure, on behalf of Homestake company, to turn over to employees of company that splendid building which was to be theirs to use for amusement and recreation, free with exception of theater portion. He said invitation to use building was extended, not only to good people of Lead, not employees of Homestake company, but to people of Lawrence County. Maximum scale of prices for theatrical attractions has been fixed at $1, 75c., 50c. and 25c. On nights when not otherwise used moving pictures will be shown, for which price of admission will be 5c. Theater seats 1000 people, and is fully equipped in every particular, with an especially good ventilating system. Management of theater and building has been put in charge of M. C. Kellogg.

UTAH

Juab County

KNIGHT-CHRISTENSEN MILL (Silver City)—Ore from Dragon Consolidated and Iron Blossom is being treated.

LOWER MAMMOTH (Mammoth)—Five sets of lessees are working on zinc ore between 1500- and 1800-ft. levels. Work on company account being done on 1000-ft. level.

CHIEF CONSOLIDATED (Eureka)—Grade is nearly finished for side track or spur to property. Zinc ore recently opened,—occurring as casing, or below silver-lead ore.

UNCLE SAM (Eureka)—Lessees are working hand jigging plants, treating silver-lead ore. Two cars of ore and jig concentrates were shipped week ended Aug. 28.

EAGLE & BLUE BELL (Eureka)—Preparations made for sinking shaft from 1550 to 1700-ft. level. Work on this will soon be started. Fifteen cars of ore were shipped the week ended Aug. 28.

DRAGON CONSOLIDATED (Silver City)—Flow of water of 60-80 gal. per min. encountered on 1000 level, where development is being done. This will not interfere with output. Two cars of ore were shipped week ended Aug. 28.

MAY DAY (Eureka)—Shipments from silver-lead orebody above tunnel level have been resumed. Work started on 300-, 400-, and 500-ft. levels, on zinc ore, which can be mined at profit at present price of spelter. This material as shipped runs about 35% zinc. Lessees also working on zinc ore at some points, and may install jigs. There is much ore exposed, which carries about 18 to 20% zinc, and effort may be made to raise zinc content by jigging.

Summit County

SNAKE CREEK TUNNEL (Park City)—Twelve to sixteen feet daily being made in driving. Face is under Bonanza Flat, and ground is dry, rock breaking easily.

Park City Mills (Park City)—Company which is remodeling old Grasselli zinc mill for chloridizing process, is installing roaster of Christensen type, similar to that used at Knight-Christensen mill in Tintic.

MINES OPERATING (Park City)—Another shipment of bullion made, containing 14,000 to 15,000 oz. silver. This is result of cleanup from operations early in August. Last previous shipment made Jul. 15. Company treating low-grade ores and stope filling from Ontario.

DALY-JUDGE (Park City)—Mill machinery being overhauled and repairs made in timbering shaft from collar to 200 level. Flotation process for mill being considered. Development being done in mine in number of places. Shipments will probably be resumed in near future. Under normal conditions 250 men are employed in mine and mill at present.

SILVER KING CONSOLIDATED (Park City)—Extensive development recently done in ore between 1500- and 1700-ft. levels. Steady shipments being made from material taken out in devlopment. A cable received from General Manager Solon Spiro said he had reached London, and would catch first available steamer for home. Mr. and Mrs. Spiro were travelling in Germany at time of outbreak of war. Net smelter returns on 200 tons shipped recently better than $40 per ton.

WASHINGTON

Okanogan County

PEACOCK MOUNTAIN (Conconully)—Contract awarded for the construction of dam, ditch and flume at this mine. Three-drill compressor will also be installed

CANADA

Ontario

LA BINE CLAIMS in Sesekinika near Kirkland Lake, optioned to Hamilton-Erlich & Co. of London.

KERN LAKE (Cobalt)—Operations will be resumed Sept. 17, with a force sufficient to maintain production at old level.

VIPOND (Schumacher)—Remodeled mill with cyanide plant addition with capacity of 150 tons per day started up Aug. 31.

SENECA SUPERIOR (Cobalt)—Mine has begun working operations on more extensive scale keeping about 70 men employed on double shifts.

DOME LAKE (Porcupine)—Development work at 180- and 300-ft. level said to show satisfactory results and mill being overhauled in preparation for starting operations in October.

BUFFALO (Cobalt)—July report states underground mining will be continued for present and reclaiming of mercury from residues will be done at high-grade plant, concentrating mill being closed down until conditions improve.

FOSTER (Cobalt)—At this mine now being worked under lease by Glen Lake Co., drifting is being undertaken on 200-ft. level with intention of getting under lake where there is a deep conglomerate formation.

TOUGH OAKES (Kirkland Lake)—Mine making effort to produce as much high-grade ore as possible. In addition to favorable prices being paid for this ore, it is believed that company needs money to carry on operations, as funds in England are not at present available.

The Market Report

METAL MARKETS

NEW YORK—Sept. 9

All of the markets have been dull during the last week.

Copper, Tin, Lead and Zinc

Copper—The situation remains unchanged. Some copper continues to go abroad on old contracts and on consignment. No demand, except for relatively trifling quantities, has yet developed from domestic manufacturers.

Base price of sheet copper has been reduced ½c. and is now 17½c. per lb. for hot rolled and 18½c. for cold rolled. The change dates from Sept. 1. The usual extras are charged, and higher prices for small quantities.

In a recent interview, Dr. W. H. Nichols, of the Nichols Copper Co., said with regard to the copper market, "that the situation was quite remarkable, and that the producers had for the first time in their history been unanimous in showing a large amount of common sense. All copper mines had reduced production by 50% or even more, and the refineries had, of course, followed suit, the Nichols Copper Co.'s plant being run at present at about 50% of its capacity. As approximately one-half of the copper produced has heretofore gone abroad, this curtailment should make it possible to provide for all of the local requirements, so that when the war is over the metal should be in a good and strong position."

Tin—There have been more arrivals and supplies have consequently become more liberal, but the market has been very quiet and quotations are nominal.

Visible stocks of tin, Aug. 31, are reported as follows, including tin afloat: London, Straits and Australia, 3835; other kinds, 3188; afloat, 3460; London, total, 10,483; Holland, 167; United States, excluding Pacific ports, 3802; total, 14,452 long tons, an increase of 285 tons during August.

Messrs. Robertson & Bense report receipts of tin ore and concentrates at Hamburg, Germany, in July at 2058 tons from Bolivia and 10 tons from German Southwest Africa; 2068 tons in all.

Lead—This market has been uninteresting, but weaker in view of some renewed pressure to sell, all faith in an advance on account of the war having been lost. However, there have been some sales for export. The Cœur d'Alene mines are maintaining their production and supplies from all quarters seem to be large. The A. S. & R. Co. maintains its previous price of 3.90c., New York, but there have been sellers at 3.85c. and less than that has been accepted.

Spelter—Demand has petered out almost entirely. Indeed, there has been no domestic demand of consequence since early in August, while during the last fortnight the demand from abroad has been absent. Producers' sales during the last week have been very light and quotations are based chiefly on the offers they have made to consumers. These have been at reduced prices from day to day, without there being, however, any pressure to sell.

By a clerical error the August spelter average was given last week as 5.412c., St. Louis, instead of 5.118c.

Other Metals

Bismuth—On Aug. 17, the International Bismuth Syndicate raised the price of bismuth from 7s. 6d. per lb. to 10s. The American price is now $2.85@3.

Antimony—It is difficult to quote this market, as there is practically no business being done. Dealers are asking 12½c. for Cooksons, 12c. for Halletts, and 10½c. for outside brands.

Aluminum—The market is still quiet, with prices at 20@20½c. per lb.

Quicksilver—The market has not changed materially since last week. Quotations are still $75@85 per 75-lb. flask, New York.

Nickel—Quotations for ordinary forms—shot, blocks, or plaquettes—are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher

Gold, Silver and Platinum

Gold output of Rhodesia, seven months ended July 31, was $8,158,966 in 1913, and $9,890,678 in 1914; increase, $1,731,712, or 21.2%, this year.

Imports of gold into France five months ended May 31 were 286,551,000 fr.; exports, 47,013,000 fr.; net imports, 239,538,000 fr., being 109,638,000 fr. morethan last year.

Platinum—There is no changes in prices. We quote $50 for refined, and $57.50 per oz. for hard metal.

Silver—Although there is still no business in silver between the Far East and London, prices advanced during the last week. The shipments going forward from the United States to London are being absorbed, presumably for Continental coinage. There is still difficulty in doing business between New York and London, because of delays in cables, of cancelled sailings, and the uncertainties of foreign exchange. Nevertheless, insurance rates have dropped markedly, and the situation has cleared up somewhat.

London prices are Sept. 3, 24d.; Sept. 4, 24d.; Sept. 5, 24¼d.; Sept. 7, 24¼d.; Sept. 8, 24 15/16d.; Sept. 9, 24 15/16d.

Shipments of silver from London to the East, Jan. 1 to Aug. 27, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£4,705,500	£4,464,500	D. £241,000
China	562,000	42,000	D. 520,000
Total	£5,267,500	£4,506,500	D. £761,000

Exports to India have been very light, as for two or three weeks past.

Imports of silver into France five months ended May 31 were 82,989,000 fr.; exports, 112,773,000 fr.; excess of exports, 29,784,000 fr., an increase of 15,481,000 fr. over last year.

Zinc and Lead Ore Markets

JOPLIN, MO.—Sept. 5

Lead, high, $47.60; base, $46 per ton of 80% metal contents; average all grades, $44.40 per ton. Sellers readily accepted the decline and ore was on the market in midweek;

Blende prices declined from $1 to $2 per ton, high price $51; assay base, $46@48; metal base, $44@46 per ton, 60% zinc; calamine base, $25@27 per ton, 40% zinc; average all grades zinc, $44.22 per ton.

DAILY PRICES OF METALS

NEW YORK

			Copper	Tin	Lead		Zinc	
Aug. Sept.	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
3	c	53¼	*	†36½	3.85 @3.90	3.70 @3.75	5.75 @5.85	5.60 @5.70
4	c	53¼	*	†36	3.80 @3.90	3.65 @3.75	5.70 @5.80	5.55 @5.65
5	c	53½	*	†35¼	3.80 @3.90	3.65 @3.75	5.70 @5.80	5.55 @5.65
7	......							
8	c	54¼	*	†34	3.80 @3.90	3.65 @3.75	5.70 @5.75	5.55 @5.60
9	c	54¾	*	†33½	3.80 @3.90	3.65 @3.75	5.65 @5.70	5.50 @5.55

*No quotations. †Nominal.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c., Chicago-New York, 13½c.

COPPER SMELTERS' REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments.	2,069,960	1,279,537	585,387	1,114,758	2,879,396
Anaconda	23,800,000	22,900,000	23,500,000	23,800,000	......
Arizona, Ltd.	3,286,000	3,570,000	3,092,000	3,742,000	3,300,000
Copper Queen	7,637,042	7,562,723	8,388,203	7,613,719	7,817,318
Calumet & Ariz.	5,875,000	5,450,000	5,495,000	4,630,000	5,940,000
Chino	5,399,814	5,926,591	5,496,875	5,486,419	......
Detroit	1,973,725	1,790,926	2,105,034	2,129,100	1,966,526
East Butte	1,546,180	1,178,000	1,179,762	1,215,323	......
Giroux	287,980	45,948	429,553	425,000	......
Mason Valley	1,250,000	862,000	916,000	950,000	......
Mammoth	1,800,000	1,850,000	1,750,000	1,725,000	1,950,000
Nevada Con.	5,218,257	4,880,043	4,959,589	4,483,175	......
Ohio	597,520	610,518	625,000	605,000	......
Old Dominion	2,997,000	2,779,000	3,302,000	2,937,000	2,962,000
Ray	6,036,908	6,089,362	6,300,847	5,941,567	......
Shannon	1,082,000	1,012,000	1,056,000	1,049,227	1,084,000
South Utah	406,381	247,641	55,394	62,990	......
Tennessee	1,262,184	1,370,800	1,336,950	......	......
United Verde*	3,100,000	3,000,000	3,100,000	2,900,000	......
Utah Copper Co.	12,323,493	12,739,757	13,208,483	12,870,063	......
Lake Superior*	11,000,000	13,000,000	12,500,000	16,000,000	......
Non-rep. mines*	8,200,000	8,000,000	8,200,000	8,000,000	......
Scrap, etc.	2,500,000	2,500,000	2,500,000	2,500,000	......
Total prod.	109,649,444	108,644,846	110,082,077	......	......
Imp., bars, etc.	22,676,605	17,043,191	19,081,487	23,885,521	......
Total blister	132,326,049	125,688,037	129,163,564	......	......
Imp. ore & matte.	7,029,646	10,400,122	10,586,506	9,157,540	......
Total Amer.	139,355,695	136,088,159	139,750,070	......	......
Arrivals–Europe†	17,572,800	17,299,520	13,558,720	19,040,000	......

† Does not include the arrivals from the United States.

there was no attempt to hold for week-end prices, as buyers, tormented the past two weeks with late sales, had announced that the price would be made on Thursday and no later price would be made. In support of this stand, few buyers bought any ore after Thursday.

SHIPMENTS WEEK ENDED SEPT. 5

	Blende	Calamine	Lead	Value
Totals this week.	8,586,560	708,920	1,600,640	$242,070
Totals this year..	363,715,330	27,242,380	61,941,390	9,176,160

Blende value, the week, $195,990; 36 weeks, $7,089,740.

Calamine value, the week, $9570; 36 weeks, $314,700.

Lead value, the week, $36,510; 36 weeks, $1,471,520.

IRON TRADE REVIEW

NEW YORK—Sept. 9

The promised activity in the iron trade has not yet materialized, and it seems doubtful whether over 60% of the steel-making capacity of the country is employed. Unfortunately the outlook is for a still further shrinkage during the current month. Fears of ferromanganese shortage are no longer entertained, as it is understood several cargoes intended for Germany have been diverted to American ports.

The Carnegie Steel Co.'s new schedule, dated Aug. 5, gives prices per ton of 2240 lb. for domestic manganese ore delivered at Pittsburgh or Etna, Penn., or at South Chicago, Ill., as follows: 49% metallic manganese, 26c. per unit; 46 to 49%, 25c.; 43 to 46%, 24c.; 40 to 43% manganese, 23c. per unit. This is an advance of 1c. per unit over the old list.

Assessments

Company	Delinq.	Sale	Amt
Alameda, Ida.	Sept. 5	Sept. 29	$0 005
Alta, Nev.	Sept. 10	Sept. 28	0 03
Andes, Nev. (post.)	Aug. 28	Sept. 18	0.03
Aurora-Sampson, Ida. (post)	July 18	Sept. 18	0.002
Best & Belcher, Nev.	Sept. 15	Oct. 6	0.05
Big Elk, Ida.	Aug. 25	Sept. 25	0.001
Black Bear, Ida.	Sept. 1	Oct. 1	0.01
Blue Star, Ida	July 28	Sept. 25	0.03
Cedar Creek, Ida.	Sept. 10	Oct. 10	0.003
Cons. Imperial, Nev. (post.)	Aug 27	Sept. 18	0.01
Con. Virginia, Nev.	Sept. 3	Sept 24	0.10
Columbine, Colo.	Sept. 15	Oct. 20	0.02
Eagle Mountain, Ida.	Aug 22	Sept. 22	0.001
Davis-Daly, Mont.	Oct. 15	.....	0 25
Emerald, Utah.	Sept. 15	Oct. 10	0.0033
Great Western, Nev. (post)	Aug. 25	Sept. 15	0.01
Huron, Mich. (Iron)	...	...	3%
Hypotheek, Ida.	Aug. 17	Sept. 15	0.01
Idaho & Los Angeles, Ida	Sept. 7	Sept. 25	0.005
Idaho-Nevada, Ida.	Sept. 7	Oct. 1	0.001
Lehi Tintic Utah.	Aug. 12	Sept. 17	0.0025
Lucky Calumet, Ida.	Aug. 21	Sept. 21	0.005
Monarch-Pittsburgh, Nev. (post.)	Sept. 14	Sept. 21	0.01
North Star, Ida.	Aug. 8	Sept. 10	0.0015
Ophir, Nev. (post.)	Aug. 31	Sept. 24	0.10
Oreano, Ida. (post.)	July 24	Sept. 25	0.002
Plutus, Utah.	Aug. 28	Sept. 15	0.002
Royal Copper, Ida.	Sept. 3	Oct. 3	0 001
Sierra Nevada, Nev. (post.)	Aug. 28	Sept. 18	0 10
Utah Metal, Utah.	....	Oct. 1	0.05

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56 260	62.938	57.572	25 887	28.983	26.553
February	59.043	61.642	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26 788
April	59 207	59.490	58 519	28 284	27.416	26.958
May	60 880	60.361	58 175	28 038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.190	25.948
July	60.654	58.721	54 678	27.919	27.074	25.219
August	61.606	59.293	54 344	28 375	27.335	25.979
September	63.078	60.640		29 088	27.986	.....
October	63 471	60.793		29 299	28 083	.....
November	62 792	58 995		29 012	27 263	......
December	63.365	57 760	.	29 320	26 720	....
Year	60.835	59 791		28 042	27 576	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0 925 fine

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50.298	37.779	238.273	171.905
February	48.766	39 830	220.140	181.556
March	46.832	38 038	213.615	173.619
April	49.115	36.154	224.159	163.963
May	49.038	33.360	224.143	150.702
June	44 820	30.577	207.208	138.321
July	40.260	31 707	183.511	142.517
August	41 582	..	188.731	.....
September	42.410	.	193.074	....
October	40.462	.	184 837	.
November	39.810	...	180.869	.
December	37.635	..	171 786	.
Av. year	44 252	.....	206 279	

New York in cents per pound; London in pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5 262	6.854	5 112	26.114	21.533
February	6.239	5 377	6.089	5 228	25 338	21 413
March	6.078	5 250	5.926	5 100	24 605	21 460
April	5.641	5 113	5.491	4 963	25.313	21.569
May	5.406	5 074	5.256	4 924	24.583	21.393
June	5.124	5 000	4 974	4 850	22.143	21 345
July	5.278	4 920	5 128	4 770	20.592	21 568
August	5.658	5 568	5 508	5 418	20.706	..
September	5.694	...	5 444		21.148	...
October	5.340	....	5 188	.	20.614	...
November	5.229	....	5 083	.	20.581	.
December	5 156	.	5 004		21 214	
Year	5.648	.....	5 504	...	22.746	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	71.741	64 304	77 750	69 488
February	14.971	14.491	65 519	65 259	71 575	70.188
March	14 713	14.131	65 329	64 778	70 658	69.170
April	15.291	14.211	68 111	64 747	74 273	69.313
May	15 436	13.996	68 807	63.182	74 774	67.786
June	14 672	13.603	67 140	61.336	70 821	66.274
July	14 190	13.223	64 166	60.540	69 440	64 955
August	15 400		69 200	.....	74 313	.
September	16.328		73 125		78 614	.
October	16.337		73 383		79 250	.
November	15.182		68 275		7[illegible] 825	
December	14.224		65.223		69 583	
Year	15.269	..	68.335		73 740	.

New York, cents per pound, London, pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4 111	4 171	4 011	17.114	19 665
February	4.325	4 048	4 175	3 937	16.550	19 606
March	4.327	3 970	4 177	3.850	15.077	19 651
April	4.381	3.810	4 242	3 688	17.597	18 225
May	4.342	3.900	4 226	3.808	18.923	18.503
June	4.325	3.900	4 190	3 810	20.226	19.411
July	4.353	3 891	4.223	3 738	20 038	19 051
August	4.024	3.875	4.550	3.715	20 406	..
September	4 698	.....	4.579	......	20.648	
October	4 402	..	4.253	.....	20.302	
November	4 293		4 146	.	19 334	
December	4 047		3 929	.	17 798	
Year	4 370	.	4 238	.	18 743	..

New York and St. Louis cents per pound. London, pounds sterling per long ton

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14.94	$17.35	$13.23	$18 59	$13.90
February	18.15	15.06	17 22	14.12	18.13	14.09
March	18.15	15 07	16 96	13.94	17.53	14 18
April	17.90	14.90	16 71	13.90	16.40	14.10
May	17.68	14.90	15.80	13.90	15.40	14.23
June	17.14	14.90	15 40	13.90	15.10	13.97
July	16.31	14 90	15.13	13.90	14 74	13.96
August	16.63	14.90	15 00	13.90	14.88	14 09
September	16 65	.....	15 04	......	14.93	....
October	16 60		14 61	...	14 80	....
November	16.03		13 91	...	14 40	...
December	15.71	..	13 71	.....	14 28	......
Year	$17.09	.....	$15 57	.....	$15.77	......

The Engineering and Mining Journal

VOLUME 98 SEPTEMBER 19, 1914 NUMBER 12

Mining Conditions in French Guiana

By Blanchard M. Snyder*

SYNOPSIS—Gold is the most valuable export of this French colony, but nearly all the production is made by native negro miners who work the placers, and where they fail, modern machinery operating under skillful technical control has not been able to make a profit. Dredging projects have not been successful as a rule, perhaps due to the abundance of clay associated with the gold. Fewer attempts have been made at quartz mining, and those few have failed.

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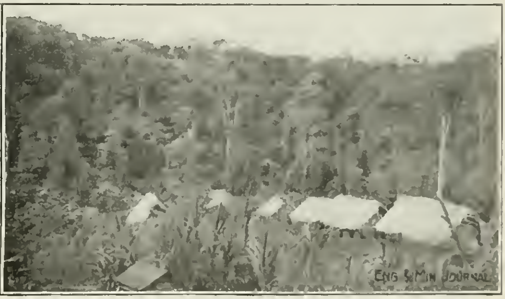
French Guiana is the smallest South American country, having an area of a little over 30,000 square miles, about that of the state of South Carolina. It lies between 2° and 6° north latitude.

View on the Niana River



Mining Camp in the Bush

The Guianas were discovered by Columbus on his third voyage to the new world, in 1498. Early in the sixteenth century, stories of the riches of a mythical town in the center of Guiana, known as Manoa del Dorado, began to be circulated. This was the original *El Dorado*, and the stories circulated regarding it called attention to the country and its riches. In 1604, the first French colonists under La Ravardiere settled at Cayenne, and during the seventeenth and eighteenth centuries, numerous trading companies attempted colonization of French Guiana, the ventures usually ending disastrously.

In 1855, gold was discovered on the Approuague River, since which time mining has been the chief industry.

The Government Is Stable and Satisfactory

The capital is Cayenne, a city of 12,000 inhabitants, and here are the chief departments of the administration and the principal courts of law.

The red tape of officials is often annoying; a box of quartz samples sent to the United States required four hours and the signing of the sender's name 17 times in order to clear through the custom house. A copy of the certificate of assay of the samples, properly sworn to before a notary and viséd by the French consul, was also demanded by the officials.

The population comprises Europeans, negroes and mixed races, and is estimated at 49,000, of whom 12,000 are classified as "gold miners in the bush" and 6500 as convicts. In the Guianas, people of mixed European and negro blood predominate. Many of the officials of the government have negro blood in their veins. The gold miners in the bush are mainly negroes also, a few being former French convicts who are under parole. Many of the miners and prospectors are negroes from Barbados, Jamaica and other English-speaking islands.

With France there is a monthly service for mail and passengers on the steamships of the *Cie. Générale Transatlantique*, or the "French Mail," as it is called. The usual route from New York is via the boats of the Royal Dutch West India Mail, *Koninklijke West-Indische Maildienst*, which leave New York every two weeks for Paramaribo, Dutch Guiana, calling en route at Barbados and Trinidad Islands, and at Georgetown, British Guiana. The schedule is 11 days for this trip, which is generally pleasant and agreeable. At Paramaribo, there is a wait of a day to three weeks for the French Mail steamer to Cayenne, the capital and chief city of the colony. The first-cabin fare over this route is $90. New York to Cayenne.

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Another way of reaching Cayenne is via Lamport & Holt or other steamship lines to Barbados, from which point an occasional sailing vessel leaves for Cayenne. There is also a steamer line to Cayenne from Trinidad, which point is reached by several lines from Europe and the United States.

The chief exportations, aside from gold, which forms over 95% of the value of the exports, are as follows: Rosewood, essence of rose, cabinet woods, coffee and balata rubber. In 1910, exports amounted to $2,241,700, while imports were valued at $2,370,800.

MINERAL RESOURCES

Gold is practically the only metal produced in the colony, but silver, copper, lead, iron and mercury ores are known to exist, though no attention has been given them as yet. Gold is found in the tributaries of all the river systems from the Oyapok to the Maroni. The chief production of gold has so far been from creek placers, most of it won by simple panning with the *batea* or by shoveling into sluice boxes. A few hydraulic and dredging installations have been made, not always attended with success. The placer deposits are largely in the creek beds or in bars alongside the streams, though a few buried channel deposits have been found. The overburden is from a few inches to several feet thick, overlying the pay which is usually found on a strata of clay or "glaze" on the bedrock. The pay gravel varies greatly in thickness, but in the creek deposits is usually not over a foot or two in thickness, but is often rich. In sluicing, the clay balls are broken up by native women working in the sluices.

Another type of placer deposit frequently found in the Guianas, though not as common as the stream placer, is the so called "alluvial" gold placer. These deposits are the result of long-continued, deep decay and erosion of gold-bearing rocks and veins, the final result being a residual concentration of the contained gold in a mantle of clayey earth or decomposed schist carrying limonite or other iron minerals. Such deposits are practically in place.

Much of the known placer ground within the explored area of the colony has been worked, and the opportunities for capital and improved methods are not so plentiful as might be supposed. Native mining methods have been criticized by some people, but as a rule they are well adapted to the peculiar conditions obtaining, and it is doubtful if American methods could be profitably substituted for them in many cases.

Foreigners seeking opportunities must usually undertake, with the aid of mechanical appliances, lower grade gravels than the negroes can handle, or open up deposits the latter have been unable to work, owing to excessive overburden, too much water to handle, etc. In the far interior, there is no doubt virgin country, but transportation is so slow and difficult that for the present, operations there cannot be considered by foreigners.

Up to date, little attention has been given to quartz mining, though there are numerous gold-bearing veins known to exist, many of them doubtless too low grade to work under present conditions. A few small quartz mills have, however, been erected and successfully operated for a time on high-grade ores.

Some precious stones, such as topaz, garnet and amethyst, are known; no diamonds have been found, though owing to their occurrence in British Guiana, their presence has been suspected.

The geology of the country has been little studied. Heavy alluvium and rank vegetation mask much of its area, leaving comparatively few rock exposures.

Granite, diorite and diabase are among the chief rocks, and there are large areas of metamorphic rocks, serpentine, gneiss, slates and schists (sericite, hornblende and amphibolite schists). In the latter series are found many of the gold veins and placers.

The production of gold during the following years has been:

	Kilograms gold	Estimated value
1905	3,130,295	$1,818,701
1906	3,583,354	2,081,928
1907	4,056,275	2,356,695
1908	4,470,675	2,597,462
1909	3,984,168	2,314,801

The total production of gold since its discovery in 1855 is estimated at over 120,000 kg., worth over $70,000,000.

CLIMATE AND HEALTH

The climate is characterized by moderate temperatures and high humidity. The temperature is ordinarily between 78 to 86° F., with extremes of 68 and 95°. The humidity averages 90°. There are only two seasons, the wet and the dry. The dry season lasts from July to November or December, and during this period the recession of the waters of streams and swamp lands leaves much vegetable matter exposed to decay, which is largely the cause of the fevers prevalent in the interior. For this reason, the wet season is the more healthful and therefore a favorable time to enter the country.

The more prevalent diseases are malaria or intermittent fever and liver troubles resulting largely from the former malady. Even the negroes are subject to "chills and fever," and every foreigner will be attacked by malaria if he stays in the country any length of time.

Of 15 men whom I knew, who spent from two months to two years in the country, but two who were there only a few months escaped the fever, and one of these was operated upon for gall stones immediately upon his return to New York. Quinine is a specific for malaria, but as ordinarily taken it is not very effective. Administered hypodermically, a comparatively small amount suffices.

The methods used in Panama and other places for the prevention of malaria would no doubt be useful and enable foreigners to endure the climate, but the expense of cleaning up for a mile or more around a camp in the bush is excessive and not warranted until a mine is proved. Moreover, during the long and tedious passage up the streams to the gold fields, no such protection against inoculation is possible. Yellow fever has been rare in South America during recent years. Leprosy is occasionally found among the natives.

Sunstroke is a danger to be guarded against. The vertical rays of the tropical sun are dangerous to the unprotected head of a white man, and a few minutes' exposure has often resulted seriously. This trouble can be easily avoided by invariably wearing a helmet when outdoors.

Food supplies of the kind used by Americans are not always easy to secure, especially when at a mine in the interior. Wine and rum or *taffia* are much used by the natives, but must be used in moderation by whites. A good man from the States, energetic and ambitious, usually works too hard at first and so reduces his vitality that he falls a prey to fevers, etc., while a man of lower ideals is likely to be affected by the low morals of the country and take to dissipation of various kinds, in which case he is of little use to an operating company.

Transportation within the Colony

Lack of suitable transportation facilities to the gold fields is to the miner a difficulty scarcely exceeded by that of the hostile climate. The only railroad in the colony is that between St. Laurent de Maroni and the penitentiary, eight miles distant. Several railroad lines have been proposed and reconnaisance surveys have been made, and the outlook is favorable for the early financing and construction of one of these lines.

There are only a few wagon roads in the province, and with one or two exceptions these are in such repair as to be well nigh impassable. Only two means of transportation to the mines are in use, namely, canoes on the rivers and creeks, and packing on the backs of negroes where the first method is impossible.

Natives Sluicing for Gold

Loading Canoes for Mines on the Maroni River

Supplies are loaded at the trading points near the mouths of the rivers, and the journey to the placers consumes from three days to upwards of three months, depending upon the distance, water conditions, etc.

The canoemen charge by the "barrel," provisions usually being sent in barrels or cases. A man is carried at the same rate as one barrel, and the charge, though varying greatly, averages five or six cents per mile per barrel.

Petrol launches and motor boats have been tried as a substitute for the native canoes, and where conditions were favorable, with success. Unfortunately, few mines are situated near the larger streams where their use is possible; numerous rapids in the rivers and low water in the creeks make the use of even a light-draft motor boat uncertain or impossible.

Many placers are situated some distance from navigable streams, in which event the last stage of transportation consists of packing supplies on the backs of negroes from the *degrad* or magazine at the water-side to the camp. A packer will carry a load of 60 to 90 lb. at an average cost per pound of 0.3c. per mile, which, though a reasonable charge, adds materially to the cost of supplies at many camps.

Native Labor Plentiful and Cheap, But Inefficient

Except for an occasional foreign miner or mechanic, the only labor available is the negro. On placers, negro miners are satisfactory, but they know little or nothing of underground mining or mechanical appliances. It is doubtful if there are 50 skilled underground miners among the native population of French Guiana. Under close supervision, the negroes make satisfactory muckers and laborers, but on work requiring skill or initiative it is the exceptional man who can be trained to fill the place.

Owing to sickness or other causes, from 20 to 30% of the natives are ordinarily off duty, so that a proportionate additional number of men must be carried on the payroll to insure a full working crew. Negroes receive rations and a daily wage of from 2½ to 8 francs, according to the work. The usual wage is 3½ to 5 francs, to which must be added the cost of rations, as prescribed by the government; an average figure for these would be approximately 1.8 francs (35c.) per man per day.

It is usual to engage the men at outfitting points on the rivers, and, as they are usually without means, advances are made to them for the purchase of clothing, etc., and losses frequently occur through desertions of shiftless negroes on the way. This of course leaves the superintendent short of men when he arrives at his camp. The substitution of white miners from the United States for the unskilled natives would in most cases be of doubtful expediency, owing to the expense of importing them and the high wages demanded by competent men, added to the probability that they would give satisfactory service during a brief campaign only, before being attacked by fever or otherwise incapacitated.

Mining Laws Good, But Taxes High

The mining industry being the principal one at this time, it naturally bears a large proportion of the expense of maintaining the government. In addition to the taxes on supplies imported and the tax on mining concessions, which last is low, the miner must pay an export tax amounting to nearly 8% of the value of gold produced. This tax is placed at 226 francs per kg. of gold dust and 238 francs per kg. of gold in the form of bars. Taxes are thus seen to be a serious item in the cost sheet of any producing mining company in the colony.

The mining laws provide for the acquisition of title to the minerals on an ytract of land in two ways, as provided by the *Decret* of Mar. 10, 1906. The prospector is expected to be provided with a permit or license to prospect, which gives him the right to prospect for minerals or placers on any public lands, such license being renewable annually by payment of a small fee (50 francs). Having found mineral of value, he can then protect his title to same in one of two ways:

(1) If surface placer, by the taking out of a "Permit for Exploitation of Placer" (*Permis D'Exploitation de Placer*). This must cover a rectangular area of not less than 10 nor more than 250 hectares. A hectare equals 2.47 acres. The rectangle must be marked by corner posts, upon which notices of location must be posted, and by cutting a line one meter wide through the bush around its perimeter. Application for such placer permit, accompanied by the annual tax of one franc per hectare, must be filed with the Mines Department.

(2) If for underground minerals or quartz veins, by taking out a mining permit (*Permis de Recherche*), to be followed later by a mining concession (*Concession de Mine*). The mining permit gives the holder the exclusive right to prospect and explore for certain minerals named in such permit, within a circle having a radius of 2 km. (1.24 miles). The actual location is made by driving a signal post at the center of the circle and posting a notice of location, etc., thereon. Upon payment of 40 centimes per hectare, and the proper recording of the application, a mining permit good for one year will be issued, and same may be renewed not more than twice, upon payment of an annual tax.

Before the expiration of such permit, a mining concession should be applied for, covering a rectangular area at least two-thirds of which must lie within the limits of the circle. Such concession is limited to a minimum of 200 hectares and a maximum of 1 00 hectares, and it must be surveyed and accurately described and monumented. Upon application and payment of the necessary fees, the chief of the department will verify the plans and will publish the application in the official journal of the colony, after which, if not contested, the governor, in privy council, grants the concession, which may, however, still be contested at any time within six months. Such a concession is renewable indefinitely upon payment of an annual tax of 60 centimes per hectare, but exploitation must be commenced within 10 years.

Foreign corporations cannot acquire mining property, hence must hold title through an agent or by acquiring title in the name of a holding company organized under the laws of France.

Vertical side and end lines are used, there being no extra-lateral rights in the case of quartz veins.

MINING OPERATIONS

The larger part of the gold produced has been won by native miners (working singly or in parties), using bateas, rockers or sluice-boxes. They outfit at some trading post near the coast, and in canoes work a tedious passage up the rivers and creeks, prospecting as they go, until gold-bearing gravel is found, which may be at some distance from any navigable stream. In many cases, months are required to reach the ground to be worked, and when supplies give out, or the dry season cuts off the water supply, operations cease and the party returns to the coast with the gold. Formerly, such operations were often exceedingly profitable and some negroes have taken out fortunes, but the easily accessible creeks have been so thoroughly worked over that the native miners now have difficulty in finding gravel that will pay for working by their methods.

These miners, or "marauders," as they are called, seldom own the placer ground they work, nor do they take out a license to prospect. If word of a strike of importance gets out, the miners flock in from all directions and all work feverishly until the pay is exhausted. Sometimes a merchant or other man of means will take a concession covering the ground, but this does not necessarily mean that the "marauders" are driven off. As a rule, they are allowed to continue, either by payment of a small royalty or on condition that they purcahse all supplies from the merchant.

In the usual way of working, the miners shovel the gravel into sluice-boxes, native women being used to break up the clay, etc., in the sluices. By such means, the larger part of past and present production of gold has been won. During recent years, a number of foreign companies, mainly French corporations, have attempted to enter the field. Owing to the difficulties elsewhere enumerated, most of these ventures have been unprofitabl. One of the successful companies, however, and the only one using hydraulic mining, is the "Cie des Mines d'Or de la Guyane Hollandaise," operating on both sides of the Maroni River, in both Dutch and French Guiana. Owing the generally unfavorable topography of the placer districts, hydraulic mining as practiced by this company is seldom practicable.

Another successful company is the "Societé Anonyme des Gisements d'Or de Saint Elie," which owns the Saint Elie concession on Creek Tigre. The company formerly operated rich placers and a five-stamp mill on quartz, but the property is now closed down except for lessees on the creeks. This company is a large stockholder in a company known as the "Societé des Mines d'Or D'Adieu-Vat et de Bonne-Aventure." The latter owns and until recently has operated a quartz mine and 20-stamp mill at Adieu-Vat, near the Sinnamarie River and due east of the St. Elie.

The annual report for the year ended June 30, 1910, showed 3103.5 metric tons milled from one vein, producing 145.769 kg. of gold worth $83,337, or an average of 42.82 grams per metric ton ($24.44), the vein averaging 16 in. wide. From another vein, 4405 metric tons produced 43.007 kg. of gold, worth $24,587, or an average of 9.76 grams per ton ($5.58). The operations for the year resulted in a loss of 54,606 francs ($10,583). The average number of men employed was 202. Operating expenses and the cost of equipment at mine and mill, from the organization of the company to June 30, 1910, and the production of gold for the same period are given as follows:

Total expenses	4,039,640.74 francs
Total production gold	2,272,789.88 francs
Difference	1,766,850.86 francs
Or approximately $342,413.	

It is evident that results at this, the largest quartz mine and mill in the colony, have not proved profitable, and the property is now idle, except for leasing operations on the creeks.

During 1911 and 1912, an American company undertook to reopen the Kokioko mine, near the St. Elie. This extremely rich placer was discovered by natives in 1907 and produced heavily for some time, but the pay dipped into the hill and the owners were unable to work it by open-cut methods. Owing to excess of water combined with the saprolitic character of the formation overlying the pay, creating a condition similar to that of quicksand, all efforts to reach the pay met with failure. During 1913, a French company undertook the same project, also without success, according to recent information.

A number of companies have attempted dredging, and some technical successes have been attained in recent years, although the difficulties encountered have not been slight. The first satisfactory installation was made by D. Levat, on the Coureibo River, but the dredge was sunk during a flood. The South American Goldfields, Ltd., built a 2-cu.ft. bucket dredge on the Elyseé Placer, on Lezard River, in 1905, and though defective in design, it operated profitably on 90c. gravel for some time. Later a dredge with 3-cu.ft. buckets was installed by the same company.

Dredging has also been tried on the upper Mana River by the "Syndicat Mana," with results said to be satisfactory. Also on the Maroni above the Inini River, there is said to be a successful dredging operation. On the Sinnamarie and Approuague Rivers, drilling has been done on possible dredging ground.

In the Guianas, dredging operations encounter many problems; transportation of heavy machinery in canoes or possibly overland to the dredging field is one; the removal of the heavy vegetation, tree trunks and roots is another. Insects attack wooden hulls, and hence steel hulls are necessary; skilled labor is difficult to secure and expensive, and the tropical climate and the hardships and diseases that go with it make such labor undependable.

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Steel Production in Canada

Steel production in Canada for the year 1913 is reported as follows, the figures being collected and reported by the American Iron & Steel Association:

	1912		1913		Changes
	Tons	%	Tons	%	Tons
Bessemer	207,569	24.3	273,391	26.2	I. 65,822
Openhearth	645,062	75.6	768,663	73.7	I. 123,601
Electric and special	400	0.1	449	0.1	I. 49
Total	853,031	100.0	1,012,503	100.0	I. 188,472

Of the total in 1913, there were 1,006,149 tons ingots and 36,354 tons direct castings. Of the castings 32,101 tons were openhearth, 3809 tons bessemer and 444 tons other steel. There were 1582 tons of alloy steel. There were six works in 1913 making steel ingot and 13 works making castings. Seven plants make ingots or castings of bessemer steel, eight openhearth steel, two electric steel and one special steel. All the openhearth steel was made by the basic process.

The production of steel in Canada has increased rapidly, as is shown by the following table which gives the make for 10 years past in long tons:

1904	148,784	1909	678,751
1905	403,449	1910	741,924
1906	570,889	1911	790,871
1907	646,754	1912	853,031
1908	509,957	1913	1,012,503

Of the steel made last year, 421,121 tons were made in Nova Scotia, 596,555 tons in Ontario, 21,827 tons in Quebec and British Columbia.

Finished Iron and Steel

The production of finished iron and steel in Canada for two years past has been as follows, in long tons:

	Rolled		Forged	
	1912	1913	1912	1913
Steel	752,212	871,216	21,548	20,827
Iron	109,012	95,881	867	2,578
Totals	861,224	967,097	22,415	23,405

The total production of iron and steel cut and wire nails in 1913 was 1,520,000 kegs of 100 lb. each, an increase of 30,000 kegs over the preceding year.

In 1913 there were 33 works which made finished forms of iron and steel, of which 21 were rolling mills. Three new plants were built during the year, and three others were under construction at the close of the year.

The most important item of finished material in 1913 was rails, of which 506,709 tons were rolled, being 52.3% of the total. All these rails were of steel.

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The Rand's Ore Reserves

By A. Cooper Key*

The Rand relies to a great extent for its stability of output and profits on the enormous advance development of its mines, some of which have millions of tons of ore opened up, i.e., exposed by driving or winzing on three sides of the blocks of ore. Pride of place is held by the Crown Mines consolidation, which can crush 200,000 tons per month. It has 10½ million tons available for attack, the value of which is not less than 15 millions sterling. The value of the whole is about 1s. per ton less than at this time last year. Of the two other big combines, the East Rand Proprietary has fallen off 410,000 tons, owing largely to the scarcity of labor in the second half of the year. On the other hand, the amalgamation of the West Rand, the Randfontein Central, has been able to increase its "stock in trade"—for so one can style the ore in sight—by 470,000 tons, although the grade is somewhat lower. The great coming mine of the Central district, the City Deep, whose output and profits will go toward balancing those of the Robinson, which will shortly decline owing to impending exhaustion, increased the unit value of its reserves by 1.3 dwt., the figure now being given at 10 dwt. It has gold to the value of 4½ million in sight, of which quite 2¼ million may be regarded as profit.

Most of the companies now declare their reserves on the mining-tons basis, instead of on milling tons as formerly; this tends to increase the aggregate, but to lower the value. The change was decided upon owing to the fact that variations in labor supply have a bearing on the percentage of rock it is feasible to discard. Hand stoping by the Kafir laborers permits of narrower widths; machine work involves the breaking of more waste; this would admit of greater sorting percentage, but not in proportion, as more unsortable fines are produced under machine conditions owing to the greater shattering of the rock. There are about 9150 drills in commission on the Rand, as compared with 5900 at work, a large proportion being under repair at any given time. In mines with comparatively flat orebodies and reasonable widths of reef, machine drills do well, but where the inclination is a steep one, as for example, at Randfontein and the East Rand Proprietary, the reports of their work are not so favorable.

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*Editor, "South African Mining Review," Johannesburg, S. A.

In the far East Rand district, the showings of the four "Modder" companies—they all have that curious Dutch word somewhere in their title—reflect great activity; the senior company, the New Modderfontein, had added 650,000 tons to reserves up to the end of its fiscal year, since materially increased; the younger Modder B is 200,000 tons to the good, the value of the entire reserve having increased by over 1 dwt. In these mines, the policy of opening out in big blocks has been adopted with great success. Exclusive of the charge of 1s. 6d. per ton for development redemption, these mines are being worked at the low figure of 14s., say $3.35 per ton. In this area there are three mines in the development category. The Modder Deep has opened out a million tons of 7-dwt. rock; the Modder State, the first and so far the only mine worked under the Government-lease scheme, 560,000 tons of 6½-dwt. ore, but this is likely to improve so soon as the better ore of the southern section enters with the average. Springs Mines is not sufficiently developed to permit of estimating its payable ore reserve. The Van Ryn Deep, another mine in this vicinity, started crushing in July and paid its initial dividend in December; it has nearly 700,000 tons additional to the credit of its ore reserves, but, more striking and important still, the value of the entire tonnage is 1½ dwt. higher. The recovery is estimated at 35s. per ton, say $8.30, about half of which may be reckoned as profit.

TONNAGES, VALUES AND STOPING WIDTHS OF THE RAND MINE RESERVES

Producing Companies	As at December, 1912			As at December, 1913, or Latest Date		
	Tons	Dwt.	In.	Tons	Dwt.	In.
Aurora West....	556,163	5 1	43	554,909	5.7	.
Bantjes Con.....	840,800	7 0	41	974,700	6 3	42
Brakpan.......	2,457,000	6 74	61	2,224,000	6 7	61
City Deep......	2,123,650	8 7	.	2,167,650	10	42
Cinderella Con. *e*	573,000	6 7	.	613,000	6.35	
	partial 304,000	...		partial 231,000	....	
City & Suburban.....	773,300	8 4	55	786,500	8.3	
Con. Langlaagte	2,069,630	*a*6 1		2,194,400	*a*6 4	.
Cons. Main Reef	610,680	7 2	.	614,470	7 32	48
Crown Mines...	10,607,670	7.1	62	10,449,000	6.82	63
Durban Rood. Deep.....	1,306,100	6 9		1,312,700	6 7	47
East Rand Prop.	6,013,000	6 8	54	5,600,000	6 7	54
Ferreira Deep...	2,070,900	9 4	61	1,974,400	8.7	68
Geduld Proprietary........	*c* 1,475,000	6 98	53	1,757,000	6 9	58
	116,000	5 79	53	106,000	6 3	59
Geldenhuis Deep	1,904,700	6 3	49	1,669,500	6 4	49
Ginsberg......	346,681	*a*6 9	.	312,540	*a*6 0	..
Glencairn.....	761,000	*a*3 5		587,920	*a*3 6	
Jupiter *c*.	1,270,000	*b*4.4	.	1,273,000	4 5	..
	partial 101,000	4 0		161,000	4 1	..
Knights Central.	647,000	6 1	62 5	539,100	6.0	60
Knights Deep...	1,477,400	4 47	..	2,777,000	4.3	..
				partial 259,000	3.7	..
Langlaagte Estate..	1,370,639			1,512,360	....	
Luipaardsvlei Estate.....	500,171	5 7	.	581,800	5 5	..
Main Reef West.	685,720	6 3		591,830	6.02	55
May Consolidated........	133,000	6 64	. 52	61,350	6 33	..
	(pillars) 25,000	8 49	53	20,700	9.9	..
Meyer & Charlton...	311,745	12		471,844	11 7	
Modder B......	2,594,000	7 2	54	2,800,400	8 3	55
New Goch......	957,600	5 1	89	917,088	5 16	
New Heriot.....	590,742	8 1	46	581,124	8 1	46
New Kleinfontein....	1,190,663	7 59	46	*c* 1,658,481	6 3	59
New Modderfontein......	3,900,000	8 1	.	4,547,000	8 1	..
New Primrose...	113,033	*a*6 5		401,045	*a*6.2	
New Rietfontein	135,887 130,107	*a*6 5	.	51,737	7 55	
New Unified....	275,028	*a*6 1		387,500	*a*5.9	..
Nourse Mines...	1,969,000	6 6		1,795,600	6.6	..
Princess Estate.	637,000	7 24	27 7	614,000	7 2	28 6
Randfontein Central.....	6,350,781	6 8		*f*6,818,929	6.5	.
Robinson.	1,130,600	11	75	....	.	
Robinson *d*..	242,500		.	....		
Robinson Main R. ..	1,160,800	4 3		.....	.	.
Rose Deep.	3,695,100	6 1	56	3,828,400	5 8	56
Robinson Deep.	1,114,000	6 7		*c* 1,538,000	6 0	.
				partial 346,000	5 88	
Roodepoort United.	379,283	5.08	41	370,732	5.3	45
	partial 100,000	6 34	38	189,000	5 4	45
Simmer & Jack	2,680,000	6 2	.	*c* 2,524,000	5 4	.
	partial 438,000	5 3		partial 406,000	4 7	
Simmer Deep	1,575,000	4 2		1,670,000	4 .	
Van Ryn.	2,154,000	6 4		2,064,500	6.5	..
Van Ryn Deep .	1,278,003	7 1	51	1,953,845	8 6	55
Village Deep	2,235,300	6 9	52	*f* 2,662,600	6.6	60
Village Main Reef.	1,418,750	8 8		....	..	.
West Rand Cons	1,116,733	6 02	49	1,364,956	6.16	..
	partial 326,500			partial 213,360	..	.
Witwatersrand	1,331,540	*a*6 4		1,225,688	*a*6.4	..
Witwatersrand Deep	1,492,257	6 83	50	1,666,000	6 8	50
Wolhuter... ..	832,977	6 48	50	784,100	6.1	51
Developing Cos.						
Apex	496,438	6 18	59	496,438	6 18	59
Govt. G. M. Areas (M) . .				559,500	6.6	50
Modder Deep...	....		.	982,000	7 0	75
				partial 191,000	10 5	62

a Estimated recovery value. *b* Mine grade. *c* Mining tons instead of milling tons as previously. *d* Old workings, stopes and shaft pillars. *e* Crushing suspended. *f* Figures not available

From the tables attached, it will be seen that no less than 30 of the Rand producing companies have each over a million tons of ore in sight, some considerably more. A general survey of the position shows that in spite of the industrial disturbances of July, followed by a shortage of the "essential Kafir" labor, the ore reserves have been well maintained. The extractable value of the aggregate may be estimated at £150,000,000. The tonnage of 115,000,000 represents about one-fifth of the entire quantity of payable rock in the producing mines, and about five years' consumption for the mills at existing rates.

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Ontario's Mineral Production for Half Year

The statistics of Ontario's metal production for the half year ended June 30, have been compiled by the Bureau of Mines. As in most other industries, the production as a whole for the half year shows a decrease. However, there is likelihood of the gold output being increased in the near future, as trade depression does not affect the "market" for this metal.

ONTARIO METAL PRODUCTION FOR HALF YEAR ENDED JUNE 30

Product	1914 output	1913 output
Gold, oz.	99,269	2,171,147
Silver, oz.	13,379,044	7,693,713
Copper, tons	8,357	832,645
Nickel, tons	13,105	2,514,414
Iron ore, tons	47,160	141,324
Pig iron, tons	343,408	5,051,840
Cobalt, tons	129	7,374
Cobalt and nickel oxides, lb.	757,268	186,347

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Charges for Wasting Slag

Railway carriers serving the Pittsburgh, Wheeling, Youngstown and Cleveland districts on Aug. 15 filed tariffs proposing a charge of 20c. per net ton for wasting or disposing of furnace slag, flue dust, refuse, etc., and 35c. a net ton for ashes mixed with refuse, brickbrats, dirt, etc. Unless overruled, tariffs will become effective Sept. 15.

Tariffs state that the minimum weight per car will be 80% of the marked capacity, actual weight to be charged for in excess of the minimum; that $25 per car will be charged shippers if material cannot be unloaded by hand, and that no allowances will be made for spotting or switching cars.

Furnace slag has been hauled gratis. It is used largely for filling purposes, and has been used to a great extent for filling railroad yards, extending switches and filling track beds. Furnace owners will oppose the effort to establish these charges. They will also, it is said, make a charge to the railroads for any slag or ashes used by them for their own work.

The El Paso Smelting Works--II

By Richard H. Vail

SYNOPSIS—Copper smelting has come into the ascendant at El Paso since the development of copper properties in that region, particularly the Chino operation. The new copper department at El Paso comprises eight Wedge roasters, three 19x100-ft. reverberatories and three basic-lined converters, two of which are Peirce-Smith and one the Great Falls type. Besides this equipment, there are two old 40x144-in. blast furnaces. The most interesting feature of the copper plant is the craneless converter department.

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The Copper Department of the El Paso Smelting Works

The present copper-smelting department of the El Paso Smelting Works owes its existence to the taking of the contract to smelt the Chino concentrates. Originally copper ores were smelted at the El Paso works with the lead-matte concentration runs, but as the supply of copper ores grew, furnaces were especially allotted for this purpose. The two 40x144-in. copper blast furnaces that have been in commission for about 10 years, are in the same building with the lead blast furnaces, but new buildings have been provided for the Wedge roasters, reverberatory furnaces and converters added since the smelting of Chino concentrates was undertaken. The new copper department is noteworthy in that it is the only works of importance in the United States that operates a converting department without an overhead traveling crane.

Copper Blast Furnaces

The blast furnaces have double-tier jackets and eight 3½-in. tuyeres on a side. A cast-iron breast jacket is used, and a water-jacketed copper spout with cast copper nose, trapping the blast 8½ in. The settlers are 14 ft. in diameter and a cast-iron tapping block is used. About 30-oz. blast pressure is carried, and a charge column of 10 ft. Normally about 1½% of flue dust is made About 11% of coke is used and an average tonnage of 278 tons, or nearly seven tons per square foot of hearth area, was maintained during a recent month with the following slag: SiO_2, 38.2; FeO, 26.6; MnO, 0.8; CaO, 24.2; ZnO, trace; Al_2O_3, 8.4; Cu, 0.39%; Ag, 0.1 oz. The copper on charge amounted to 7.7%, and the sulphur on charge was 9.8%. The matte fall averages about 15% and the grade of the matte for the above month was 47.4%.

The matte is tapped into pot cars brought in on a depressed track by the dinkey locomotive that serves the converters. Recently an auxiliary settler, 12 ft. in diameter and covered with a domed roof of silica brick, has been tried as an experiment in slag disposal for both the copper and lead furnaces. This settler is oil-fired and consumes about four barrels of oil per day. Little matte has been caught in the second settler, its chief value at the copper furnace being in reducing the expense of slag disposal. The auxiliary settler is tapped for slag at intervals when convenient for the slag-hauling locomotive and in this respect involves no extra expense over slag-hauling from the Rhodes separator furnace to which the lead slag is regularly taken. This auxiliary-settler system may be extended after further trial, instead of adopting the more usual plan of spur tracks, which would involve tunneling and tracks of short radii.

Large Tonnage in the Wedge Roasters

In the copper-roasting department there are eight 22-ft. Wedge water-cooled roasters, which have three roasting hearths and a drying hearth on top. These are oil-fired on account of the low sulphur contents of the concentrates; about 0.2 bbl. of oil are used per ton roasted. With the low desulphurization a large tonnage is obtained from the Wedge furnaces which averaged 140 tons per day during a recent month; as much as 180 tons have been put through in a single day. The sulphur in the concentrates averages from 13 to 16%, and in the calcines, from 9 to 11%. The concentrates are brought to the roaster department in small tram cars which dump into a bucket-elevator delivering on a 20-in. conveyor belt and tripper feeding the roaster hoppers. The calcine hoppers are comparatively small and provide little storage; some inconvenience is felt thereby, owing to the long interval between reverberatory charges.

The gases from the Wedge roasters and the copper blast furnaces pass into a brick flue having a cross-section, 10x15 ft., which later enlarges to 16x20 ft., with hopper bottom; one wall of the copper flue for about 600 ft. forms a common wall with a flue 10x17½ ft. for the lead-furnace gases. These flues unite about 100 ft. from the main stack, which is 225 ft. high and octagonal in cross-section, the least diameter being 14 ft. 8 in. There are discharged from the stack about 300,000 cu.ft. of gases per minute, at a temperature of about 270° F.; the gases consequently have a high velocity.

Reverberatory Furnaces

There are three reverberatory furnaces, 19x100 ft., the waste gases from which are utilized by seven 400-hp. Erie vertical water-tube boilers. The reverberatories are oil-fired and smelt an average of 300 tons per day. The tonnage has been as high as 398 tons of solid charge for a period of 10 days. Oil burners are used and air is supplied to the burners at 15-lb. pressure. One of the furnaces has openings above the burners to admit excess air. The oil consumption is about one barrel per ton of charge smelted. The matte usually contains from 42 to 45% copper, but at periods has been as high as 55%. The reverberatory slag is removed in 50-cu.ft. pots, hauled by a 20-ton coal-fired locomotive. The flues over the skimming doors leading to the boilers are sheathed with sheet asbestos to keep the heat off the men while skimming.

Fettling of the reverberatories is done with high-silica, copper-sulphide ores, averaging SiO_2, 70%, Fe, 2; S, 3; Cu, 7%. The fettling is thrown in from the side doors except at the bridge, where there are fettling hoppers that permit the material to be dropped through the roof. While the fettling material has a tendency to slough off into the furnace, no great difficulty is experienced with the fluxing of the side walls. The No. 2 furnace, with some small repairs, ran for 14 months before the side walls required renewal.

A Craneless Converter Department

The converting department is unique among large smelting works in that it was built to operate without an overhead traveling crane. All matte and other material fed to the converters is brought to the feed floor by 20-ton coal-burning locomotives on an elevated track that serves both the converter and the reverberatory feed floor; the converter slag and copper are likewise transferred by dinkey locomotives on a track below the converter operating floor.

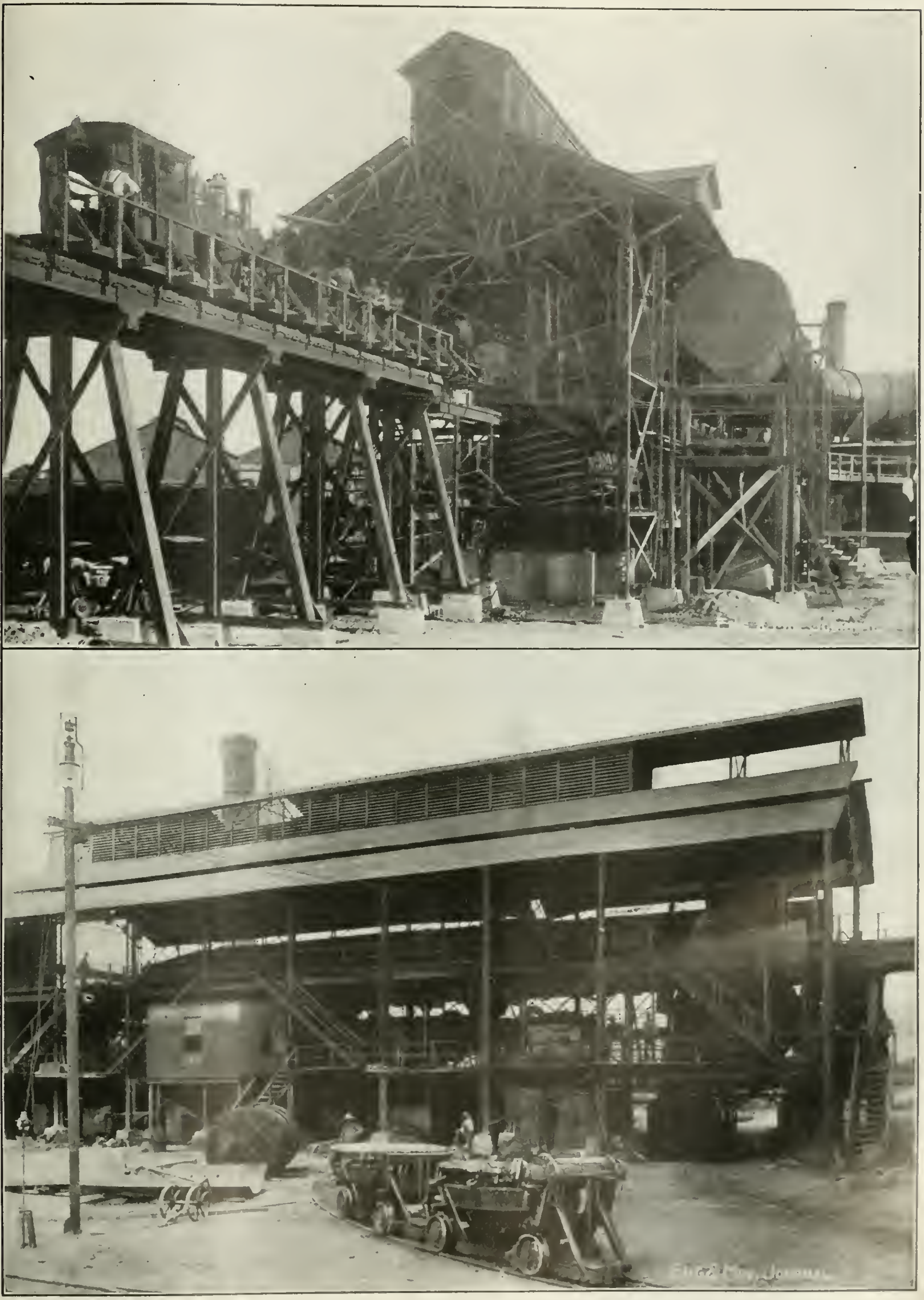
The operation of a converter department without an overhead crane is a novelty that on short observation does not commend itself greatly to one accustomed to a crane-served plant. The converter department here when in full operation employs a locomotive and crew for the slag haulage, and another for matte and bullion. The locomotives operate on a switchback having a length of 850 ft. and a grade of 2%. In transferring slag to the reverberatory feed floor, it is necessary to disturb the flux cars over the converters; before leaving the building, these must be replaced. Also, it may easily be surmised that at night it is difficult to secure prompt service from locomotive crews that are outside of the building, and possibly one-sixth of a mile away. In the craneless plant, however, there is a great saving in first cost, and where there is ample converter capacity and cheap labor, it might be accepted as a substitute for the usual equipment.

The converter department originally comprised two 10x26-ft. Peirce-Smith converters, but these were supplemented last year by the addition of a 12-ft. upright converter, made by the Power & Mining Machinery Co. The converter department, when in full operation, produces about 8,000,000 lb. of copper per month. About 7000 tons have been obtained per lining from the Peirce-Smith converters; the upright converter at the time these notes were taken had not been in use long enough to have had representative runs. The upright converter gave more trouble from slopping, probably on account of the comparatively shallow distance, 10 in., from tuyere line to the bottom of the "saucer;" this distance has since been extended to 13 in. and better results have been obtained. The No. 2 Peirce-Smith converter was last year completely relined and 1½-in. tuyere pipes were used in place of 1¼-in. pipes formerly employed.

Air is supplied to the converters at from 10 to 15 lb. pressure and about 160,000 cu.ft. of air are used per ton of copper. Matte in 6- to 10-ton hand-tilted ladle cars is hauled by a dinkey locomotive to the upper floor of the building and tilted into the converters. The silica flux for the converters is brought to the upper floor in larry cars, which, when in position, feed directly into the converter. However, when silica is desired, it is necessary to send a man to the upper floor to open the car gate. The slag from the converters averages SiO_2, 23.5%; Fe, 50.8; Cu, 1.7; Ag, 0.25 oz. The Peirce-Smith converters are equipped with oil burners to keep the charges hot in case of delay. Little difficulty is experienced here with converter collars, owing to the fact that the converter mouths are built up with clay, and that there is little slopping. Since the converter department has no crane, the avoidance of bad converter collars is a necessity at this works. This may not permit of running the converters at so high a capacity as at some plants, but it may be questioned whether more time is required for "mudding" the converter mouth than for pulling a bad collar.

Copper-Casting Department

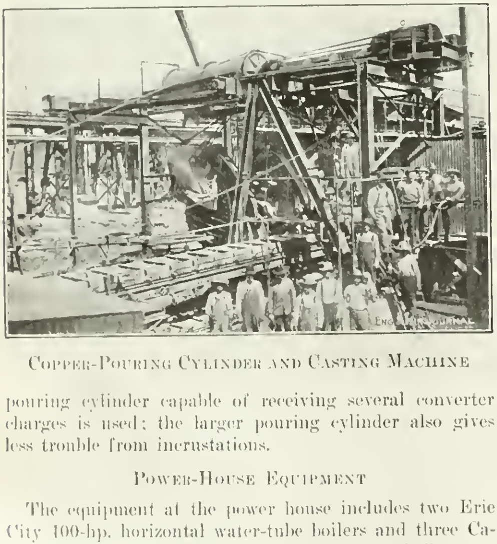
The copper from the converters is poured into a cylinder 6 ft. in diameter by 9 ft. long, mounted on two



TWO VIEWS OF THE CRANELESS CONVERTER PLANT AT EL PASO

The converter feed floor is served by coal-burning locomotives operating on a trestle and switchback 850 ft. long.

four-wheel trucks. This pouring ladle is lined with magnesite brick and holds 20 tons when clean; they have a tendency to fill up even though they are oil-fired. Two ladles are usually required for a charge of copper, which is taken from the converter in from 20 to 30 min. The ladles are hauled from the converting department to the casting machine by locomotive; when in place, the pouring ladle is lifted by a hydraulic tilting device so that it revolves about the tip of the spout, which remains in the same position. The hydraulic cylinder for operating the ladle is 36 in. in diameter by 11 ft. long and receives water at 190- to 200-lb. pressure. From the ladle spout the copper stream is received in a hydraulically operated pouring spoon from which it is delivered into cast-iron molds on a straight-line casting machine. This is hydraulically operated, and the average pouring speed is about 2½ bars per min. The cast-iron molds are reinforced on the back with a steel plate. An overlapping lip on the molds prevents the spilling of copper and the formation of fins; little trimming of the bars is necessary. The collection and pouring of the copper do not appear to be so expeditiously done as in a crane-served plant; for example, as at Hayden, where a larger pouring cylinder capable of receiving several converter charges is used; the larger pouring cylinder also gives less trouble from incrustations.



COPPER-POURING CYLINDER AND CASTING MACHINE

POWER-HOUSE EQUIPMENT

The equipment at the power house includes two Erie City 100-hp. horizontal water-tube boilers and three Cahall 300-hp. boilers of similar type. These boilers are used when the five reverberatory waste-heat boilers are out of service for any reason. The oil consumption in the power-house boilers during a typical month was only 1188 bbl. Figuring a 30% utilization of the oil burned in the reverberatories, the water evaporated by all boilers for the above month was 7.83 lb. per pound of coal (oil equivalent) and the water evaporated per horsepower-hour was 28.1 lb. The temperature of the feed water was 160° F. and the steam pressure 135 lb. The indicated horsepower required for the works, on full-time basis for all equipment, is about 1200 hp. All steam engines in the power house are run condensing, two Wheeler condensers being used and a vacuum of about 19 in. maintained. In a typical month, 13,100,000 lb. of exhaust steam at 192° F. were condesed, 780,760,000 lb. of circulating water at 71° F. being required.

Air is furnished to the lead and copper blast furnaces by rotary blowers: One 300-cu.ft. (No. 10) Connersville blower is direct connected to a Hamilton corliss, tandem-compound engine, 16x32x36 in., operating at from 70 to 105 r.p.m.; two No. 9 Connersville blowers are direct connected to a Pennsylvania corliss, tandem-compound, 20-36x42-in. engine operating at 60 to 100 r.p.m.; one No. 7 Roots blower is driven at each end by General Electric motors. Two Nordberg, cross-compound, converter blowing engines are used. One has steam cylinders 22 and 48 in. in diameter, 48-in. air cylinders and 48-in. stroke; its capacity is 12,000 cu.ft. of air at 16-lb. pressure. No. 2 engine has 26- and 56-in. steam cylinders, 54-in. air cylinders, and 48-in. stroke; its capacity is 15,000 cu.ft. at 16-lb. pressure. These engines supply air to the converters and to the reverberatory oil burners. A small Ingersoll-Rand compressor supplies air at 100-lb. pressure for mechanical tools in the company's shops; this is shortly to be supplanted by a compressor of larger capacity, a 500-cu.ft. Ingersoll-Rand double-stage compressor having been ordered.

Electric power is supplied by two 250-kw., 250-volt General Electric direct-current generators; these are direct connected to two Nordberg cross-compound, 15x30x36-in. engines operating at 120 r.p.m. Hydraulic power for operating lifts, converter-hood dampers and the copper-casting machine is obtained from two 12x18x18-in. Buffalo outside-packed, plunger-type duplex steam pumps These are equipped with automatic pressure governors set to maintain a pressure of 195 lb. in the hydraulic system. There are two 7x12x10-in. Deane duplex fire pumps, and three Worthington outside-packed plunger-type pumps, 7x12x12 in., to supply feed water to the reverberatory and power-house boilers.

OIL CONSUMPTION

Oil is used as fuel throughout the works, except for the five coal-burning locomotives in industrial service, one coal-fired Godfrey roaster and, of course, the coke for the blast-furnace charge. The oil consumption for a typical month was as follows: Reverberatories, 15,021 bbl.; power-house boilers, 1188; separator furnace, 750; Godfrey roasters, 393; Wedge roasters, 2382; converters, 264; copper-casting ladle, 250; assay office, 150; total for month, 20,398 bbl.

About 1000 men are employed at the El Paso plant. Most of the work in the metallurgical departments is done by Mexicans and the common labor is exclusively of this nationality; eight-hour shifts are worked for all continuous operations, the prevailing rate of wages being $1.50 for unskilled labor. The mechanical shops work nine hours and there is a daylight roustabout gang working 10 hours.

The El Paso Smelting Works are under the general management of Kuno Doerr, and under the immediate direction of J. J. Ormsbee, superintendent; H. F. Easter, first assistant superintendent; Alan F. McCormick, second assistant; W. J. Eustace, chief clerk.

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Texas Mineral Production in 1913 showed an increase in value of nearly 40%, according to the U. S. Geological Survey. Principal items were: Petroleum, 15,099,478 bbl.; coal, including lignite, 2,429,144 tons; asphalt, principally residue from heavy asphaltic oils, 122,026; gypsum, 161,090 tons; salt, 355,529 bbl. Other mineral products, copper, quicksilver, sulphur, etc., were produced, but the quantities are not stated.

The Men and Machinery of the Comstock--The Sutro Tunnel

By G. W. Dickie

SYNOPSIS—An exceedingly interesting character in connection with the early days of the Comstock lode was Adolph Sutro, who was responsible for the famous Sutro tunnel, originally built to handle the ore from the lode to the refining works on the Carson River, but used only for draining purposes. This tunnel made possible the handling of water from the extreme depths which became necessary. The pumping engines of various types which were built on this account are described and illustrated. They provided problems which, up to that time, had never been considered.

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Before the demand for big machinery on the Comstock became an accomplished fact in the history of that wonderful mining camp, an interesting character and strong personality connected with a great project that requires consideration in this narrative came into notice in Comstock affairs. Adolph Sutro, a German Jew, doing business in San Francisco as a stock and bond broker, became, through his business dealings, connected with and much interested in the Comstock mines. Previous to this time the celebrated William Sharon and his financial friends had projected and built the Virginia and Truckee R.R., to handle the rapidly increasing freight and passenger traffic which the development of the mines had created. This was before the construction of the Virginia and Gold Hill Water-Works. The scarcity of water at Virginia City in these earlier days had compelled the mining companies to locate their mills for extracting the precious metals, gold and silver from the ores, on the Carson River, and Sharon's railroad was built to transport these ores from the mines to the mills, which were some 1700 ft. below them and about 10 to 12 miles distant. The relative positions of the mines and mill vertically set Mr. Sutro thinking, for he had been educated as an engineer and out of his thinking came the idea of driving a tunnel from the Carson River at the mills to the Comstock lode, which is a direct horizontal line to the nearest point of contact would be four miles.

The Sutro Tunnel

The project was a big one, but although the financiers in San Francisco were not afraid of big things, Sutro's dream did not captivate them. The Bank of California crowd was in the height of its power then and the Bonanza crowd had not yet become a power. The Virginia and Truckee R.R. was making money even if the mines were not and to carry out Sutro's scheme would hurt the railroad. Sutro then tried to interest the general public in his scheme and endeavored to get them to invest in the shares of the Sutro Tunnel Co.; some of the methods he adopted to win their attention certainly amused them if they did not get their money; in fact, they did both. He got a stereopticon, hired Platt's Hall, a famous central meeting place on Montgomery St., and began by a series of illustrated lectures to interest the good citizens of San Francisco in the proposed tunnel and those who opposed it.

Mr. Ralston, who was at that time at the head of the Bank of California, which was opposed to the tunnel, had a beautiful country home at Belmont, a little village 28 miles south of San Francisco; he was fond of driving fine horses and used to drive in to his office from Belmont in the morning in a resplendent coach, drawn by six fast thoroughbreds, changing horses at Uncle Tom's Cabin, a

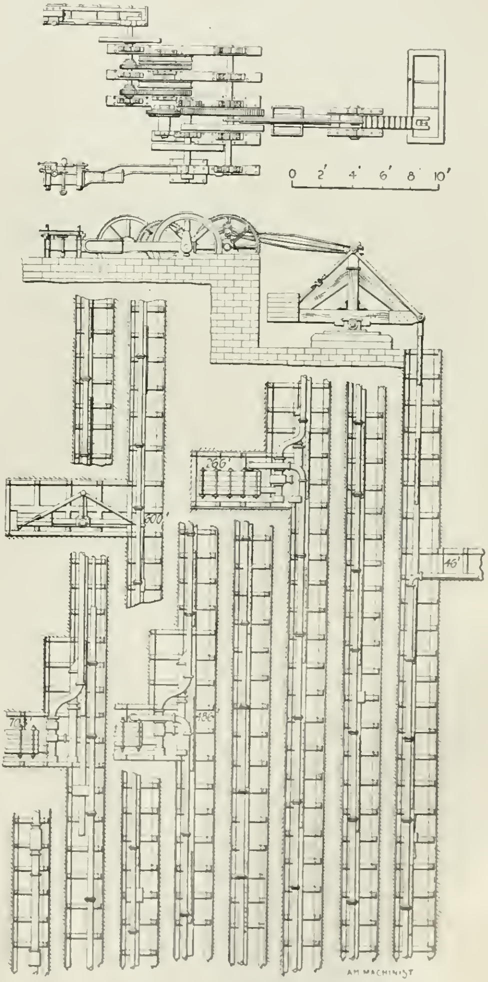

Fig. 1. Plan and Elevation of the Pumping and Hoisting Works Built in 1874

resort about half-way to town; in the afternoon he would drive back on the same way. This was a fine ride, as I can testify, having made the trip with Mr. Ralston on two or more occasions, and he made good time.

Usually the first picture shown by Sutro was that of Ralston's grand turnout with Ralston on the box and Sharon beside him. "These," Sutro would say with his quaint German accent, "These are the men who don't want my tunnel built." Then he would go on to tell his audience of the foolishness of the railroad's method of transporting ore by hoisting it up 1700 ft. above the mills, loading it on cars, and then lowering it down 1700 ft. on the cars to be milled. Having worked up the crowd to this point, he would throw a picture on the screen, showing a train of empty ore cars doubled back on itself on one of the many sharp turns of the road, the engine just passing the caboose, the engineer leaning out of his cab and talking to the brakeman in the caboose, and he would remark, "Ladies and gentlemen, this is Sharon's crooked railroad."

Some years before this, a sad accident happened. The Yellow Jacket mine on the north end had a fire in the shaft at about the 800-ft. level, which cut off from escape the miners below and a number of lives were lost. The horror of this was still in the minds of people. Sutro would throw a picture of the burning shaft on the screen with the terror-stricken and helpless miners huddled in the drifts below. "Ladies and Gentlemen," Sutro would say, " you know what this picture is and I do not want to hurt your feelings by keeping it before you." Then another picture was shown with the Yellow Jacket Shaft afire from the 800-ft. level to the surface, but showing the Sutro tunnel at the 1700-ft. level and the miners leisurely walking the four miles to safety contentedly smoking their pipes, and Sutro would say, "Ladies and Gentlemen, this is what might have been." So with pictures and talk he managed to get about $1,000,000 out of San Francisco; the rest he raised in Germany and the Great Sutro Tunnel was driven through the mountains to the mines between the 1600- and 1700-ft. levels.

Sutro, with all his peculiarities, was a remarkable man and both by nature and early education, a constructor and engineer. His tunnel was economically correct, but certain moneyed interests were opposed to it even after it was an accomplished fact and the Great Bonanza had made Virginia City known and celebrated throughout the whole world. The men in control built the mills for working the ores from the Consolidated Virginia, not on the Carson River where the old mills were, but at Virginia City, beside the mines. This was made possible by the building of the Gold Hill Water-Works, which brought to Virginia City an abundant supply of water, so no ore trains ever went through the Sutro tunnel. It came, however, to be a great water drain, making pumping possible from depths that could not have been reached without it. It struck into a lateral gallery connecting the shafts of all the mines and Sutro had contracts covering the use of the tunnel for the conveyance of ores and the drainage of water; unfortunately for the Tunnel company, the contracts for drainage were not remunerative and the tunnel was not a profitable venture; nevertheless fortunes were made and lost in the fluctuations of its stocks. It was its function as a water drain that has made it necessary to introduce the famous four-mile tunnel and the man who made it into our narrative at this point.

EARLY METHODS OF HANDLING WATER

In the earlier days of gold and silver mining on the Pacific Coast states, neither great depths nor large quantities of water had to be dealt with and the machine shops around the Bay of San Francisco furnished such simple devices as were then found to be sufficient. A water wheel, generally a hurdy-gurdy, driven by a small jet from some high head, was the usual prime mover. A pump-bob of the simplest construction and all of wood and a bucket lift were all the pit work necessary. Some rigs like this may be seen working to this day in placer diggings. In quartz mines water was not often available for power and steam had to be applied to this purpose.

Some of the first pumps used on the Comstock were of considerable power. The best of the older pumping engines that I recollect was that at the Savage mine, a fine beam engine of about 200 hp., geared 5 to 1, driving a line of 12-in. plunger pumps, and a bucket-lift sinking pump at a depth of 1800 ft. This engine was removed in 1875 and replaced by a compound direct-acting differential engine. The old engine which was a fine specimen of its type was used for years after to drive the machinery of a quartz mill.

As the mines increased in depth and larger quantities of water had to be raised to greater heights, powerful engines and heavy gears had to be built to do the work. Some time about the middle of 1874, I. F. Thompson, engineer for a number of the mining companies, came to the Risdon Iron Works with a proposal for new pumping and hoisting works for several of the mines. This involved us in something bigger than we had as yet undertaken and we had no data concerning previous construction of similar installations even approaching this magnitude; in fact, these were greater pumps of their kind than had been built anywhere. We had to go very carefully into our calculations. It was settled that 14-in. pumps should be used and that the depth that would be reached ultimately would be 2000 ft. I made the plans for these great works which included both pumping and hoisting, and fortunately I have found a lithograph of the original drawing. The illustration, Fig. 1, is from a photograph of the lithograph. I may state that I myself redrew the plans used to illustrate these articles and many others also on the lithographic stones in such spare time as I had in those old strenuous days. To realize the amount of labor this involved you must think of drawing a plan of a complicated mechanism upside down backwards by gas light with a greased pen after a hard day's work. The arrangement as shown may be taken as representing the best we had done previous to 1875 with high-pressure expansive non-condensing engines. It turned out that identical sets of this machinery would be required for the Silver Hill, Dayton, Caledonia, New York and Ophir Mines, and we undertook to have all five sets in operation in 12 months.

The five sets were all built from the same design and were of the following dimensions (see Fig. 2): Engine for pumping gear, 24 in. diameter of cylinder, 60-in. stroke, fitted with double beat valves and variable cut-off. The illustration, Fig. 1, shows the arrangement of gearing; this consisted of two pinions 24 in. diameter and 14-in. face, gearing into two spur wheels 168 in. diameter and 14-in. face. The pitch of the gears was 4 in. The wristpin for the connecting-rod or pitman was secured in hubs on the arms of the spur wheels; there were two sets of hubs, one giving a stroke of 8 ft. to the pumps and the other a stroke of 6 ft. The flywheel, which was 14 ft. diameter, weighed 20 tons. Behind the pumping gear a winch barrel was arranged for handling pumps and pit work in the shaft.

The hoisting gear consisted of a horizontal slide-valve engine with 20 in. diameter of cylinder and 30-in. stroke. Two pinions on the engine shaft geared into spur wheels, the spur wheels being on separate shafts, each shaft having a brake wheel. Flat ropes were used 6x½ in., which wound on a spool between the gears and the brake wheels. These were balanced hoists, one cage coming up while the other was going down. Every care was taken to make these works of a most enduring character. The foundations and the bedplates were of a most massive design. The weight of the machinery in each surface set was 325,000 lb. and the pit work weighed 400,000 lb., exclusive of all wooden parts, which latter were supplied by the mines.

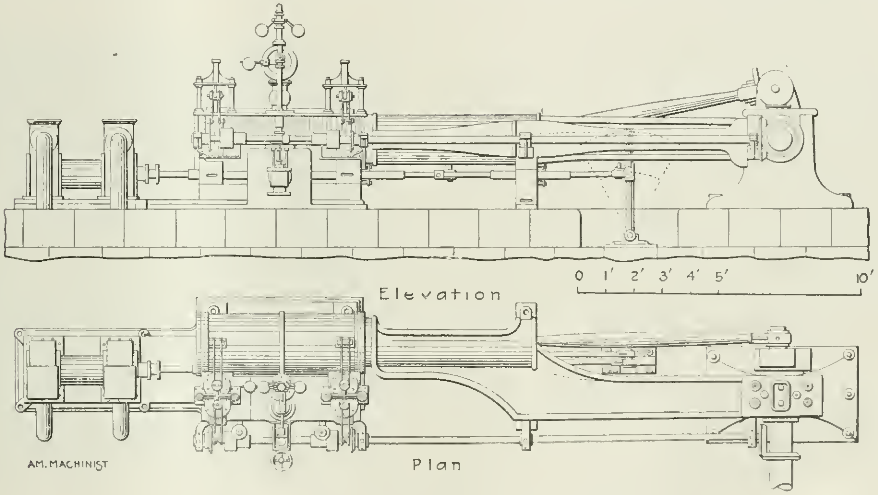

FIG. 2. TYPE OF ENGINE USED IN PUMPING PLANT

If these engines had all been fitted with condensers and the number of strokes made by the pumps kept within the limits of safe working, it would have been a hard matter to have beaten them in their economy of fuel. In pumping from deep mines, the great weight of the pit work, which is of so much importance in any direct-acting system, soon proves the destruction of the geared system. In driving from wristpins fitted in the arms of two large spur wheels, as in the example I have just given, the accelerating and retarding of the motion imparted to the great mass of pit work must follow that of the wristpin, which it will do only up to a certain rate of speed. This rate of speed is determined by the weight of the structure set in motion, the speed at which it is moved, that is the number of revolutions, and the strength of the parts. Consequently with geared pumping engines working at great depths with a heavy mass of pit work to keep in motion, the speed must be kept very slow indeed. Geared engines for pumping from great depths should, therefore, have their pumps made very large and run very slow or the frequent breakdowns and consequent delays would soon condemn the whole system, as was soon discovered on the Comstock. Fortunately I have an indicator card, showing seven consecutive revolutions of the engine of one of the five pumping sets that I referred to above; this card covers one complete double stroke of the pump, as the pump made six double strokes per minute and the engine 42 revolutions per minute. On the card four of the revolutions are on one end of the cylinder and three are on the other. A careful study of this card shows the effects of the weight of the pitmans, and pit work, on the power developed in the cylinder in spite of the 20-ton flywheel. The speed of the engine was maintained nearly constant by an ordinary centrifugal governor. In this particular case there was 1400 ft. of pit work in motion and an attempt to increase the pump speed from six double strokes per minute to eight resulted in a severe breakdown and hastened the introduction of another type of pumping engine on the Comstock.

THE DIFFERENTIAL PUMPING ENGINE

The pumping engine that began to claim attention when several of the mines had reached a depth where the geared type was no longer reliable and which began to take its place at the head of some of the deepest mines on the Comstock was that known as Davey's Patent Differential Pumping Engine. In England this engine was known in two distinct types, the single-cylinder and the compound engine. When it came to designing this type of engine for the Comstock mines, three types had to be provided to meet all the conditions. Of the single-cylinder type only two were built that I remember; both of these were built by the Union Iron Works. One was at the Consolidated Virginia and California Combination shaft and the other at the Lady Washington shaft. The cylinders were 56 in. diameter and 8-ft. stroke, using

120 lb. steam pressure. The steam was expanded as far as the weight of the pit work and the piston speed would admit, which, in these cases, was not much; after making the stroke the steam was exhausted into the atmosphere as in an ordinary steam pump. They were horizontal and double-acting, operating the pit work through a right-angle bob working a single line of 14-in. pumps. The engine on the Consolidated and California shaft did not work long before it was compounded.

Of the compound condensing type several examples, both beam and horizontal, were built. In this type the steam was expanded to a much greater extent than in the single-cylinder type, the use of two cylinders making this possible even when the load was light and the velocity small. They admitted of the use of comparatively high steam pressures, which, in conjunction with the high degree of expansion, gave them what was considered at that time a great economy of fuel.

The third type was the compound noncondensing, two or three of which were built. These were the same as the second type, but without the condenser; where there was a possibility of obtaining condensing water, this type was never recommended.

In regard to the design of pumping plants there was a standing question of dispute between the Union Iron Works and the Risdon Iron Works which enabled mine superintendents to determine whether a plan sent to them eminated from the brain of I. M. Scott or G. W. Dickie; that was the presence or absence of a flywheel. Mr. Scott always wanted the stroke controlled by a rotating shaft and flywheel. Mr. Fair, at the head of the Bonanza crowd, always had his inspirations from Mr. Scott; this led sometimes to rather strange arrangements for working in a flywheel of which the great pumping engine installed at the Virginia mine was a striking example; the history of this demands a place in this narrative.

The Virginia Mine Engine

Mr. Thompson went to Europe and particularly to the British Isles to examine pumping and hoisting machinery on deep mines. Joseph Moore, of the Risdon Iron Works, had a brother, Ralph Moore, who was at this time, 1874, Government Inspector of Mines for the West of Scotland. He introduced Mr. Thompson to a style of pumping engine which had then obtained considerable popularity among the mine owners of Lanarkshire. This engine was patented and manufactured by Mr. Barclay, of Kilmarnock, Scotland. Mr. Thompson was so impressed that he ordered from Mr. Barclay a very large engine that would work a line of 15-in. pumps to 2800 ft. It was a compound engine and its distinctive feature was the method of attaching the engine to the pumps. This was accomplished by means of a long beam or girder which extended over the shaft far enough to receive the upper end of the spear rod and from that point extended back into the pump house a distance of about 60 ft., where the journal pins on the inner end rested in pillow blocks supported on a pedestal of masonry. The high-pressure cylinder was 42 in. diameter and 7-ft. stroke, while the low-pressure cylinder was 78 in. diameter and 8-ft. stroke; the pumps were to have a stroke of 9 ft.

As the engine was double-acting, the pit work, including the operating girder, had to be balanced sufficiently to make the up-and-down strokes equal for power. The low-pressure cylinder was placed as close to the neck of the shaft as the security of foundations would permit and the high-pressure cylinder was placed close behind it, the piston-rods of both cylinders being guided by a parallel motion of the well known James Watt type. Such was the engine ordered by Mr. Thompson, but he had still to find a place for it and that was not so easy. Neither the Union Iron Works nor the Risdon Iron Works would approve of an engine built abroad and the directors of the mining companies at both ends of the Comstock did not care to take any risks where the engineers, whose opinions they had always been guided by, would not recommend Thompson's foreign engine. The points of superiority claimed by the Barclay engine were that the maximum stresses were greatly reduced by expansion in a second cylinder, that the foundations were not so expensive and that the engine itself, by dispensing with the beam and substituting an overhanging lifting girder, was less costly. I have a letter written by myself at the time to one of the best known superintendents on the Comstock, from which I quote the following: "As this engine (the Barclay) may be introduced to the attention of mining companies in this country, and as there are no Cornish pumping engines at work on our mines with which to compare it, we will have to compare it with the horizontal differential pumping engine built by us for the Alta mine, or with the beam differential pumping engine built by us for the Lady Bryan, and for engines of moderate dimensions such as I have mentioned, the horizontal compound can be built just as cheap as the Barclay and will work as well, with the advantage of being able to work double spear rods balanced, which I think is an advantage of some importance. For larger engines the upright cylinders become a necessity, and we must compare the Barclay with such beam engines as we have already in operation. Here in the matter of the foundations (unless the nature of the ground favors the underground beam), the Barclay engine has the advantage. The lifting girder of the Barclay engine will also be cheaper built than the regular beam of our beam-engine arrangements; otherwise the cost of either engine will be the same, the finish being equal. As to the relative economy of either engine, there is nothing in the design of the one any more than in the other that can affect this question. Well loaded and properly worked, either the Barclay or the beam compound will give good results. It is saying a great deal for the Barclay engine when I state that it has become a formidable rival to the Cornish engine in situations where the latter has been in undisturbed possession for three quarters of a century. Let it come amongst us and we will either beat it or admit its superiority."

The above shows the spirit in which we discussed the engine problems of the deep mines of the Comstock

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Murcia Copper & Iron, Ltd

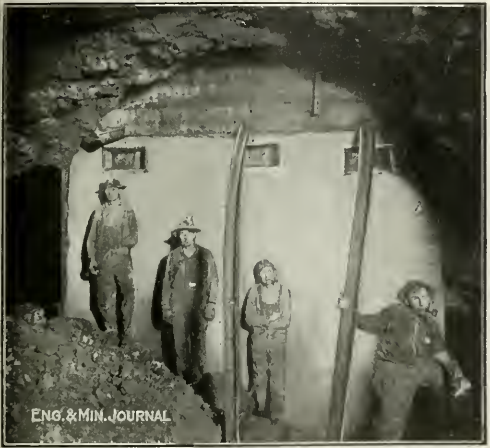
According to *Madrid Cientifico*, Aug. 5, 1914, a corporation with the above mentioned title has been formed recently to acquire and exploit a field containing deposits of copper and iron at Blanca, province of Murcia Spain. Company has capital of £60,000, divided into shares of £1 each. There are 1000 bonds of £20 each, bearing 5½% interest and retiring in 30 years.

Details of Practical Mining

Pouring Concrete Stope Pillars from Surface

By Temple Chapman*

The accompanying photograph shows the upper part f one of the concrete pillars in the Longacre & Chapman mine at Neck City, Mo. There have been built six f these pillars of reinforced concrete, a preliminary de- cription of which appeared in the Journal, June 6, 1914. They average 40 ft. in height and 16 ft. square. Sixty-pound T-rails set in the cement were carried from he top of one pillar to the top of the next pillar, about 25 ft. away. Hitches were also left by setting empty dynamite boxes in the cement to carry the ends of timbers. Cordwood was filled in above the timbers and the T-rails, the latter being braced, thus making a wide support, both the roof over the pillars and the roof between them being held.



One of the Completed Pillars with Rails Bent by Cave over Uncompleted Pillar

The concrete was mixed on the surface and poured down holes, drilled for the purpose, directly into the forms built in the mine. Old screen jackets were cut into slices 10 ft. long by 6 in. wide, and used for reinforcement. These strips were laid in the cement east and west, about 6 in. apart. Then a foot higher up they would be laid north and south. The forms were built of 1-in. boards, held in by heavy wire. The piers increased about 6 ft. in height each day, the previous day's mixture being pretty well set by the next morning. The boards for forms were all recovered after each pillar was completed.

When the pillar got up to 35 ft., or within 5 ft. of the roof, the roof was carefully trimmed and left a little high where the drill hole came through. The last cement would then be mixed a little richer and wetter and would fill every space up tight to the top.

One pillar had just been started when the roof immediately over it, which the pillar was intended to support, caved in. The rails had been left sticking 30 ft. out from the adjoining pillar over to the site of the pillar under the cave. These rails, shown in the picture, were bent down and broken off by the caving roof. The caved dirt has filled the drift up nearly to the top of the nearest concrete pier. However, this pier held up its share of the roof and prevented the cave from spreading and becoming general. Could the pillar that was started have been completed, no cave would have occurred. The concrete piers and log pens now in place are enough to permit taking out all the remaining ore in the mine. War prices have made this ore extremely valuable. The timber work in the mine has had to be reinforced with more timbers so much that it is found that the concrete is not only stronger, but also no more expensive.

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Systematic Control of Injury Cases*

Along with several other mining companies in the Iron River district of Michigan, the Munro Iron Mining Co. is using a system of following up the cases of personal injuries received in its mines, which has proved thoroughly effective.

When a man is hired, an identification card is made out giving a description of his person, the places where he has worked recently and his cause for leaving, his family connections, nationality, education in English, etc. Furthermore, after they are ascertained, his drink habits are included.

The timekeepers, dry-men, captains, skip tenders, foremen, etc., are warned to be on a constant lookout for injuries, no matter how slight. When one is discovered, the man is sent to the doctor for attention and the injury is reported to the timekeeper. The timekeeper in turn reports by telephone to the general office and makes out a card showing the date, name and nature of the injury. This card is hung on a registry board, which is kept where the captain and foremen can easily refer to it when taking on their shifts. No man with his name on the board is allowed to go underground.

The timekeeper also makes out a report giving a history of the accident and statements of witnesses, and forwards this to the general office. The general office upon receipt of the telephone notification from the timekeeper, passes on the notice by telephone to the hospital, and also posts on a registry board in the registry office a card similar to that posted by the timekeeper.

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*Stockbridge, Mass.

*An abstract of an article by Herbert J. Fisher, presented before the Ishpeming meeting of the Lake Superior Mining Institute, Aug. 31, 1913.

Finally the hospital posts a similar card on its registry board, opposite the date and day of the week on which the man was injured. If he does not appear for treatment, the hospital communicates with the general office and the compensation clerk takes steps to locate the workman. When he does come to the hospital and receives his dressing, a hospital card is filled in and the physician's report is made. The physician's report gives all the necessary data, describing the man, the nature of the injury, the treatment received, the statement of the injured man, the names of witnesses, and also on a anatomical chart locates the injury. A large part of this information also appears on a hospital card, which is kept on file in the hospital, the physician's card having been forwarded to the general office. The injured man is given what is called a dressing card and envelope, which he carries with him, and he is advised when to report for another dressing. Then on the registry board is inserted a small card in a column under the day of the week in which he must report for this next dressing. Thus the physician's registry board shows just what men are to be expected on each day. If a man fails to appear he is looked up as described.

When the injured man can resume work, the physician indicates this on his dressing card, the workman then presents this to his foreman and is allowed to work if things are satisfactory. This card the foreman checks with the mine registry board to be sure there is no error. Meanwhile, the physician has filled in a postal card and forwarded it to the general office, which communicates with the timekeeper, who takes the man's card off his mine registry board.

The physician is required to report to the general office when any man comes to him for treatment of an injury, unless the general office has already reported to him. In this way it is insured that an injury card is posted on the various registry boards, and that these correspond. No man is allowed to go to work again until his dressing card shows that the physician has given his permission.

By means of this checking system, it is quite unusual for a man having even a little injury to be able to leave the mine without the existence of the hurt being known. It is found furthermore that the system is not difficult in operation and has been found satisfactory by the various officers of the company concerned.

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Determination of Dip of Beds from Drill Cores

By E. E. White*

Having occasion some time ago to determine the true dip of beds penetrated by a drill hole not inclined at right angles to the strike of the bedding, and not being able to find a published method, I worked out the following formulas. They are applicable where the strike of the bedding and the direction and inclination of the drill hole are known.

The general formula is most easily derived for the case of a hole dipping downward in the same direction as the beds, as in Fig. 1.

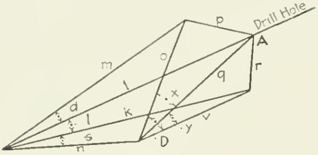


FIG. 1.
Down Hole

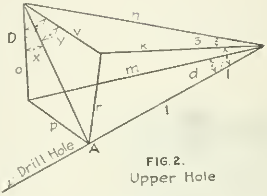
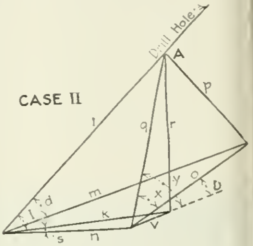


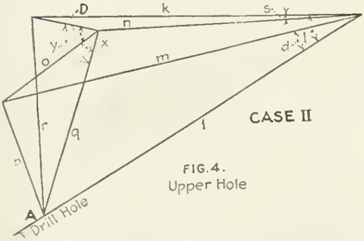
FIG. 2.
Upper Hole

CASE I



CASE II

FIG. 3.
Down Hole



CASE II

FIG. 4.
Upper Hole

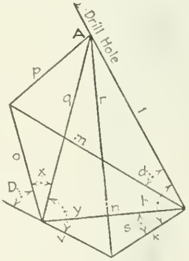
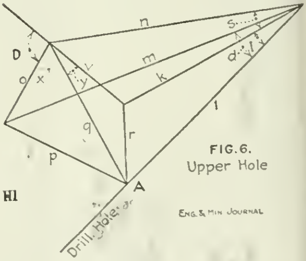


FIG. 5.
Down Hole



CASE III

FIG. 6.
Upper Hole

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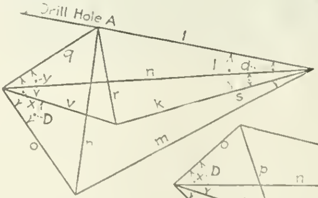

FIG. 7.
Down Hole

CASE IV

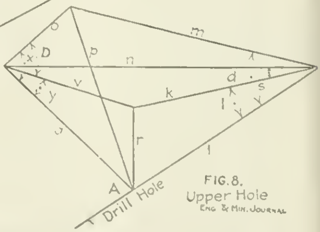

FIG. 8.
Upper Hole

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Various Combinations of Drill Hole and Bed et

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*Ishpeming, Mich.

I = Inclination of drill hole from horizontal.

d = Angle between bedding and axis of the drill hole as obtained from the drill cores.

S = Difference in strike between the bedding and the drill hole.

D = True dip of strata.

Then in Fig. 1:

et

p = Length of perpendicular dropped from any point A on the drill hole to the plane of the bedding.

r = Length of perpendicular dropped from A to the horizontal plane through the intersection of the drill hole with the plane of the bedding.

et

$m\ o\ n$ represent a bedding plane.

$k\ v\ n$ represent a horizontal plane through intersection of drill hole and bedding plane.

$q\ v\ r$ and $q\ o\ p$ represent vertical planes at right angles to n, through A.

n = Strike line of bedding

Consider r as equal to unity.

Then

$$\cos I = k. \quad \cos d = m. \quad \cos S = \frac{n}{k}$$

$$\sin I = r. \quad \sin d = p.$$

Hence

$$n = k \cos S = \cos I \cos S$$

$$o = \sqrt{m^2 - n^2} = \sqrt{\cos^2 d - \cos^2 I \cos^2 S}$$

$$q = \sqrt{o^2 + p^2} = \sqrt{\cos^2 d - \cos^2 I \cos^2 S + \sin^2 d}$$
$$= \sqrt{1 - \cos^2 I \cos^2 S}$$

$$\text{angle } x = \sin^{-1} \frac{p}{q} = \sin^{-1} \frac{\sin d}{\sqrt{1 - \cos^2 I \cos^2 S}}$$

$$\text{angle } y = \sin^{-1} \frac{r}{q} = \sin^{-1} \frac{\sin I}{\sqrt{1 - \cos^2 I \cos^2 S}}$$

$$\text{Angle } D = \text{angle } y + \text{angle } x.$$

From these formulas for x and y, the value of D may easily be worked out with a table of squares or square roots and a table of natural trigonometric functions. A table of the squares of the cosines of angles 0° to 90° s convenient.

There are three other possible cases for a hole dipping downward and also four possible cases for a hole dipping upward. The formula for each of the four cases s different but is the same for up and down holes in each case; it may be derived from the proper figure for each case.

In case 1, $D = y + x$. The beds dip in the same direction as the drill hole from their intersection more steeply than the plane through the drill hole and the strike line of the beds, Figs. 1 and 2.

In case 2, $D = y - x$. The beds dip in the same direction as the drill hole from their intersection, but less steeply than the plane through the drill hole and the strike line of the beds, Figs. 3 and 4.

In case 3, $D = (90° - y) + (90° - x) = 180° - y - x$. The beds dip in the opposite direction to the drill hole from their intersection, and more steeply than a plane perpendicular to the plane through the drill hole and the strike line of the beds, Figs. 5 and 6.

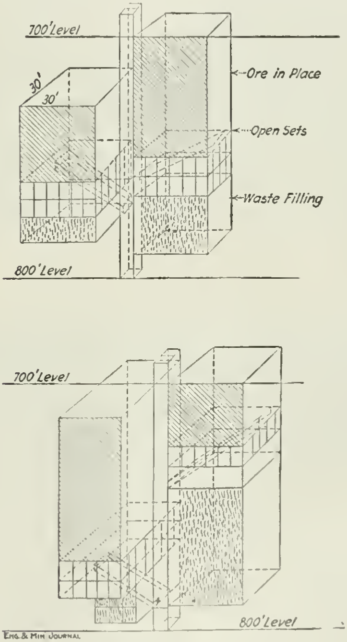
In case 4, $D = (90° - y) - (90° - x) = x - y$. The beds dip in the opposite direction to the drill hole from their intersection, and less steeply than a plane perpendicular to the plane through the drill hole and the strike line of the beds. Figs. 7 and 8.

It will be noted that if the hole is at right angles to the strike of the bedding, these formulas become:

Case 1, $D = I + d$.
Case 2, $D = I - d$.
Case 3, $D = 180° - I - d$.
Case 4, $D = d - I$.

Square-Set Blocks at Copper Queen*

The general custom in the square-setting system practiced at the Copper Queen, Bisbee, Ariz., is to block the ore out in sections, numbering the sections consecutively, and mine, if possible, four sections around one central raise. This can often be done, but frequently the ground is of so heavy a character, and so much weight is thrown upon the timbers, that it is impossible to take out more than two or three sections in any one raise. These sections are laid out according to the local character of the ground, and are from two to four sets in width, and from six to ten in length. Great care must necessarily be taken in laying out the work to avoid making sections so large and so wide as to cause caving.



Two Stages in Removing a Square-Set Block

As stoping progresses from the sill upward the raise is usually sent through to the next level, to admit of the lowering of timbers, the proper ventilation of the stope and the dumping of filling; since it has been found necessary to carry the filling within about two floors of the back of the stope and keep it immediately below where the men are working. In many of the stopes, particularly in the oxide ores, a good deal of hand sorting is necessary. While this in many cases increases mining cost materially, yet the company believes it is cheaper than putting the waste in chutes, tramming, hoisting and paying transportation and smelting charges upon it. In order that nothing may be mined but what shows a margin of profit, a system of minima is in effect, based upon the selling price of copper.

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*From A. I. M. E. "Bulletin," August, 1914.

The figures illustrate different stages of extracting the ore by means of sections under the square-set system. The chutes are so arranged as to require the least amount of mucking.

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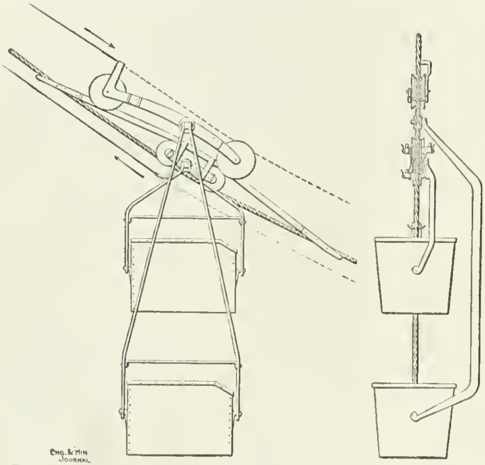
Single-Track Double-Bucket Cableway

The accompanying drawing illustrates a communication received from Herbert K. Scott and published in the Journal of Aug. 22, 1914, under the title "Single-Track Cableway in Sardinia." The device is similar to that described by E. Praetorius in the Journal of Nov. 29, 1913, and no additional description is necessary more than the noting of the fact that in this case the carriers for the two buckets differ in design and the one shown on top always rides over the other whether it is descending or ascending.



Device Permitting Aerial Buckets to Pass on Single Rope

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Hoisting Rope of Quarter-Inch Wires*

The Spanish-American Iron Co. operates a plane on the north coast of Cuba, which is 6716 ft. long and has a maximum grade of 25.13%. The hoisting machinery was designed to haul up this plane three loaded cars at a speed of 15 miles per hr., their weight and the weight of the rope causing a maximum pull of about 110,000 lb. The rope drums are 20 ft. in diameter. To handle this load required an exceedingly large rope, and in order to make it practicable to wrap this around the drums, it was found advisable to follow standard construction for small ropes, that is, six strands of 19 wires each, with the difference that a wire-rope center was substituted for the usual hemp center. Heretofore similar large ropes have been constructed of a greater number of wires, which remained small in diameter. To get the required total strength, it was found that the wires in the outside strands had to be extren thick, ranging from 0.175 to 0.225 in. in diameter. ' drawing of such wire, nearly a quarter of an inch th of the same strength, toughness and pliability as in finer sizes, was a new problem in rope making. It successfully solved by the John A. Roebling's Sons (by the use of skill and care and the application of rec improvements in heat treatment.

The completed rope is 3 in. thick, 7810 ft. long, wei 123,360 lb., and has a breaking strength of 377 to it was made of plow steel. The wire-rope center f lows the construction of ordinary hoisting rope, bei 1⅛ in. thick and consisting of six strands of 19 wi each, twisted around a hemp core.

The shipping of the rope was almost as much of problem as its manufacture. It had to be prepared f a railroad haul with trans-shipment to a steamer. F this it was wound on three reels in the following ma ner. About 200 ft. from the main reel, on which had been coiled as stranded, an empty reel was up and a little more than half the rope coiled off this. This reel was then moved and another empty r put in its place; the rope was so looped about th reel, that when it was revolved, rope was taken in equ lengths from the other two reels. In this way, about on third of the rope was carried by each reel. The large of the two reels was 10 ft. high by 9½ ft. wide; th other two were 8 ft. 10 in. by 7 ft. 2 in. The shi ment was made on two flat cars, the rope being coiled the car bottoms between the reels.

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*From information furnished by the manufacturers.

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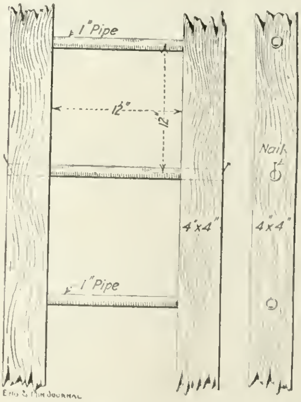
Wood and Iron Pipe Ladder

An economical and serviceable mine ladder may b made of 4x4-in. timbers, with rungs of 1-in. pipe, th latter consisting discarded pipe sawe into 20-in. length The rungs ar spaced 1 ft. apar holes being bore through the timber just large enough t receive them. Smal holes are drille through each pip length, one near eac end, before driving into the timbers, an when the rungs ar in place nails ar inserted into these holes and drive tight. This prevents the rungs from twisting or slipping sideways and holds the ladder securely together.



Ladder of 4x4-In. Uprights and 1-In. Pipe Rungs

Such ladders cost more in the first place than ladders of the same length constructed of 2x4- and 1x4-in. lumber, but their cost may be kept at a minimum by using the better parts of discarded pipe and having the shop crews make up extra ladders during what would otherwise be spare time, while their great durability, which largely reduces the repairs necessitated by breakage and wear, makes it economical to use them instead of all-wood ladders, especially in more permanent manways.

Details of Milling and Smelting

Shaking Baghouse Bags

Hand shaking of bags has been supplanted in most large baghouses by either mechanical or differential-pressure shaking. The last named method was developed several years ago at Midvale, Utah, in an effort to save expense in the replacement of torn bags. It consists simply of cutting off the blast from a section and applying a slight vacuum, repeating the operation two or three times. It is not so efficient as hand shaking, or shaking by mechanical means, says L. Douglass Anderson, in the July Bulletin of the American Institute of Mining Engineers. However, it is not so unhealthful as hand shaking and is satisfactory when done often enough—every eight hours at Midvale—and the bags last longer.

New Arrangement of the Dome Mill

Enlargement and rearrangement of the Dome mill, South Porcupine, Ont., has been completed, under the direction of the Merrill Metallurgical Co., of San Francisco, materially increasing its capacity. An additional quota of 40 stamps, 1250 lb. each, has been placed at the rear of the mill bin, so that the stamps now stand back to back. The ore bin has been raised 6 ft. all round to accommodate a greater tonnage. Crushing is still to be performed in water, but there are no primary amalgamating plates. Plate amalgamation is performed after regrinding in the tube mills.

New Addition to the Dome Mill

General View of Dome Mill

Leaching Tanks at Dome Mill

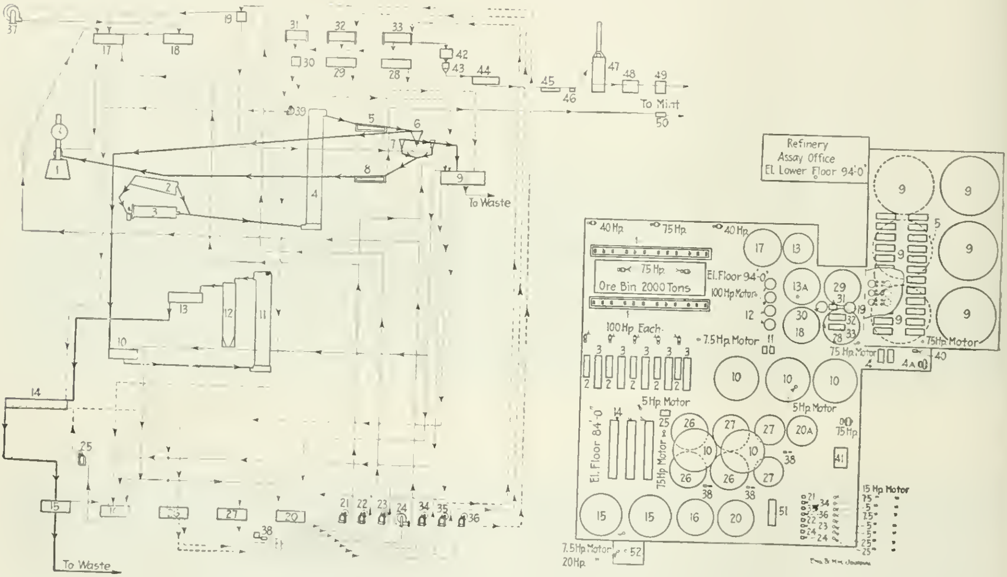
Amalgamating Plates at Dome Mill

Pulp is separated in Merrill classifying cones and the slimes treated identically as they were before. The amalgamating plates have been removed from the lower part of the mill and placed in the upper part of the new addition where they are served with pulp from the elevators. Sands are passed through concentrating cones, the concentrates reground and the sands sent to the leaching tanks.

Precipitate presses have been removed from the lower part of the mill, and are now in the upper part, over the solution tanks. An arrangement which will facilitate the handling of precipitates is being installed. The presses will discharge into cars, which will be run across the trestle into the upper part of the refinery, convenient for placing in the acid tank without excessive handling.

A sampler of the automatic type has been installed to sample the pulp just before it reaches the amalgamating plates. Another is placed in the sluices leading to discharge for sampling the tailings. The accompanying flow sheet and plan of the mill shows the system of treatment in detail, and the arrangement of the equipment as it now stands.

As now arranged, the Dome mill is expected to treat a greatly increased quantity of ore, which is necessary in view of the low grade of the ore reserves. Regrinding costs will be much reduced, as will also the treatment costs, since simple leaching of sands is cheap, and slimes treatment will be reduced in cost because of the elimination of all sands from it.



Flow Sheet and Plan of the Newly Arranged Dome Mill

Item	No.	Description	
1	80	1250 lb. gravity stamps	
2	5	4'x16' duplex Dorr classifiers	
3	5	5'x22' tube mills	
4	2	28"x9" bucket elevators (unclassified product)	4a. Robeson pump, spare to 4
5	24	54"x144" amalgamating plates	
6	6	Merrill hydraulic classifying cones.	
7	12	Merrill concentrating cones.	
8	4	72"x108' amalgamating plates (for concentrates)	
9	6	40" dia. by 8' 6" leaching tanks.	
10	5	30'x10' Dorr thickeners. 3 tanks.	
11	2	16"x7" bucket elevators (slime only)	
12	4	8'x10' Pachuca agitators.	
13	1	20'x10' mechanical agitator.	
13a	1	25'x10' mechanical agitator.	
14	3	90 frame Merrill slime presses	
15	2	30'x10' Dorr thickeners for press residue	
16	1	25'x10' sluicing water tank.	
17	1	25'x20' battery supply water tank.	
18	1	25'x10' Porcupine Lake water storage tank.	
19	1	8'x8' cone water supply tank.	
20	1	25'x10' return battery water tanks.	
21	1	9"x9", 350-gal. Aldrich triplex pump	Water for filling and sluicing water tanks
22	1	5"x7", 100-gal. Aldrich triplex pump	Water to tank No. 19 for classifying cones
23	1	6"x9", 175-gal. Aldrich triplex pump	Water to tank No. 19 for classifying cones
24	2	5", 700-gal. Gould centrifugal pumps	Return to battery water tank
25	1	11"x12", 700-gal. Aldrich triplex pump	Sluicing water for presses
26	3	25'x10' low sol. sump tanks.	
27	3	1—25'x10' and 2—20'x10' weak sol. sump tanks	
28	1	25'x10' bar. w.s. for leaching tanks.	
29	1	25"x10" bar. s. s. for leaching tanks.	
30	1	10"x10' bar. low sol. tank.	
31	1	10 frame precipitation press for low solution	
32	1	20 frame prescription press for low solution.	
33	1	20 frame precipitation press for weak solution	
34	1	6"x9", 175 gal. Aldrich triplex pump	
35	1	6x9", 175-gal. aldrich triplex pump	
36	1	5"x7", 100-gal. Aldrich triplex pump	
37	2	750-gal. centrifugal pumps, Porcupine Lake	
38	3	Zinc feeders (Merrill)	
39	1	Slime press wash water booster pump, 4" centrifugal	
40	1	Lime equipment	
41	1	Air compressor	
42	1	Acid-treatment tank, refinery	
43	1	Monteju, refinery	
44	1	Press, refinery	
45	1	Drying pan, refinery	
46	1	Briquetting press, refinery	
47	1	Blast furnace, refinery	
48	1	Cupel furnace, refinery	
49	1	Tilting furnace, refinery	
50	1	Amalgam retort, refinery	
51	1	Heating boiler, refinery	
52	2	Tailings pumps, refinery	

The Assayer and Chemist

Determination of Hydrocyanic Acid and Alkali Cyanides

A new method for the determination of hydrocyanic acid and the alkaline cyanides has been worked out by G. E. F. Lundell and J. A. Bridgman (*Journ. Ind. Eng. Chem.*, July, 1914). Briefly, it consists of titrating an ammoniacal cyanide solution containing a small quantity of dimethylglyoxime with a standard nickel-ammonium sulphate solution until a permanent red precipitate is produced. The reactions involved are:

$$NiSO_4 + 4\,KCN = K_2Ni(CN)_4 + K_2SO_4$$

$$NiSO_4 + 2\,C_4H_8N_2O_2 = Ni(C_4H_7N_2O_2) + H_2SO_4$$

No permanent red precipitate is produced until all the cyanide has been used up. An ammoniacal solution is used since free sulphuric acid prevents the precipitation of nickel dimethylglyoxime.

The standard nickel solution consists of 15.3 grams of nickel-ammonium sulphate dissolved in one liter of water containing 2 c.c. strong sulphuric acid. The dimethylglyoxime solution consists of 8.9 grams dimethylglyoxime in one liter of 95% alcohol.

Standardize the nickel solution thus: 25-c.c. portions are diluted with distilled water to 200 c.c., treated with 0.2 gram tartaric acid, and heated to boiling. Glyoxime solution sufficient to precipitate all the nickel is then added. If the glyoxime solution has been made as above directed, 30 c.c. should be enough. After adding the glyoxime, make slightly acid with ammonia, boil for two minutes and then set aside to digest for half an hour. Filter on a tared gooch, wash with 200 c.c. hot water, dry for 45 min. at 120°C. and weigh. The weighed precipitate contains 20.31% Ni. From the equations given above the CN titer of the solutions can be calculated. If a chemically pure potassium cyanide is at hand, the titer can be determined directly by titrating weighed portions as directed below.

Five grams of the sample are dissolved in water and diluted to 500 c.c. Pipetted 50-c.c. portions of this solution are diluted with water to 100 c.c. and treated with 1 c.c. of ammonium hydrate and 0.5 c.c. of dimethylglyoxime solution and then titrated with the standard nickel solution until a permanent red precipitate is produced.

The color play toward the end of the reaction resembles the methyl orange end point observed in titrating an alkaline solution with an acid solution. The nickel-ammonium sulfate solution may be added rapidly at first, provided the cyanide solution is vigorously stirred; toward the end point the addition should be slower and the stirring more rapid. If more than 0.5 c.c. of glyoxime is used, the end point shows a tendency to appear too soon unless the addition of the standard solution is slow and the agitation of the solution very brisk. The cyanide dilution may be varied without serious effect; however the method works better when the volume is approximately 100 c.c.

A large excess of ammonium hydroxide delays the end point; the 1 to 5 c.c. in volume specified does no harm. A titration requiring 50 c.c. of the standard solution costs one-fifth of a cent. In titrating solutions which contain hydrocyanic acid, a measured volume of solution is made alkaline with ammonium hydroxide and then treated as above.

The method checks established methods well, and is remarkably free from interferences. KOH and $K_4Fe(CN)_6$ interfere when present in large amounts; the small quantities usually present in commercial cyanides have practically no effect at all.

It is accurate in the presence of the double cyanides commonly used in electroplating.

It is seen that the method gives only the "free" cyanide in silver- and copper-cyanide solutions. Experiments show that more than the free cyanide is obtained in zinc-cyande solutions, the end point occurring when the Zn: KCN ratio is approximately 1:0.6. In copper- and silver-cyanide solutions Liebig's method works the same as the new method. In zinc-cyanide solutions Liebig's method gives the total cyanide, that is, the free cyanide plus the cyanogen in the zinc-double cyanide. Hannay's method gives the total cyanide in all three cases. This is a disadvantage because only the free cyanide is ordinarily desired.

*

Separation of Titanium and Zirconium from Iron and Aluminum

William M. Thornton, Jr., and E. M. Hayden, Jr., have pointed out (*Am. Journ. Sci.*, February, 1911, p. 173, and May, 1914, p. 407) that titanium can be quantitatively separated from iron and aluminum (also phosphorus) by the ammonium salt of nitrosophenylhydroxylamine (cupferron) by throwing down the iron as ferrous sulphide in a solution containing enough ammonium tartrate to hold up the titanium, and after acidifying the iron-free filtrate, the titanium can be quantitatively precipitated by the cupferron reagent notwithstanding the tartaric acid, and that if the above mentioned filtrate be strongly acidified with sulphuric acid, and contains enough tartaric acid, titanium can be quantitatively separated from both aluminum and phosphoric acid in one operation.

The solution (about 100 c.c.) is treated with sufficient tartaric acid (at least 4 times the total weight of the four oxides) to prevent precipitation by ammonia, then neutralized with ammonia, acidified with 2 c.c. of sulphuric acid (1:1), and the iron reduced by hydrogen sulphide. An excess of ammonia is then added; the ferrous sulphide is filtered off and well washed with water containing ammonium sulphide. The filtrate is acidified with 40 c.c. of sulphuric acid (1:1), the hydrogen sulphide boiled off, the solution cooled, diluted to 400 c.c., and a 6% solution of "cupferron" added slowly with constant stirring. The precipitate is allowed to settle and the supernatant liquid tested with a few drops of the reagent. The formation of a yellow turbidity shows the precipitation to be incomplete. The precipitate is filtered off and washed 20 times with dilute hydrochloric acid (1:10), the filter placed in a tared platinum crucible, dried at 110° C., ignited very gently at first, then over the blowpipe to constant weight and the residue weighed at TiO_2.

The same separation was tried for zirconium (*Am. Journ. Sci.*, August, 1914, p. 137), but apparently there is too much phosphate carried down by the zirconium precipitate so that phosphoric acid must be separated from zirconium by a preliminary fusion with sodium carbonate and a little sodium nitrate, after which the sodium phosphate can be leached out with water, leaving sodium zirconate behind, soluble in sulphuric acid. Following this zirconium can be separated from iron and aluminum by the cupferron reagent, just as titanium is.

* * *

Working Up Platinum Residues

The following method is recommended by the *Mining and Engineering Review* for working up the platinum residues from precipitation, etc., which accumulate in a laboratory. The residue liquors are evaporated to a small bulk, made alkaline with sodium hydroxide and sodium formate equal to half the weight of the platinum supposed to be present is added slowly, while the mixture is constantly stirred. The foaming which is liable to occur may be checked to some extent by adding more sodium hydroxide. The mixture is then heated on a water bath for about an hour, being occasionally stirred, then 25% hydrochloric acid is carefully added, until the mixture is acid, stirring all the time. The heating on the water bath is continued for another hour. The precipitated platinum is filtered off, washed with hot, weak (2%) hydrochloric acid, then with hot water until free from acid. The platinum is then separated from the filter, dried, ignited and weighed. To convert this into platinum solution, it is covered with five times its weight of 25% hydrochloric acid, heated on the water bath, and 50% nitric acid added, till no more gas is evolved. This requires about 1 c.c. of nitric acid for each gram of platinum. The solution is evaporated several times to get rid of the excess of nitric acid and the bulk of hydrochloric acid, diluted with water, filtered, the residue being dried, weighed and deducted from the previous weight of platinum; the difference gives the amount of pure platinum present. From this the solution may be made up to any desired strength.

* * *

Filtration of Barium Sulphate

It has been pointed out that barium sulphate can be filtered readily if the supernatant liquid is removed, 10 c.c. of a saturated, slightly acid solution of ammonium acetate added, and the mixture heated. The fine precipitate then changes to a coarse precipitate, which can be readily filtered by suction without any danger of passing through the filter. The theory of this action has recently been investigated, and the following explanation is given by Osborne (*Journ. Phys. Chem.*, p. 629, Vol. 17). Barium sulphate is soluble in ammonium acetate solution; therefore the crystals grow in a hot solution. If the barium sulphate is precipitated under conditions such that the crystals are already comparatively large, a short heating will cause sufficient growth to permit of filtration with suction. If the barium sulphate is precipitated cold, the crystals are small, and a much longer heating is necessary to give the required size. Ammonium chloride and hydrochloric acid retard the growth of the barium sulphate crystals, and should be got rid of; hence the necessity of the removal of the supernatant liquid.

* * *

Arsenic in Hydrochloric and Sulphuric Acid

A method for the determination of arsenic in hydrochloric and sulphuric acids is given by R. F. Tarbell (*Journ. Ind. Eng. Chem.*, p. 400, 1914).

In the process described, the arsenic is converted into hydrogen arsenide, which is passed through a solution of iodine in gasoline, whereby it is converted into arsenic tri-iodide. Twenty-five grams of the acid are treated with 35 grams of zinc and 1 c.c. of stannous-chloride solution (50 grams Sn per liter). The specific gravity of hydrochloric acid is first adjusted to about 1 : 1 and that of sulphuric acid to about 1 : 40 by addition of either water or arsenic-free acid. The reaction is allowed to proceed for about two hours, with warming if necessary, then 20 c.c. of sulphuric acid, of specific gravity 1 : 4 are added, and the reaction allowed to continue for one hour more. The evolved gases are passed through a solution of lead acetate to remove hydrogen sulphide, and then through a bulb tube containing 80 c.c. of purified 60° gasoline, 20 c.c. of water and 20 c.c. of a solution of iodine in purified gasoline (0.6773 gram per liter). (The gasoline is purified by washing twice with sulphuric acid, then with dilute sodium hydroxide and with water.) The contents of the bulb tube are subsequently shaken with 200 c.c. of sodium arsenite solution (0.264 gram arsenic trioxide, 1 gram sodium carbonate and 1 gram sodium bicarbonate per liter), the aqueous layer removed and the excess of arsenic titrated with iodine solution (0.6773 gram iodine and 1 : 2 gram potassium iodide per liter). The equations given are:

$$AsH_3 + 3\ I_2 = AsI_3 + 3\ HI;$$
$$2\ AsI_3 + 3\ H_2O = As_2O_3 + 6\ HI;$$
$$As_2O_3 + 2I_2 + 2\ H_2O = As_2O_5 + 4\ HI$$

1 c.c. of the solution of iodine in gasoline is equivalent to 0.00005 gram arsenic.

* * *

Separation of Scandium

Scandium was isolated from wolframite residues by dissolving the oxides in hydrochloric acid and precipitating with ammonium fluoride (J. Sterba, *Zeit. Elektrochem.* p. 289, 1914). To separate pure scandium salt from this precipitate, lead, copper, etc., were precipitated with hydrogen sulphide from acid solution of scandium chloride; iron and manganese from solutions of the double scandium-potassium carbonate, the former with potassium-hydrogen sulphide and the latter with iodine in potassium-iodide solution; molybdenum was removed as sulphide by precipitation in presence of formic acid; and thorium, yttrium and ytterbium by the precipitation of the double scandium-sodium carbonate, combined with the fractional crystallization of scandium formate. A spectroscopically pure scandium oxide was thus obtained. The observation of J. R. Meyer that scandium forms complex water-soluble fluorides was confirmed, and based upon this, a simple and complete separation of scandium from the other rare earths was devised.

The Klondike Pipe Line*

SYNOPSIS—Description of method of construction of the longest inverted siphon in the Yukon Gold Co.'s main ditch system. Presence of "frost" necessitated special methods of construction. Description of setting expansion joints, anchors and foundations. Riveting by air. Pipe handled on tramway. Special difficulty at various points.

⁂

The Klondike pipe line was built during 1907 and 1908 by the Yukon Gold Co. at Dawson, Yukon Territory. It is an inverted siphon crossing the Klondike River valley, and was designed for a capacity of 125 sec-ft., which figure, however, has been slightly exceeded in operation. The maximum head on the pipe line is about 1100 ft. The total length of 15,760 ft. is made up of 2390 ft. of wood-stave pipe, 49 in. inside diameter; 5850 ft. of riveted steel pipe, 49 in. inside diameter, and 7520 ft. of lap-welded steel pipe, 43 in. inside diameter. The steel pipe ranged in thickness from $\frac{3}{16}$ to $\frac{11}{16}$ in., and came in lengths of from 15 to 30 ft. This is the largest of several inverted siphons along the line of the main ditch system of the Yukon Gold Co., 70 miles in length, which supplies water for hydraulic mining operations on Bonanza Creek.

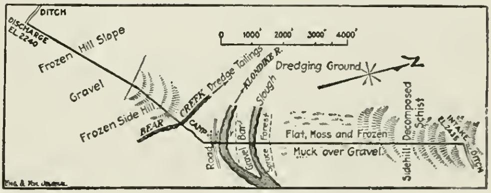
CHARACTER OF GROUND

The intake end of the pipe is on a comparatively steep side-hill. This hill is of decomposed schist covered by a foot or two of soil which supports a growth of bushes, poplars and a few spruce trees. The flat valley of the Klondike is here about 5000 ft. wide. It is covered with a blanket of Arctic moss from 1 to 2 ft. in depth. Below this there is a layer of frozen muck, or vegetable mold, generally about 5 ft. thick, and below this is generally found gravel. The moss blanket on the surface protects the muck from the summer heat, and whenever this blanket is undisturbed the ground beneath the moss remains frozen the year round. If the moss covering is removed, however, allowing air and water to act on the frozen muck, it soon melts. In places the "frost," as the frozen muck is called, has been built up by the seasonal thaws not penetrating fully through the winter's freezing, and extends to a known depth of 200 ft. and unknown further depths. This condition makes the question of foundations a serious one. The "frost" is a good foundation if it is not disturbed, but, if disturbed, the structure placed in it must be frozen in and the surface mossed over again to keep out the air and water absolutely. If this cannot be done, the structure must be carried through the frozen muck to good gravel or bed-rock foundation. Frozen muck was encountered all the way across the Klondike Valley and in spots along the pipe line up the side hill as far as the discharge box.

FITTINGS, EXPANSION JOINTS, DRAINS, ETC.

Only two horizontal angles were made in the pipe line, with the exception of those used in making a short offset around the base of a hill. Manholes, drains and air cocks were provided wherever necessary. Cast-steel expansion joints were put in every 500 ft. to allow for the expansion and contraction due to the extreme variation in temperature, from 80° F. in summer to —70° F. in winter. One three-span steel bridge, 295 ft. long, was necessary in crossing the Klondike River, and a total of several hundred feet of pile trestle or framed trestle were put in at various places along the line. The aim was to have the pipe supported at least once in every 16 ft. Whenever the conditions warranted it, as, for instance, when good foundation was deep, trestle bents were built every 32 ft. and king-post trusses were put in to give the intermediate bearing. In good material, sills were merely laid in the bottom of the pipe trench, and on these the pipe was supported. Whenever the foundation was within 3 or 4 ft. of the pipe, crib supports were used; if greater than 4 ft., framed bents were used.

One anchor was put in at least every 500 ft., about midway between expansion joints, and, where necessary, they were used more frequently. Each anchor consisted of a cable wrapped around the pipe in the form of a clove hitch, the ends being made fast to two "deadmen" on opposite sides of the pipe. Each deadman was set in the ground about 6 ft. below the surface.



PLAN OF THE PIPE LINE

On the side-hills drains were dug at frequent intervals to lead off seepage and leakage. At every drain a bulkhead was put in which fitted closely to the pipe and effectually intercepted the water.

EQUIPMENT AND POWER

In many ways conditions were unique for heavy construction. Common labor was paid $4 per day and board, which meant a total of about $5.50 per day. The working season was only five months, May 1 to Oct. 1. Some kinds of equipment were plentiful in the country, notably steam engines and boilers, but other kinds were sadly lacking. A well selected stock of equipment was ordered for the job, but breakages and unforeseen difficulties sometimes caused awkward situations because of the distance from a base of supplies.

Power was furnished from the Yukon Gold Co.'s hydro-electric plant on Little Twelve Mile River, about 50 miles from the pipe line. It was delivered at the main transformer house at 33,000 volts, and stepped down to 2300 volts. It was distributed at this voltage to the transformer banks at the several compressors and at the machine shop, where it was stepped down to 220 volts.

Construction was begun in 1907. The right of way was cleared and a small quantity of pipe trench was dug. The three-span steel bridge over the Klondike was erected. Foundation cribs were put in the river bed, most of the work being done while the river was frozen over and the water low. Piles were driven in the river bottom and sawed off at the gravel surface, and on them the cribs were built. These cribs were then extended to a height of about 5 ft. above high-water level and filled with rock. They were sheathed with sheet iron on the up-stream end to protect them from ice. Derricks were used in assembling the steel spans. During this season also a pile approach to the bridge, 400 ft. long, was built, and several other smaller pile trestles and framed trestles. Construction was halted in the midst of the working season in 1907.

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*Abstract of an article by W. W. Edwards in Proceedings of the A. S. C. E., May, 1911.

Careful Surveying

In the spring of 1908 construction was begun again. It was desired to have the job completed by the following Oct. 1, the end of the working season. All the pipe was not then on the ground and sections of pipe were missing here and there. As there were many different kinds of pipe in the line, and extra pieces were few, it was generally impossible to use sections of pipe interchangeably; therefore work could be started only at certain places. In the course of the work, it was necessary to start laying pipe at four different stations. An error in surveying would lead to awkward consequences where any of these headings joined, as well as at angle points in the pipe line. As there was in the country no heavy machinery or plate for making pipe of this size, and there would not be time to send "outside" for extras, it was necessary to be extremely careful in surveying.

All the pipe on hand was first measured up carefully and a relation established between actual measurements and those given on the blueprints. An offset line was then run parallelling the located line at a distance of 20 ft. As the seasonal thaw had loosened the original hubs so much that they could not be relied on, measurements were begun from a point on one of the bridge piers. Hubs were driven about 99 ft. apart, and measurements were taken from plumb-bob strings held from tripods. This was done on the side-hills as well as the flats. A standard pull of 15 lb. was used, the same that had been used in measuring up the pipe on hand. Corrections were made for temperature variations. Levels were run over the hubs, and horizontal distances were computed from the slope measurements and elevation differences. This system resulted in giving a first-class base line, which could be absolutely relied on in setting grades or starting points. Grades were shot in by transit. Points were set along the edge of the pipe trench, and were transferred to the bottom, when needed, by using a large wooden square and a carpenter's level. Bench-marks were set every 50 ft. in elevation. Levels were determined by running ahead for half a day and then tying back to the starting point.

In construction, it was frequently found advantageous to depart from the profile in order to avoid excessive excavation, and in these cases grade changes were made by shifting angle points.

Handling of Steel Pipe

Pipe was distributed along the line by a tramway. The cars were pulled by horses across the flat and by hoists on the hills. Of these hoists, two were run by steam and one by electricity. Signals were given by use of a wire attached to a spring pole. A telephone system also helped in signaling and in general communication. Turntables were installed on which to change the sections of pipe end for end when necessary. Steel-frame cars were used. In hoisting, a bridle was attached to the end of the pipe, and the cable was shackled to this bridle. When the pipe was at the spot desired, the cars were chained to the rail, and the pipe, with the hoisting cable still attached, was rolled into the ditch. This held the pipe from getting away on the side-hill, and the cable always had so much spring that no harm was done to the engine.

Riveting

Riveting, caulking and drilling were done with pneumatic tools. Air was furnished by 8x8-in. Clayton air compressors run by 15-hp. three-phase motors. One air compressor would furnish air enough to operate a riveting hammer, caulking hammer, drills and air dolly with not much to spare. The compressor outfits were mounted on platforms and moved from place to place as desired. The riveting of the holes in the bottom of the pipe was done from the inside, and of the upper holes from the outside. Air dollies were used in holding on inside the pipe and spring dollies on the outside. Each riveting gang consisted of a riveter, bucker-up, heater and passer. An average day's work was from 160 to 180 1-in. rivets, when conditions were good. Fitting-up bolts were used liberally and the joint was well sledged before driving each rivet. All castings were hand-riveted to the pipe, the riveting being done on the inside.

The expansion-joint castings were frequently found to be too large for the pipe. In such cases the pipe was heated by a blast lamp and belled out with hammers to fit the casting. Rivet holes in all castings were drilled in the field after assembling. All caulking was done with rounded-edge fullers, the square tool being dispensed with. The riveted pipe was caulked on the outside only, the lap-welded pipe was caulked both inside and outside. Rivets were inspected with a 1-lb. tapping hammer.

Protection of Line

The pipe was coated on the outside with a red-mineral linseed-oil paint and inside with a quick-drying black paraffin paint.

The wood-stave pipe was of California redwood staves thoroughly seasoned. It was laid in a trench 2 ft. deep, and, when completed, was back-filled to a depth of half the diameter of the pipe, so as to give a good bearing.

The intake penstock was equipped with overflow and turn-out, as was also the discharge box. The discharge box was located on a shaded side-hill on frozen clay. This condition made necessary considerable cribbing to protect it from the sloughing of the clay when it thawed consequent on the removal of its moss covering.

Timber was secured from adjoining leases and also from river drives. It was necessary to do considerable work to protect the river banks from undercutting in the vicinity of the bridge, as they were of loose gravel, loam and moss. Piles were driven and shear cribs put in along the river bank above the bridge. Protection cribs were also put in above the pile bents on the bridge to take the brunt of the ice pressure and to break up the ice stream.

Where frozen muck, reaching to a depth of 45 ft., was encountered at one point, shafts were dug to gravel foundation and trestle bents were put in at intervals of 32 ft. At another point a heavy cut through dredge tailings and solid rock was necessary. This was just at the base of a hill which was covered with frozen muck. The digging of this section was delayed until as late as possible, so that the extreme cold would keep the overburden on the slope above from thawing on exposure and sliding.

A small spot of frozen clay was encountered at still another point., and the depth of good foundation being unknown, a corduroy of spruce trees was laid on the frozen clay in the bottom of the pipe trench, and this was covered with about 2 ft. of gravel. A bulkhead was built around the pipe above this place to shut off all seepage and leakage, and a drain was run off to the side. The pipe was back-filled and the surface covered with moss again. Apparently, the foundation remained frozen, as no settlement was noticed.

Although work was begun at the camp about Apr. 1, it was not until about May 15 that all the snow was off the ground and it was possible to work to the best advantage. A night shift was put on about May 15 and continued until Oct. 1, by which date the pipe was all laid. The long days of the extreme northern latitude made lights unnecessary on the work until Aug. 1. After that, a system of arc and incandescent lights was installed, which worked well. The missing sections of pipe began to arrive about July 1, and from that time onward operations were rushed. A force of 350 men was used to push the work to completion.

CONNECTION OF SECTIONS AND ANCHORING

The different headings of pipe were connected up at the expansion joints. This was effected by sliding the outside ring of the expansion joint back on the pipe and then pulling it up to position after the pipe had been lined up. A tabulation was made showing the space to be left open at the expansion joints at various temperatures, so that they would not close during the hottest or open in the coldest weather. This was followed in setting the joints. Gages were wired on at each expansion joint so that unequal expansion or contraction could be noted and steps taken to prevent it. The coupling bolts for each expansion joint were set so that the lap in each joint could not be less than 1 in. Reference points were also put in on each 500-ft. section of pipe, so that movement could be detected. Anchors were put in at every angle point. These were generally either bulkheads of timber against the pipe, used as thrust anchors, or cables around the pipe attached to deadmen. When possible, at the angle points, a timber crib was put completely over the pipe and filled with rock. The high cost of transportation and the character of the foundation made concrete anchors out of the question. The only timber available was white spruce, which was soft and brittle, and had to be used with a high factor of safety in all structures.

TROUBLE ENCOUNTERED

Some trouble was experienced from the lap-welded pipe. Two makes were used on the job. One, an American, was perfectly satisfactory, but the other, a German, was not. One section of the second kind cracked along the weld for a distance of 10 ft. on being dropped into the pipe trench. This was patched and reinforced, and gave no trouble in operation. Another section of this pipe burst in testing under 835 ft. of head. Examination showed a flaw in the metal. When it burst, the water was shot out to the side of the pipe line and little damage was done. This was the extent of the trouble with the line in testing.

In operation, the quantity of water flowing through the pipe fluctuated considerably. As the difference in elevation between intake and discharge was 195 ft., this variation caused great fluctuations in the water level in the pipe at the intake end, there being no regulating gate at the discharge end. When little water was flowing, it ran in a rapid stream down the bottom of the wood-stave pipe at the intake end. This had the result of rapidly wearing out the bottom staves, so that considerable patching had to be done.

Bulkheads were put in at each end of the pipe and all other openings were closed as soon as the pipe was thoroughly drained. Thus the air circulation inside the pipe was shut off and the snow formed a blanket which protected it from the extremes of the winter temperature. It was found that with an air temperature of —30° or —40° F. the temperature inside the pipe was only about —5° F. In operation, the pipe is drained at the close of the working season, about Oct. 1, and opened again about May 1.

FOUNDATION WORK

The peculiar and therefore the most interesting feature of this work was, as noted before, the study of foundations and the best styles of substructures to be used in the frozen ground. In places in the North, piles of sawdust have been placed on the moss and buildings put on this foundation. When water is kept away, this makes a good foundation, as the sawdust protects the moss and the frozen ground below from heat and consequent thawing, thus insuring stability. In flume substructures on the Yukon company's line on frozen sidehills, cripple bents were tried and discarded in favor of level mudsills set in the "frost," about 2 or 3 ft. below the surface at the down-hill end. These were mossed over and remained frozen unless excessive leakage thawed the ground.

Mr. A. C. Strong, of the Yukon Gold Co., developed a type of structure which well suited the foundation. He used piles driven into holes previously thawed out by steam points. As the surface moss is disturbed hardly at all in this process, the pile immediately freezes in and remains in this condition. At last reports, pile substructures, such as these, were giving good service. This appears to be the cheapest form of substructure as yet devised for use in ground frozen to any considerable depth.

Risk Not Assumed by Miner

An employee in an iron mine did not assume the risk of being injured in a shaft or raise into which he had been lowered to loosen ore, which had become clogged in a chute, caused by breaking of the chute partition above him when the ore was released, where he was inexperienced in such work. In reaching this decision in the recent case of Ranta vs. Newport Mining Co., 147 *Northwestern Reporter* 609, the Michigan Supreme Court said:

> The plaintiff had nothing to do with the building, inspecting, or repairing of the raise, and he claims he was ordered to do this work by the shift boss, without any warning of the danger, and that he did not know of any danger. The duty to furnish a safe place was a duty which could not be delegated by the master; nor can it be said that the plaintiff assumed the risk

Mechanical Underground Shovel

Although a great variety of machines and labor-saving devices is in use at mines, the hand shovel today retains its importance as a handler of broken ore. The reason is probably that no one machine has yet been built that will successfully compete with the hand shovel in all classes of mines. Of late years, however, mechanical engineers and practical mining men have been devoting more thought to the possibilities of mechanical underground shovels, with the result that some models have been placed on the market and others are being developed and experimented with.

The Lake Shore Engine Works, Marquette, Mich., have been working on mechanical loaders for the last five years, and are about to market a machine which has been patented by V. G. Halby, chief engineer of the company, N. D. Flodin, sales manager, and M. E. Richards, general manager of the Judson Mining Co., Crystal Falls, Mich. This machine was demonstrated at the Lake Superior Mining Institute meeting held on Aug. 31. The loader is designed for use in iron, copper and coal mines, in drifts 8x8 ft. and possibly smaller.

The machine has an extreme height of 5 ft. from the top of the rail, width of 3 ft. 9 in. and an extreme length of 14 ft., including the shovel, or 11 ft. without the shovel. It can be arranged for operation on any gage track, is self-propelled, compact and weighs 6500 lb. The rubber conveyor belt, 22 in. wide, is the only detail in the machine which is not either iron or steel. The capacity is 40 tons of material per hour. The loader may be arranged for operation by air or electricity although it is expected that air operation will be popular because the exhaust from the engine will help to clear the drift of smoke after a blast. It will be possible, however, to change the power, on any machine, in an hour's time when the necessary electric equipment is at hand. There are six different motions controlled by one operator. The machine propels itself forward and backward, the conveyor and shovel operate on a vertical arc of 30° and in a radial arc of 60° respectively; the conveyor belt is driven and there is the driving mechanism of the shovel. With this combination of motions a great deal will probably depend upon the ability of the operator to get the best output from the machine, and this in turn will depend upon his skill and experience in actual service with it.

The loader consists of three distinct parts which may be disconnected with little difficulty when it is required to take the machine from surface to points underground, or from drift to drift. The truck constitutes one portion, the frame with driving mechanism another, and the conveyor belt and shovel the third. All chains for driving are heavy-construction automobile chains. The gear drive from the engine to the main shaft is of the Wuest patented herringbone type. All operating mechanism is completely inclosed, and securely covered so that no dirt can interfere with the operation of the drive.

The digging dipper, which is somewhat cup-shaped, is fitted with teeth on the cutting edge, and hinged at the back. After securing a load, the dipper is revolved through a vertical arc, and its load falls backward upon the rubber conveyor belt. This belt carries the dirt up an incline of about 30°, dumping it at the turn into an iron chute. The latter directs the dirt into the tram car, and both its angle and direction can be changed within certain limits.

It is the intention of the company to manufacture several sizes, adaptable to other mines where conditions are different. The demonstrating machine will go into service soon at the Judson mine, at Alpha, on the Menominee iron range, Michigan. Mine operators on the Lake Superior ranges are much interested in this loader.

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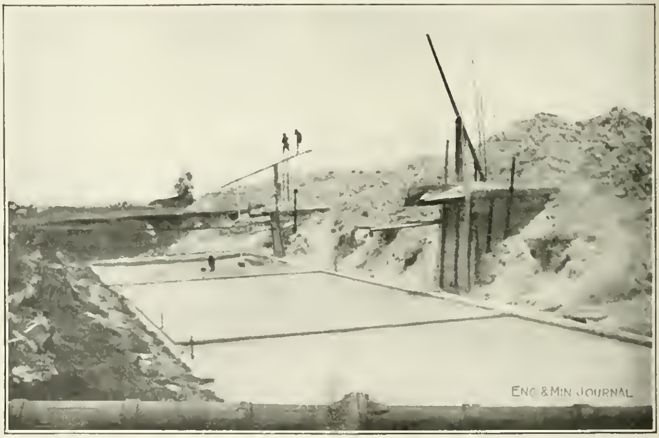
Slime Settling in India

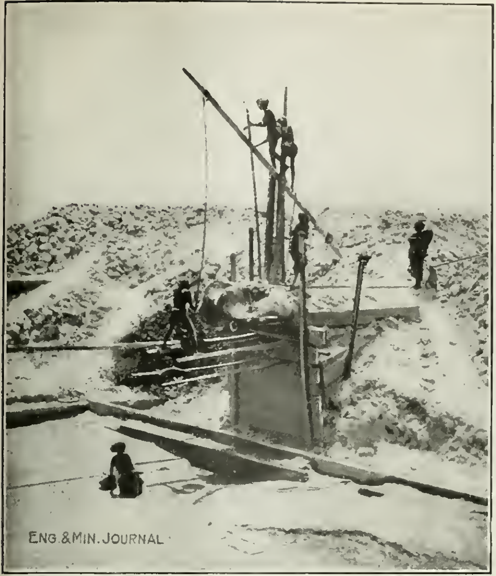
With the highly perfected systems of slimes settling in use in most mining districts of the world today, it is difficult to realize that in some remote places the most primitive and laborious methods are still followed. This circumstance is not due to ignorance, since the operators are unquestionably aware of the developments made in the art, but is on account of the conditions existing locally, which govern the possibilities in every case.



General View of Settling Tanks and Elevating Devices

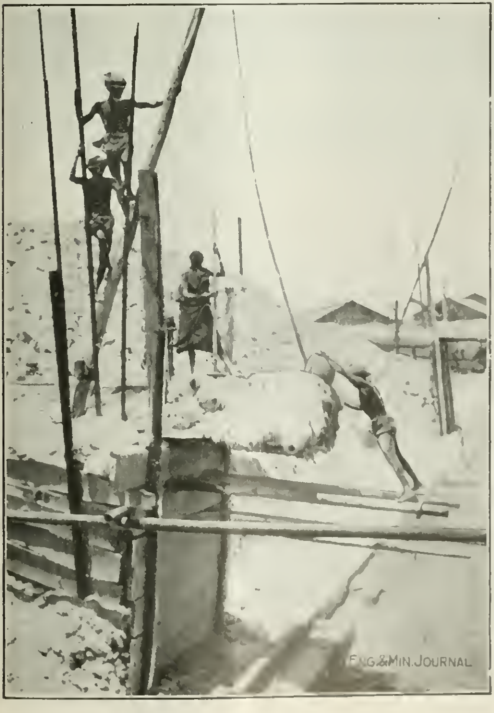
Among the most primitive of the settling systems now in use is that followed at the Nundydroog mines of India, where native labor takes the place of both machinery and power. In carrying out this method, the slimes are run into large masonry tanks built in the ground. Slime pulp is run into one of these until the overflow is muddy, when the stream is run into another tank. By alternately filling and settling in this manner, the tanks are filled with settled slime.

To extract the settled solids, native methods are resorted to. Into the slime mass a native woman is stationed, her duty being to fill an earthware pot by scraping the slime into it with a basket. The pot is hung by a rope from the end of a wooden lever, a kind of walking beam operated by two men, by means of which the pot full of slimes is raised to the level of a discharge



RAISING THE POT OF SLIMES

launder. Here two more women, each with a long-handled hoe, push the heavier pulp along to the discharge point. The accompanying photographs illustrate the operation fully.



DUMPING THE SLIMES

This seemingly barbarous procedure is followed for two reasons, the first being that it is cheaper than the most modern system would be, and the second that it is desired to employ as many of the natives as is possible, distributing the wage output widely so as to maintain the greatest possible number of people, a laudable object in a country so subject to poverty and starvation.

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American Institute of Mining Engineers--Hadfield Research Prize

According to a circular just issued, through the generosity of Sir Robert Hadfield, honorary member, the directors of the Institute are enabled to announce the Hadfield Research Prize of $1000 for the best contribution to the publications of the Institute upon the general subject of "The Different Forms and Combinations of Carbon with Iron, including those in Iron Alloys." The prize will be awarded at the annual meeting of the Institute in February, 1916, to the best paper upon this subject which is presented to the Institute before Nov. 1, 1915, provided such paper is deemed worthy by the Iron and Steel Committee.

The following suggestions are added for the guidance of those who may take part in this research. While it is not desired to define closely the exact lines or scope of the proposed research, as it is advisable to make these as broad as possible, the object in mind may be said to be generally as follows:

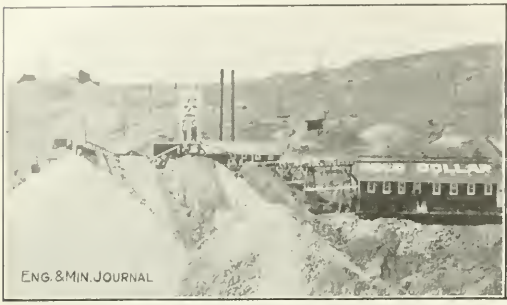
To elaborate and find out the best methods of determining the forms of carbon in steel or iron, including those in iron alloys. A portion of the work would probably be a continuation of the researches which have in the past been carried out by Jullien, Abel, Muller, Ledebur, T. Sterny Hunt, Akerman, Arnold, Stead, E. D. Campbell, Hogg, Parry, Upton and others.

In a generic way, metallurgists now speak of carbides, subcarbides, double carbides, special carbides, and other combinations. It is very desirable that these should be accurately defined and understood. It is also desirable to know whether there are other or new forms; if so, can these be separated and their characteristics obtained?

In addition to research work upon particular forms of carbide which have not yet been determined, it is also desirable and necessary to determine the state in which the carbon exists. For example, there exists what is termed a "missing form" of carbon, about which little is known or understood. More light is required about this form, as for many years very little has been added to our knowledge on this subject. It would be desirable, for example, to know whether the carbon not accounted for as carbide is "missed" in consequence of its being in so fine a state of division, or whether it is present in some special form or condition. It is also necessary, if possible, to ascertain the molecular constitution of the carbides.

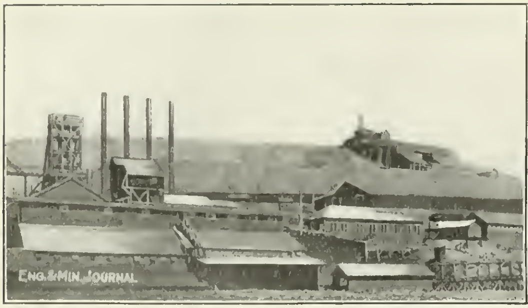
The above seems to be an outline of the general direction which should guide those considering and taking part in this research. It is hoped that the results obtained will throw much light on the cause of the hardness of steel, also the nature and form of carbon combinations with iron and its alloys. Further information may be obtained from Bradley Stoughton, Secretary, American Institute of Mining Engineers, 29 West 39th St., New York.

Photographs from the Field



Gold Dollar Mine, Cripple Creek, Colo.

Victor, in the Cripple Creek District



Portland Mines, near Victor

Golden Cycle Mill, Cripple Creek District

Highland Hoist

One of the Homestake shafts, near Lead, S. D. The ore is delivered to four No. 6 B Gates breakers, and then to a 1000-ton bin, whence it is trammed to the mill.

Carbonate Hill, Leadville, Colo.

Two Bobs Lead Mine, Sheridan-Adams Royalty Syndicate, Joplin, Mo.

NEW PUBLICATIONS

RAPID METHODS FOR THE CHEMICAL ANALYSIS OF SPECIAL STEELS, STEEL-MAKING ALLOYS, AND GRAPHITE. By Charles Morris Johnson. Second Edition, Rewritten. 6x9¼, pp. 436, illus.; $3. John Wiley & Sons, Inc., New York.

THE PRE-CAMBRIAN GEOLOGY OF SOUTHEASTERN ONTARIO. By Willet G. Miller and Cyril W. Knight. Pp. 151, illus. Vol. XXII, Part 2, Report of Bureau of Mines of Canada, Toronto.

ALASKA. ITS MEANING TO THE WORLD. By Charles R. Tuttle. 6x9, pp. 318, illus.; $2.50. Franklin Shuey & Co., Seattle, Washington.

This is wholly a compilation, as the author himself states. Its one virtue is its timeliness. The book contains nothing new of value but might prove serviceable to those without access to the original sources of information.

HANDBOOK OF MILLING DETAILS. Compiled from the "Engineering and Mining Journal" by the Editorial Staff. 6¼x9½, pp. 425, illus.; $4. McGraw-Hill Book Co., New York.

A couple of years ago, I reviewed in the "Journal" the companion-volume of this one, a "Handbook of Mining Details." The two are alike in plan, and equally satisfactory in execution. The present volume like the former professes to be the gossip of modern practice. It is a symposium of competent observers returned from trips of observation, and reporting what they have noted en route as interesting or valuable to their common profession. Simply to describe it is to praise it.

Compiled from the columns of the "Journal" during the past two or three years, it fills an important place in technical literature—namely, the place between the elaborate and comprehensive treatise and the casual paragraph in a weekly or monthly publication. And this it does by furnishing a series of such paragraphs, selected for their suggestive interest and authoritative value, grouped under their respective departments, carefully edited and adequately indexed.

Every instructor or practitioner knows the difficulty of keeping himself up to date. Precisely those items which have not yet been embodied in the text-books are the things he wants to know. He sees them in the swift "movie" of the periodical press, and wishes he could stop the machine to scrutinize them and, if they prove worth preserving, to keep them as permanent possessions. Perhaps he starts in with an ambitious set of envelopes, in which are to be filed the separate cuttings that interest him. But he is too busy to keep up the system regularly, and his stenographer is not able to carry it on with due discrimination. The envelopes are either too plentifully or too scantily filled; and their contents are not critically winnowed. There is room for a competent middleman, who shall select, test and arrange the scattered notes of progress. And such books as this are such middlemen as that.

Of course, this volume could not be expected to contain long expositions, even of novelties. It is intended for those who already almost know almost everything, and wish to have the latest comments and suggestions of practical details, if only as a guide to more thorough experiment and research.

The contents are arranged under the successive titles of Sampling; Ore-Dressing (Breaking, Crushing and Grinding, Washing, Separating and Concentration and Accessory Apparatus); Notes on the Equipment of Metallurgical Plants; Hydrometallurgical Processes; Smelting; and Refining. Under each head, there are interesting items, and occasionally more or less thorough discussions of single features of process or apparatus.

Occasionally, a brief note sheds much light upon the methods as well as the controversies of the day. For instance, the question of stamp-drop sequence in 5-stamp batteries has been voluminously treated, as we all know; and everybody admits that the stamp dropping in the order 1, 2, 3, 4, 5, would drive the charge to one end of the mortar, with obvious injury to the work of the battery, while by another arrangement both ends may be clogged while the center-dies are exposed, and their stamps "pound on iron." Avoiding both these confessedly bad sequences, the experts have been for years divided between two formulas: 1, 4, 2, 5, 3 and 1, 3, 5, 2, 4. The advocates of each have demonstrated the disadvantages of the other; and yet, as Mr. W. E. Storms points out, the two sets of figures represent the same succession, as counted from left to right or from right to left in the mortar. This amusing instance of intellectual confusion might be paralleled in other professional controversies.

During my service as U. S. Commissioner of Mining Statistics, from 1868 to 1876, such controversies were specially frequent concerning the apparatus of crushing and grinding. The patentees of grinding-pans stood belligerently for the "tractory conoidal" and other forms; and the multiplicity of rival constructions was bewildering. Dr. Percy, before issuing his volume on Silver and Lead, wrote to me in a tone of despair, asking for a general classification of pans; and I wrote him in reply that there were three great classes comprising respectively pans for grinding or amalgation alone and for both; that under each head there were two classes: the rickety and the durable; that there were also differences in material—stone, wood, iron, copper, and combinations thereof, and differences of size, and differences of speed; and that the practical effects of these differences was much greater than the theoretical effect of recondite forms, gears and motions. It was not until our mill-builders had learned to give us good materials, simple and durable constructions and adequate power, that the discussion of theoretical forms became pertinent and practicable.

But the importance of details is by no means to be underrated. It was impressed upon me very early in my work. In 1871, at the first meeting of the American Institute of Mining Engineers, I read two papers—the first two in its Transactions. One of them was on The Relation between the Speed and Effectiveness of Stamps—a subject concerning which I knew at that time very little, while I recognized its significance and ardently desired to interest western experts in its discussion. This and other tentative invitations had the effect of securing members from the Pacific slope and contributions from such members. For many years, the Transactions contained numerous brief notes, describing any simple devices or features of operation, furnished by practitioners who had not the time to prepare longer essays, or the experience, knowledge of technical literature and access to files and libraries necessary for such larger efforts.

The question of the relative value of such contributions to the Transactions did not arise. So far as I can recall, no pertinent and valuable paper of either class was ever rejected by the Institute. After the establishment of the Bulletin, when our Transactions had become crowded, we printed much in that publication which was not subsequently reprinted in the Transactions.

The last two years has shown an immense increase in the amount of the Institute's publications, and a great predominance of long and elaborate papers. This may tend to discourage the tender or the acceptance of the smaller notes of practice. In that event, the service rendered by the "Engineering and Mining Journal" both to young practitioners and to the profession at large, will be enhanced. For, like the rest of our generation, in whatever department of human endeavor, we want the news. Even the daily papers report to us things "important if true" in engineering and applied science. But in our line, as in all others, it may generally be assumed concerning such newspaper items, first, that they have a basis of fact; secondly, that they are incorrect in statement. They are not intentionally false; but they are not intelligent. We look, therefore, to our technical journals and societies for the real news, and finally, for the truth precipitated by boiling and filtering the news. Then comes the still more accurate measuring, weighing and testing of the new truth in its relation to other truths—a work performed by both the societies and the journals;—and finally the refined and defined result of these processes is incorporated into the appropriate science by those skillful critical compilers, "the leading authorities."

Every step in this evolution of an applied science is necessary; and at every step the exercise of critical inspection is welcome. It is a pity that even the news should be misleading; but it is a crime to pass on an item of such news until it is imbedded as a truth in books. We may well be gratified to those who competently edit our professional news at the very first stage, since we must have it, always read it, and are often called to act upon it, whether it be or be not a safe and sufficient guide.

The reader must pardon the discursive garrulity of an old man. But the pardoner need not expect penitence or apology. For I glory in the opportunity of vindicating the dignity of editors—under which turn I include every one who detects and corrects an error.

"Baby bye,
"Here's a fly!
"Let us swat him, you and I"

should be our amended version of poetic exhortation, from the nursery onward.

The moral of all this seeming, but not real, digression is, that the editorial staff of the "Engineering and Mining Journal," who arranged and revised the contents of this book, are entitled to our gratitude for this entertaining and useful book.

R. W. RAYMOND.

James B. Haggin

James Ben Ali Haggin died on Saturday, Sept. 12, at his summer home in Newport, Villa Rosa. He had been in poor health for some time. He was born in Harrodsburg, Ky., December, 1822. The name Ben Ali came to him from his mother, who was Adeline Ben-Ali, and was declared to have been a Turkish woman who was exiled because she embraced Christianity. Many other stories were told of her, but this one was generally accepted as fact, although Mr. Haggin always refused to confirm or deny any of them. That he had Turkish blood in his veins and Turkish sentiment in his heart was never doubted, and his son and grandson were named Ben Ali.

Little is known of Mr. Haggin's early life, except that he received his education in Danville, Ky., was prepared for the legal profession and admitted to the bar in his native state. He began practicing in Shelbyville, Ky.; later went to Natchez, Miss., and then to New Orleans, where he became inspired by the tales of gold in California, and in 1849 started for the Pacific Coast, by way of the Isthmus of Panama, arriving in San Francisco in 1850. For a time he practiced his profession, his first partner being Milton S. Latham, who afterward became Governor of California. Later he was a partner of Lloyd Tevis, who became known as the most successful lawyer in San Francisco.

At the time of his arrival on the coast there was much need for active and competent lawyers in the settlement of individual and property rights, and the demand for Mr. Haggin's services was so great and the payments so large that he made a great deal of money, all of which went into mining investments.

Although at this time he possessed no technical knowledge of mining, his investments proved so good that it was only a short time after he formed his partnership with Tevis that he was obliged to abandon the practice of law and devoted himself to his mining interests. From that time onward and for many years the firm of Haggin & Tevis was one of the greatest factors in the mining industry west of the Rocky Mountains. They then began the series of fortunate investments which landed them among the foremost capitalists of the United States.

Nor was their system of investment by any means haphazard. This firm was the prototype of the modern exploration and development companies. Stock-jobbing was in no way their guiding principle. Rather was it the development of mines for what they would yield in ore, and especially was it the development of "prospects," not the purchase of developed mines. Their theory was that out of a large number of well chosen "prospects" the majority would prove to be worthless, but some would earn a little, fewer would be profitable in a small way and perhaps one would turn out to be very rich and would more than pay for the losses in all the others. In fact, they had the marvelous fortune to develop not only one phenomenal mine, but three of them, and these no less than the Ontario, the Anaconda and the Homestake.

In carrying out their mining business they had a small army of engineers, scouts and prospectors in the field. Their methods were in short about the same as those of some successful concerns of the present day, but they were operating in a more primitive time and in a more virgin mining country, in a time and with conditions when discoveries were more easily made than they are now. They operated in the days when mines were found that paid from "the grass roots down," and in that era they were not confronted with the problem of $10,000,000 financings before one cent of return could be expected.

In many of their operations, George Hearst, that sterling old pioneer and prince of prospectors, was associated with them and the syndicate was often referred to as Haggin, Tevis & Hearst, although we believe there was never any formal partnership except in individual ventures. However, Hearst participated in the three great successes and was the predominant factor in the Homestake and a very important one in the Anaconda. Hearst became connected with the mining interests of Haggin & Tevis in 1870. Upon the discovery of silver ore at Park City, Utah, he went there in the interest of his firm, and after watching developments, in 1872, purchased the Ontario mine for $33,000. The sum of $500,000 was put into this property, in exploration of the vein and construction of the mill, before any return was received, but in 1877 it paid its first dividend. This brief record of the Ontario development sufficiently exemplifies the methods of Haggin & Tevis in their mining operations. In 1876, Hearst bought for the firm the great Black Hills group of gold mines, the most famous of which is the Homestake. In a similar way Marcus Daly cooperated with the firm.

JAMES B. HAGGIN

Marcus Daly, an old Comstocker, had been in Utah whence he went to Butte to open the Alice mine for the Walker Brothers. There he saw the Anaconda outcroppings and obtained an option on the property, having some vision of its magnitude, although at that time he regarded it as a silver mine, not copper. He knew George Hearst and through him Haggin and Tevis. He laid his plans before them, explaining that he should need a great deal of money, but impressed Mr. Haggin, who told him to go ahead. This was in 1881. After two years, during which he had expended large sums of money, he wrote to Haggin & Tevis that he would not draw for any more until one or both of them had visited Butte and seen what use had been made of their money. So Mr. Haggin went there for the first time, and having looked over things is quoted as remarking:

"Daly, you make me a vast amount of trouble. I'm getting old, but you drag me here and race me through your mine for days, though it was all unnecessary. The property is bigger than you ever led me to believe, which I suspected before I left home. Hereafter, please keep in mind what I told you in the first place. When you need money draw, and keep drawing."

After the development of the Anaconda mine, Mr. Haggin rather retired from the active making of mines, although he ever maintained his lively interest in the business, until only a few years ago he took up the Cerro de Pasco property in Peru. This was one of the modern kind of mining enterprises, the old mine with great resources of ore too low in grade for the ancients, the conversion of which was dependent upon the provision of immense mining and metallurgical plant with an initial outlay of many millions of dollars. This enterprise was eventually brought to fruition and was a great achievement for a man who was already much upward of three score and ten years. Even after this he kept his scouts in the field, sending them all over the world. Once we asked one of his confidential engineers why the old man sent him off on such adventurous journeys.

"Well," he replied, "he likes to read the reports."

"There are plenty of people who would send him reports," we suggested.

"Yes, but they would not be like his own."

While Haggin was in partnership with Tevis, he bought farm lands in California, until at one time he was the owner of a solid block of 100,000 acres, practically the whole of Kern County, and was the head and front of the great irrigation contest between the individual settlers on farm lands in California and Miller & Lux, who owned 750,000 acres of land in different counties and hundreds of thousands of head of cattle. The cattlemen objected to the diversion of rivers to flumes and ditches for the purpose of irrigation in the San Joaquin valley, which had turned it into orchards, vineyards and alfalfa fields, from a barren waste, claiming that irrigation was unconstitutional and quoting the old English law, "Water ought to flow as it has been accustomed to flow."

They wanted the water for the use of their herds and the the watering of their pastures. Haggin and his partner came to the defense of the small farmers, and fought the issue successfully through courts and legislature. Had the battle been lost, and it would have been had the individual settlers been left to fight it out against the cattle interests, southern California and the fertile San Joaquin valley might have, to this day, remained "bad lands." Mr. Haggin's enormous holdings in California are now managed on scientific principles. They are cut up into workable ranches, some of them leased to farmers and some exploited by his own men. The wheat fields are large enough to supply all California, the sheep herds are the largest on the coast, and more hops are grown there than by any one man in the United States.

When Mr. Haggin had reached the height of his prosperity, and had advanced in age, he began to devote a little time to play. Coaching appealed to him at first, and he drove a four-in-hand with William C. Ralston and Milton S. Latham as his constant associates. After Ralston's death and Latham's financial troubles, he lost all interest in that sport, and turned to the breeding of thoroughbred horses. He started a small establishment near Sacramento with one sire, Langfield, and a few mares, and a year or two later his colors began to appear on the turf. For many years he was a great figure in racing and he was the owner of some famous horses. On the death of his son, Ben Ali, he withdrew from racing and devoted himself to breeding only for some years. When Mr. Haggin's Rancho del Paso stock farm was at the height of its greatness, in 1905, he concluded to dispose of it and retain only his Elmendorf farm, in Kentucky.

Mr. Haggin was president of the Homestake Mining Co. and of the Cerro de Pasco Mining Co., vice-president and director of the Jalapa Railway & Power Co., and director in the American Car & Foundry Co., International Steam Pump Co., Oriental Consolidated Mining Co., and Oyamel Co.

While living in Natchez, Mr. Haggin married Miss Saunders, who died in 1894. On Dec. 30, 1897, he was married again, in Versailles, Ky., to Miss Pearl Voorhies, of that city, who was more than 35 years his junior, being a niece of his first wife. She survives him, together with Louis T. Haggin and Mrs. Richard P. Lounsberry, children of his first wife. The artist, Ben Ali Haggin, is Mr. Haggin's grandson.

Albert Grothe

Albert Grothe died in the American Hospital at Mexico City on Aug. 19, 1914. Mr. Grothe was one of the best known of the veterans of mining in Mexico and died in his 74th year. He was born at Hagen, Prussia, in 1841, and educated as a civil engineer at the technical college at Utrecht, Holland. He went to Java and was on railroad construction from Samarang to the interior, and later became chief engineer of the Batavia Tramway Co. He returned to Europe in 1870 and superintended the construction of a number of bridges on the railway from Tamboff to Saratoff on the Volga in southeastern Russia. He was in charge of the construction of the bridge across the Tay in Scotland, the largest in the world at that time. In 1879, Mr. Grothe was manager of the Tharsis Sulphur & Copper Co.'s works in Spain. In the '80's, he became manager of the United Mexican Mines, a British corporation which took over some of the most famous old mines in the Guanajuato district, among which were the San Cayetano and Cubo groups. The company was the first foreign one to enter Guanajuato and prospered under Mr. Grothe's management. He later had charge of the Tepezala copper mine, near Aguascalientes, and one of the Pachuca properties. About a decade ago, Mr. Grothe became a partner in the firm of Grothe & Carter, which he formed for the purpose of dealing in milling machinery, particularly promoting the well known Pachuca tank, which Mr. Grothe patented and introduced into Mexico, making the first installation at his Pachuca mill. His firm carried the representation for Dorr machinery, Deister concentrators and many of the best known appliances in the milling field. Mr. Grothe was widely known and highly respected. His absence will be sincerely felt and regretted by most of the mining profession in Mexico.

Editorials

The Situation in Cyanide

The conflagration in Europe has brought the American people face to face with the fact that we do not produce many of the substances necessary for our commercial comfort, and further, that some of them are produced only in Germany. Finding the latter nation effectually out of communication with us, and likely to continue so for some time, a mild panic has been caused, due to the apparent necessity for the abrupt cessation of some of our industries, with the consequent loss of occupation by a large number of workmen. In general industry, the most prominent item in the class under consideration is dyestuffs; in the mining field it is cyanide.

There seems to be a good deal of uncertainty about the manufacture of cyanide, but there is no uncertainty about the proposition that if we do not get it, a large number of men will be thrown out of employment and the supply of precious metals will be materially reduced. As to why it is not more largely manufactured in the United States, there is a difference of opinion. Independent chemists maintain that it can be manufactured cheaply almost anywhere, but that the present output is in the hands of a German monopoly, which has effectually throttled all attempted competition. The producers deny this, and state that they are producing it as cheaply as possible, and that the lack of competition is purely through economic reasons. Be that as it may, the fact remains that the most of the cyanide used in precious-metal recovery is made in Germany, and the supply in this country is decidedly short.

One factory only is in operation here, that of the Roessler & Hasslacher Chemical Co., important producers, at Perth Amboy, N. J. Its owners say that they are prepared to supply all contract holders with their necessities; also that regular customers will probably be taken care of up to their normal requirements, but that no increase of consumption can be provided for and no new demands met. Many cyanide users, foreseeing a shortage, have made efforts to secure advance supplies sufficient to secure them from idleness. The producers have refused to comply with these requests, and this fact has done more than any one thing to give a greater impression of stringency than that which really exists.

Aside from the German cyanide factories, there is a good production in England, but that will be of little use in America, since it is likely to be claimed for South African use. The Rand properties are of great value to Great Britain in the present circumstances, and it is likely that every effort will be made to keep them at work.

That cyanide is not made more largely in the United States is not through lack of knowledge or material, but on account of either or both of the conditions already mentioned. Now that the necessity is so great, several movements are on foot to institute its manufacture on a commercial scale. One such movement was instituted four or five years ago in Mexico, where a French syndicate had perfected plans to manufacture sodium cyanide in Mexico City. Civil war in that country prevented the materialization of the project at that time, and it is not known whether it has been since considered. The American Cyanamid Co. has been considering cyanide production for some time, and has, in fact, ordered the necessary machinery to make it, with the idea of marketing cyanide not later than January, 1915. Since the machinery was ordered in Germany, there is a strong factor of doubt about the time manufacturing means will be completed, unless the machinery had left Europe previous to the outbreak of war. In any event, new American cyanide seems a practical certainty some day. In addition to those mentioned, there are two other movements to produce cyanide here for the mining industry. Neither of these, however, has progressed to the point of giving definite information as to when production will be started or how much will be offered. Late advices point to a notable increase on the part of the English factories, so that those who contemplate production here are hesitating, keeping a careful eye on those movements.

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Interesting Features of the Spelter Market

In these days of uncertainties and radical changes in industrial conditions, all markets possess features of unusual interest, and the spelter market is no exception. American smelters having been helped out of a desperate hole and the price of spelter having advanced more than a cent a pound within 30 days, especially under the influence of buying from England, together with the operations of outside speculators, there ensued a relapse in price almost as rapid as the previous advance had been.

The recession in the price started with the discontinuance of demand by England, which at first was considered to have overbought immediate requirements, the export sales of American smelters during August having been very large. Now, however, it appears from late advices that England has been able to obtain spelter from Holland or Belgium, via Rotterdam.

The situation of the Belgian smelters is an uncertain factor. We have heard from Europe, but not directly from the company, that about a half of the Vieille Montagne plant at Angleur, near Liege, had to be destroyed to clear a line of fire. Presumably, this plant, as well as the other smelteries farther up the River Meuse, are idle. On the other hand, the works of Beer, Sondheimer & Co. at Lommel and Overpelt were in operation up to Aug. 18, according to advices of that date. These works are near the Dutch frontier, and rather outside the zone of fighting. If they were in operation as late as the middle of August, they are probably still running. The spelter offered in England may come from them, or what is more likely, may be a part of the accumulation of stocks in Belgium. We imagine the latter to be the case, inasmuch as we hear from Italy that the mining companies of Sardinia are unable to market their output, which normally goes to Belgium. Consequently, those mining companies are seeking to find a market among American smelters. Similarly are the Australian producers trying to find here a market for their ore, which normally goes to Germany.

The arrival of Belgian spelter in England is apparently a very late development, inasmuch as the last British papers received here said nothing about it and were discussing the desirability of enlarging the zinc-smelting industry of Great Britain. Some of the English zinc-mining companies are said to be considering the establishment of smelting works of their own, but as yet nothing definite has been done, for the reason that the conditions are not now auspicious for the financing of them, and moreover, no plans are ready. Another difficulty of zinc smelting in Great Britain is said to be the labor question. A correspondent of the London *Mining Journal* remarks: "It is very difficult to get on with Welsh labor; the uncertainty of compliance with contracts once entered into and their general truculence have hitherto 'flattened us out.' Whether we can select another neighborhood in this country, where labor is more disposed to comply with its agreements is another question." Also, we may add that the design and construction of a modern zinc-smelting works is a matter of a year or so of time, and if British consumers have to await such a development, they are likely to starve in the meanwhile. Far more likely is it that an augmented business in the smelting of ores from oversea will develop in the United States, where several of our plants, especially three in Virginia and two in Pennsylvania, are not unfavorably situated for the handling of ores received through Atlantic seaports.

The "Journal" Transfers an Editor to Chicago

In order to better serve the interests of its subscribers and readers, the JOURNAL has transferred one of the members of its editorial staff to its office in the Monadnock Building, Chicago, L. E. Ives, mining engineer, going to that post. This will enable us to give better attention to the great mining and metallurgical districts—the copper and iron mines of Michigan, the iron mines of Minnesota, the zinc mines of Wisconsin, the lead mines of Missouri, and the zinc mines of the Joplin district—which are easily reached from Chicago. With resident editors in San Francisco and Chicago, and with regular staff correspondents in Denver and Salt Lake City, besides its correspondents in nearly every important mining district of the United States, the organization of the JOURNAL enables it to give the necessary attention to all of the important branches of the widespread and diverse mining industry of the United States.

The Open Shop at Butte

The declaration of the "open shop" at Butte, on Sept. 9, was the logical sequence of the labor troubles that have developed there. The companies have been for many years willing to recognize the unions and enter into agreements with them, but when the unions fell out among themselves there was no longer any party of the second part, and the companies could not very well do anything but say: "A plague on both your houses!" and decide hereafter to do business on the basis of a free community, in which anybody may work who wants to.

The companies have no intention of reducing wages. They will have to maintain wages in order to obtain the kind of miners they want. Nobody knows any better than the managers of these companies that the laborer is worthy of his hire, and that it is more economical to employ good men and pay them high wages than it is to have poor men at low wages. However, the companies now propose to be the masters in their own houses. Let us hope that the opening of Butte will extend to the unions of artisans and mechanics, and that no longer will it be a cause for a strike if a pipe fitter bores a hole through a wooden partition, or if a carpenter picks up a monkey wrench.

No evidence of opposition to the operators' decree has yet been manifested in Butte and all the mines are being worked with full complement of men. Perhaps the laboring men of Butte are themselves tired of the excesses of unionism in that town.

One of the Last of the Forty-Niners

Assuming an Argonaut to have been 20 years old when he went to California in 1849, the survivors must be now at least 85 years of age, which is equivalent to saying that not many of them are left. One of the most distinguished of them, James B. Haggin, died last week. He was a man who made a great mark in the mining industry and acquired a great fortune thereby, which he thriftily increased.

We have had many mining millionaires who have made a great fortune out of some rich mine, as did Mackay, Fair, DeLamar, Stratton, Walsh and many others, but to few was it given to be in three such bonanzas as the Ontario, Homestake and Anaconda, as was Haggin. To match such a chain of successes we have to think of Jackling and the Guggenheims of our own day. That they have been able to do what they have done shows that opportunities were not exhausted by the pioneers.

Haggin and his partners were the prototypes of the modern great mine developers. Apart from his achievement of a great fortune for himself and his praiseworthy participation in some public movements, we think that Haggin's greatest claim to fame was his demonstration that mining for gold, silver, lead and copper could be conducted on a thorough-going business basis.

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One of the most annoying conditions into which a mill operator can fall is the sudden and complete failure of some step in the metallurgy. This is just what happened to the McIntyre mill, Porcupine, Canada, recently. Due to the treatment of a different ore, light slimes accumulated in the pregnant solution. There being no provision for clarifying, zinc-shaving precipitation suffered to such an extent that it was absolutely useless, the shavings being covered with an adherent coating of slime. Precipitation by zinc dust seemed the only salvation for the situation, but that would have necessitated much time and more money than the company could dispose of. Just at this time the JOURNAL of May 17, 1913, appeared with an article on the use of canvas bags as zinc-dust filters at the Lluvia de Oro, Mexico. This alternative required only canvas and pipe fittings so that in two days and at a cost of $1500, the mill was equipped with clarifying and precipitation filters that would have cost several months and many times the money to do any other way. The JOURNAL in this case undoubtedly saved a long shut-down and consequent money loss. The Merrill Co. is said to consider this appliance an infringement of their zinc-dust precipitation patents.

BY THE WAY

The Boston *Herald* sensibly remarks that with the "buy a bale of cotton" movement to take care of the cotton crop becoming so popular that even the President is reported to have bought a bale at 10c. per lb., some of the copper producers are becoming enthusiastic over a proposed "buy a ton of copper" movement. They figure that if enough people could be enlisted in a campaign for each to buy a ton of copper, at 20c. per lb., and take it out of the market, it might well insure prosperity for the copper producers and the miners for some time to come. And they say there is as much financial and economic sense in the latter as in the former proposition.

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When a mine manager makes a mistake he usually likes to cover it up. Sometimes a subordinate (with the best of intentions and with the desire to promote general efficiency) points out the error; only to get a "can tied to him," lest in his zeal he bark so loud that the directors will hand the manager his. At a certain mine the manager had conducted elaborate tests over a period of several months to determine what class of fuse was best for stoping. A high-priced American fuse was finally selected as being safe and reliable. The next manager, striving to make a low cost-per-ton record, canceled the E. M.'s requisition for American double-taped fuse and substituted an equal number of cases of cheap tarred German fuse. The E. M. protested against the use of the cheap stuff in damp ground; proving by tests that the time of burning was always irregular and that a fuse once bent either delayed a shot or else caused it to fail entirely. His protest was ignored. Result, one Finlander hopelessly mangled within a week. Official report on accident stated that the "squarehead" was careless. Unofficial note by E. M. stated the truth, putting the blame on the fuse. Result, one E. M. looking for new job. Ultimate sequel of such policies, combined with payroll padding, general grafting, stock rigging, and depreciation in market price of product; mining company busted, reorganized and busted again. On the whole, quite a "successful failure" for those on inside.

⁂

A hunger strike is something new for the mining engineer to contend with. Some of them may have entered upon one involuntarily, but few had experience with the voluntary variety, which is, of course, "made in England," not Germany. H. C. Hoover, who has been prominent in the work of relieving stranded American tourists in London, was recently confronted by a hunger strike on the part of a young American woman who started to starve to death in the American relief committee's headquarters rather than return to America in the steerage. According to a London despatch, the young woman stuck obdurately in the committee's headquarters for some hours after all other visitors had left. Mr. Hoover finally offered her four shillings with which to buy a meal and succeeded in breaking the strike. Excellent work has been done under Mr. Hoover's direction by the American relief committee in London, but with the limited funds available, it was not possible to send stranded tourists home in cabins *de luxe*. All have had to travel third class except the aged, the sick, or those with very small children. Mr. Hoover has been quoted in an interview as saying that doubtless some tourists will be dissatisfied with these accommodations, and, in fact, some have already threatened to voice complaints on their arrival in the United States. We think that those who are unable to rough it for once in their lives will receive but short shrift on presenting their complaints in this country.

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S. R. Guggenheim is quoted as saying:

> The copper-producing trade will be affected, but copper-manufacturing industries should be greatly stimulated. Contracts for our Chile Copper Co., placed in Germany, will be transferred to America. The great German electric manufacturing companies are bottled up tight, and we alone are the only country in position to step into the gap.
>
> We shall not stop development work on any of our properties.
>
> In South America the colonization by Americans following development of American trade will further stimulate demand for American goods. In addition, there will be thousands of buyers in this country this year who ordinarily spend millions each year abroad.

⁂

Bartholomew F. Griffin, one of the editors of the *Boston News Bureau*, contributed this fine poem to his paper, just before the European war broke out:

IF!

Suppose 'twere done!
The lanyard pulled on every shotted gun;
Into the wheeling death-clutch sent,
Each millioned armament,
To grapple there
On land, on sea, and under, and in air!
Suppose at last 'twere come—
Now, while each bourse and shop and mill is dumb
And arsenals and dockyards hum—
Now all complete, supreme,
That vast, Satanic dream!—

Each field were trampled, soaked,
Each stream dyed, choked,
Each leaguered city and blockaded port
Made famine's sport;
The empty wave
Made reeling Dreadnaught's grave,
Cathedral, castle, gallery, smoking fell
'Neath bomb and shell;
In deathlike trance
Lay industry, finance,
Two thousand years'
Bequest, achievement, saving, disappears
In blood and tears,
In widowed woe
That slum and palace equal know,
In civilization's suicide.
What served thereby, what satisfied?
For justice, freedom, right, what wrought?
Naught!—

Save, after the great cataclysm, perhaps
On the world's shaken map
New lines, more near or far,
Binding to king or czar
In festering hate
Some newly vassaled state;
And passion, lust and pride made satiate;
And just a trace
Of lingering smile on Satan's face!

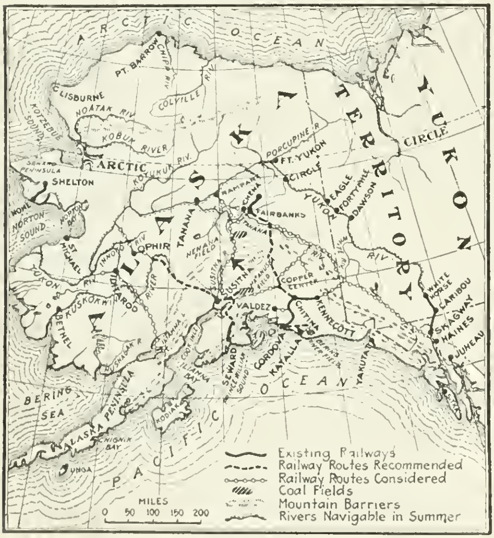
Great Gold Find in Alaska

The following article, telling of a great gold find in Alaska, was printed by the New York *Sun*, on Sept. 14:

Daniel Guggenheim, head of the Guggenheim interests, received a telegram yesterday from Stephen Birch, managing director of the Morgan-Guggenheim Alaskan mining syndicate, confirming the reports of a remarkable gold discovery in Broad Pass on the Susitna River, Alaska. Mr. Birch said he was on his way to this city with samples of the ore.

The discovery, it is predicted, will create a new era of prosperity in this country and already has started another rush of prospectors to Alaska. News of the find spread like wildfire through the region and hundreds of gold seekers have poured into the pass during the last week to stake out claims.

"The news of the discovery is true," said Mr. Guggenheim last night, "and Mr. Birch is on his way to this city with complete information regarding it. He did not care to trust the information on the wires and consequently is making this journey from Alaska to convey the news in person. We have expected this news for some time, for every geologist who has ever been to that region knows that it is extremely favorable for gold and other valuable minerals.



Map of Alaska

Broad Pass, mentioned in the reports of new gold discoveries, is shown by the arrow north of Susitna, along the line of the proposed extension of the Alaska Northern Ry., but there has been prospecting and discoveries during the last season in a great semicircle from Broad Pass in the Alaska Range to Kennecott in the Wrangell Mountains.

"The discovery will afford employment to hundreds of men, for the recovery will not be made by placer mining, as in the Klondike, but by smelting and cyaniding. This means getting back to the old pick and shovel game, and hundreds of prospectors already have entered the region with their kits to stake out claims and start operations.

"Many will want to get into the gold region. The Government must recognize this fact now and prosecute the construction of the railroads in Alaska. The discoveries will not be available until this is done. I believe they contemplate constructing 1000 miles of railway in the country to open the region. The work should be pushed at once because for every hundred miles of railroad built the country surrounding it will be opened up ten hundred miles."

According to reports from the regions in the Northwest, the strike was made where there are gold ledges 100 to 2000 feet wide. One of the 100-foot ledges assays $15 per ton straight across. A fourteen foot pay streak on the hanging wall averages better than $250 per ton.

This announcement in the daily press of this "greatest gold discovery ever made" is doubtless exaggerated, but no definite announcement can be obtained at this time from the principals mentioned. The reports must, in consequence, be scrutinized with the usual reservations when reading of scientific or technical discoveries in the daily press, whose reporters feel constrained to make "an interesting story." What influence these discoveries may have on the building of railways in Alaska cannot be determined until more is known as to the exact situation of the gold finds. At one end of the great semicircle in which prospecting has been active during the last season the projected extension of the Alaska Northern Ry. would be the natural outlet, while for discoveries in the Wrangell Mountains, the Copper River & Northwestern would be the most convenient line.

Upon being interviewed by a representative of the Journal, Mr. Birch, who has just returned from Alaska, refused to make a statement for publication, and declined either to confirm or deny the accounts published in the daily press. Engineers of the Guggenheim staff, however, have been in the country mentioned, and there has been much activity during the last summer in a great semicircle extending northward, from Kennecott, in the Wrangell Mountains, to Broad Pass, in the Alaska range. Ever since the Shushanna strike, there have been many prospectors in this region, and only the inaccessibility of the country and the lack of transportation has delayed its actual development.

Copper developments have been active in the Wrangell Mountains during the last season, the Alaska Syndicate having developed some rich ore in the Jumbo, which may now be regarded as a rival of its famous Bonanza mine. The tramway to the Jumbo is being completed and the property is expected to come into production about the first of the year. The same interests are completing at the Beatson copper property on Latouche Island a 700-ton concentrator, which will also be ready for production about Jan. 1, 1915. A smelting operation will probably be undertaken on the coast of Alaska in the vicinity of Cordova, when the Bering River coal fields are open to development. This would afford an outlet for the copper production of the Guggenheim properties in Alaska and for such developments as may take place in the Wrangell Mountains and in the Alaska range, when the proposed Governmental railroads have become a reality.

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A. S. & R. Semiannual Report

Notwithstanding unsatisfactory conditions in Mexico, the American Smelting & Refining Co. and American Smelters Securities, according to the semi-annual reports, issued recently, earned a surplus over both preferred- and common-stock requirements during the six months ended June 30, 1914. The surplus available for dividends on the common stock was $1,956,691. This compares with $2,017,894, in the corresponding period of 1913, and is equivalent to 3.91 per cent. earned, against 4.03 per cent. in 1913. Gross earnings amounted to $6,782,254, an increase of $110,642 over the same period in 1913. The directors charged off $764,918, for depreciation, an increase of $176,717 over the first six months of 1913. The net income for the first six months of 1914 was $4,966,692, a decrease of $61,202, compared to last year.

PERSONALS

Morton Webber has gone to Porcupine, Ontario.

Dr. O. Susmann is expected home from Europe shortly.

Homer L. Carr has gone to Honduras on examination work.

C. B. Lihme, of the M. & H. Zinc Co., La Salle, Ill., has returned from Europe.

F. D. Weeks has returned from Chile where he has been engaged on metallurgical work.

Walter Pickering, of New York, is in the Mogollon district of Socorro County, New Mexico.

Edwin J. Collins has returned to Duluth from an examination trip in Montana and California.

M. W. Porterfield, general manager Mangas Development Co., is in Silver City after an Eastern trip.

E. N. Barbot de Marny, of Petrograd, has been in Alaska for several weeks in the interests of the Lenskoie Mining Co.

George H. Garrey has spent the last three months examining zinc and lead bearing properties in Tennessee and Virginia.

R. C. Canby, of the Miami Copper Co., is back in New York, his extensive experimental work in Arizona being nearly completed.

Walter Harvey Weed has returned to Houghton from a professional trip to the Seward Peninsula, Alaska. He will be in New York about Sept. 25 for a few days.

George St. Clair Douglas, formerly in charge of mining operations in Zacatecas, Mex., has gone to Pinos Altos, N. M., where he will operate the Silver Hill mine. Mr. Douglas is accompanied by W. G. Jude, of London, Eng.

Arthur Thatcher, of St Louis, visited the properties of the Empire Zinc Company in New Mexico during the first week of September. He was accompanied by R. B. Paul, of Denver, C. A. Schmidt, of Tucson, and C. T. Brown, of Socorro, N. M.

William Thum, superintendent of the lead refinery of the United States Metals Refining Co., at Grasselli, Ind., was called to Newark, N. J., last week, by death of his father, Frederick A. Thum, who had for many years been in charge of the Balbach works at Newark.

John R. Stanton has been elected president of the Wolverine and Mohawk Copper Mining companies to succeed Joseph E. Gay, who retired after serving as president for eight years. Frank M. Stanton has been chosen treasurer and George W. Drucker secretary of the concerns.

Chas. E. Coxe, secretary of the Rosario Mining Co., near Sombrerete, Zacatecas, who came to the States about a year ago on account of the disturbances in Mexico, and has been in Reading, Penn., his old home, most of the time since then, expects to return to Mexico shortly.

E. R. Wash, who for the last three years has been chief engineer of the Mascot Copper Co., as well as the Western Finance and Associated Copper Companies of Dos Cabezas, Ariz., has tendered his resignation in order to engage in private engineering practice with headquarters at Tombstone, Arizona.

Prof. A. L. Walker writes from Japan that he has had to abandon his trip around the world to see metallurgical works and things in general, having no desire to find himself tied up in some out-of-the-way place and not be able to get out. Consequently he proposes to return directly from Japan to the United States.

J. W. H. Hamilton, of the firm of Hamilton & Hansell, has recently returned to America after having spent more than a year in Europe. During this time he has visited most of the mining districts of Scandinavia and continental Europe and has been instrumental in establishing several Greenawalt sintering plants.

H. Parker Willis, who was the author of the original draft of the Reserve Bank act, has been appointed secretary of the Federal Reserve Board. Mr. Willis is a native of Massachusetts, 40 years of age, and was educated in the Western Reserve and Chicago Universities with post-graduate work in the Universities of Leipsic and Vienna. For several years he was Professor of Economics and Political Science in Washington and Lee, and George Washington Universities. For a good many years, previous to a few weeks ago, he acted as Washington correspondent of the "Engineering & Mining Journal."

OBITUARY

John Armstrong Rawlins, vice-president and director of the American Grondal Co., died on Aug. 27.

Henry Bratnober, a mining engineer who was prominently identified with the Klondike rush, died on Sept. 14 in California.

Dr. C. A. Stewart, professor of Geology at the University of Idaho, died on Long Island on Aug. 29, after an illness of several months' duration. He was born in New York on Dec. 1, 1885, but his early years were spent in Franklin, Mass. He graduated from Columbia University in 1906, and remained there until 1908 as a graduate student and instructor in geology, receiving his master's degree at the end of that time. From 1908 until 1911 he was instructor in geology at Cornell University, and while there made a trip to Arizona where he made a detailed geological survey and examination of the Silver Bell camp, as material for his doctor's thesis, which was published in 1912 in the Transactions of the American Institute of Mining Engineers. He received his doctor's degree from Columbia University in 1912. In 1911 he was appointed professor of geology at the University of Idaho, which position he held until his death.

SOCIETIES

Mining and Metallurgical Society—The New York Section held its first meeting of 1914-5 at the Engineers' Club, Sept. 15. Howard F. Wierum gave an account of the development of the Hall process of desulphurization. This excited lively discussion. Officers of the section for the ensuing year were elected as follows: Sydney J. Jennings, chairman; Allen H Rogers, vice-chairman; Donald M. Liddell, secretary and treasurer.

The San Francisco section of the Society held a meeting on Sept. 14, at which Mr. Colby gave a talk on the Kennedy Extension-Argonaut case.

Chemical, Metallurgical and Mining Society of South Africa—At the meeting on Aug. 15, the following papers were presented for discussion: "Notes on Hydraulic Classifiers and Classification," by Prof. G. H. Stanley; "The Detection of Platinum Metals in Cupellation Beads by Means of the Microscope," by C. O. Bannister and G. Patchin; "The Relation of Falls of Roof in Collieries on the Middleburg Coalfield to Weather Changes," by Chas. J. Gray; "Rock Temperatures," by E. J. Moynihan; "A Method of Assaying Concentrates and Battery Chips for Gold and Platinum Metals," by Andrew F Crosse; "The Blue Iron-Cyanogen Compounds," by H. E Williams; "The Witwatersrand Earth Tremors," by H. E. Wood; "The United Patents Bill," by A L. Spoor and W. E. John.

NEW PATENTS

United States patent specifictaions may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALKALI METALS—Improvements in the Electrolytic Manufacture of Alkali Metals and Alkali Metal Compounds. E. A. Ashcroft, London, S. W., Eng. (Brit. No. 10,980 of 1914.)

BORIC ACID—Process for the Production of Boric Acid. Alfred Burger, New Brighton, N Y (U. S. No. 1,108,129; Aug 25, 1914.)

CLASSIFIER—Ore-Pulp Classifier. Joseph T. Terry, Jr., San Francisco, Calif. (U. S. No. 1,109,485; Sept. 1, 1914.)

CONCENTRATOR—Dry Concentrator. John F. Hiltscher, Fullerton, Calif. (U. S. No. 1,108,499; Aug. 25, 1914.)

CRUSHING ROLLER—James C. Reid, Bluefields, Nicaragua, assignor, by mesne assignments, to Allis-Chalmers Manufacturing Co. (U S. No. 1,108,850; Aug. 25, 1914.)

CRUSHING — Improvements in Crushing and Grinding Mills. J. Mohs, Dessau, Germany. (Brit. No. 14,222 of 1913.)

CRUSHING—Rock Crusher. Samuel C. Arnold, Denver, Colo., assignor to Denver Quartz Mill & Crusher Co., Denver Colo. U. S. No. 1,109,158; Sept. 1, 1914.)

DRILL CHUCK—George W Emrick, Brooklyn, N Y (U. S. No. 1,109,121 Sept. 1, 1914.)

DRILL—Electric Drill. William O. Duntley, Chicago, Ill., assignor to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S No. 1,109,325; Sept. 1, 1914.)

DRILL—Mine Drilling and Channeling Machine. Longfellow J. Daft, Seattle, Wash. (U. S. No. 1,108,342; Aug 25, 1914.)

ELECTRIC FURNACE. James W Moffat, Toronto, Ont (U. S. No. 1,108,924, Sept 1, 1914.)

Editorial Correspondence

SAN FRANCISCO—Sept. 10

Necessary Economy in Operations on the Comstock has resulted in the resignation of A. M. Walsh, superintendent of the United Comstock Pumping Association, and Charles Liddell, surveyor. Mr. Walsh has been succeeded by Thomas F. McCormick, who will perform these duties in addition to his superintendency of Con. Virginia and Ophir. The chief interest is still in the Belcher and the Union. Although the ore in the Belcher does not run high there are indications of improvement. The face of the drift in the 2400-ft. level of Con. Virginia shows improvement. Aggressive development is in progress on the 2650-ft. level of the Union. Altogether there is a general advancement and the practice of economy insisted upon has lent encouragement to stockholders.

More than 90% of Natomas Consolidated First Mortgage Bonds had been deposited under the reorganization plan at the end of August, amounting to $12,731,000. Of the second mortgage bonds, $2,450,000 had been deposited, leaving only $50,000. There had been deposited 147,700 shares of stock, which will be augmented by 5000 more that were delayed, leaving only 10,690 shares of the total of 163,390. Security holders who have been unavoidably delayed will be given further time to make deposits. But after the reorganization has progressed to a certain point fixed by the committee it will not be within the power of the committee to accept further deposits so that first mortgage securities then still outstanding will receive only their pro rata under bankruptcy sale of the Natomas properties. Holders of second mortgage bonds and stock, not deposited at that time, it is understood will receive only what is due them under the reorganization plan.

Nevada and Amador Counties Ranked First and Second Respectively in gold production in California in 1913. Nevada County produced $2,945,275, Amador County, $2,922,942. The two largest deep gold mines are in these counties, the North Star and the Kennedy. Three other counties produced each over $2,000,000: Sacramento, $2,503,633; Yuba, $2-491,505; Butte, $2,269,849. The bulk of the gold in these three counties was from the dredges. Three counties producing over $1,000,000 each in gold were Shasta, $1,208,870; Calaveras, $1,175,208; Sierra, $1,006,573. Shasta County ranked first in the total value of minerals produced, being credited with a total yield of $5,354,875, including gold, silver, copper and lead. Shasta produced 27,044,297 lb. of copper, 741,773 oz. silver, 19,295 lb. lead, being first in production of copper and silver and third in production of lead. Calaveras County was second in production of copper, with 5,823,226 lb. Inyo County ranked first in production of lead, with 3,246,432 lb.; San Bernardino County produced 237,480 lb. of lead.

Application of the Government for Appointment of Receiver pending final decision of the General Land Office in the application for patents to oil claims known as the Hawk locations in Kern County has been denied by Judge Dooling in the U. S. District Court. The property is operated by the General Petroleum, Pacific Midway, J. D. Spreckels, Obispo and Queen companies, who are the defendants in the hearing before Judge Dooling. The several oil claims were located by G. W. McCutchen and others in 1912 for the purpose of securing further title to lands originally within the area of the Lone Star location. It was contended by the Government that the filing of the Hawk location was irregular and invalid because of the use of the names of dummy locators. Judge Dooling attached but little weight to the contention of the Government attorneys, and was evidently convinced that no fraud had been practiced; holding that if there had been fraud in the McCutchen locations, that would be no excuse for denying patents to the companies now in possession, which have in good faith developed the lands, relying on the long established custom of the Government, and have expended large sums in development. The court would not impose the hardship on the operators of placing the lands and operations in the hands of a receiver pending such decision as the land office might make. Judge Dooling, of course, did not decide as to validity of the application for patent, but made it plain that he doubted if the purchasers of the land in good faith could be made to suffer for the error or fraud of the locator, especially since the development of the lands had proved their value as mineral oil lands.

DENVER—Sept. 11

Two Different Events of Nation-wide Importance interest Colorado mining men vitally. Announcements have come by press almost simultaneously of President Wilson's proposal of terms for the restoration of peace in the Colorado coal-mining districts and of the Butte mine operators' ultimatum declaring for open shop. Analysis of each of these policies shows that their successful operation will leave no function for unionism. The operators of Colorado, both in coal mining and in metal mining, await the outcome of these two issues for establishing equilibrium between employers and miners. Officers of the United Mine Workers are reported as ready to accept the terms of Mr. Wilson's request although why this is so cannot be understood except from the viewpoint that a gracious compliance is the only safe attitude for unions to display at this time. Coal operators will also probably accept the terms. If Butte operators succeed in their open-shop policy, Colorado metal-mine managers will undoubtedly take advantage of such victory over tyrannical unionism and will place the entire state upon the same non-union basis as prevails in the Cripple Creek district.

BUTTE—Sept. 10

Butte Labor Situation—Butte and Silver Bow County are under martial law. Military authority has reigned supreme since Sept. 1. Major Dan J. Donohue, commanding officer of the 10 companies of the Second Regiment of the National Guard of Montana who arrived in Butte Sept. 1 has issued the following proclamation, printed copies of which were posted at conspicuous places in the city and county:

Headquarters National Guard of Montana.
In the Field, Sept. 1, 1914.

Proclamation by commanding officer:

(1) Silver Bow County, in the state of Montana, is now in the possession of the military forces of the state of Montana, who have come to restore peace and order and to enforce the laws of the state, under the authority and by command of the governor.

The undersigned, commanding the said military forces, therefore makes known and proclaims the object and purposes of the state in thus taking possession of the said Silver Bow County, and the rules and regulations by which the laws of the United States and the state of Montana will be, for the present, and during the state of insurrection, maintained. This information and these rules are for the guidance of all good citizens, as well as for others who are or may have been in insurrection.

(2) There exists in Silver Bow County insurrection against the laws of the state, and a state of lawlessness and defiance of authority. The commanding officer of the national guard of Montana, the undersigned, therefore, will cause the said Silver Bow County to be governed, until further orders, by military authority. This measure is deemed necessary because of the facts previously recited.

(3) The persons and property of all well disposed citizens will be protected and safeguarded.

(4) All persons who have heretofore engaged in insurrection, or who have given aid and comfort to those in insurrection against law and the civil authority, but who shall return to peaceful occupations and preserve quiet and order, will not be disturbed in person or property by the military forces, except where the exigencies of the military government may render it necessary. All rights of property will be held inviolate. All shops and places of business, except those hereinafter mentioned, may be kept open as usual.

(5) All saloons and places where intoxicating liquors are sold at retail as a beverage will be closed at once and kept closed until further order. The stock of liquors of any person or persons violating this rule will be destroyed and all violations severely punished.

(6) Misdemeanors will be punished by the summary court. Maj. Jesse B. Roote is hereby appointed and constituted summary court of the military forces in said Silver Bow County. Violations of state and Federal laws, other than misdemeanors, will be referred to a proper military commission for trial and punishment; civil causes will await the ordinary tribunals.

(7) No publication, either in newspaper, pamphlet, handbill or otherwise, in any way reflecting upon the United States, the state of Montana or their officers, civil or military, or tending to influence the public mind against them, will be tolerated.

(8) All good citizens are requested to render all possible and proper aid to the military authority and forces.

(9) All assemblages in streets and highways are forbidden. Assemblages in other places can only be held after the permission of the commanding officer is given.

(10) Children under 18 years of age will not be permitted on the streets after 7 o'clock p.m., nor before 6 o'clock a.m. Women are requested to not appear on the streets after 8 o'clock p.m., nor before 6 o'clock a.m.

(11) Vagrancy will not be tolerated.

(12) It is hoped that martial law in Silver Bow County

will be mild and gentle; but it will be quickly and vigorously exercised when occasion requires.

Given this 1st day of September, 1914.

DAN J. DONAHUE, Major Commanding.

Official:

JESSE B. ROOTE, Major and Adjutant.

The 600 men of the militia made their headquarters in the large courthouse on Granite St., where are also the offices for the administration of the affairs of the city and county, the functions of the municipal and county officers having automatically ceased with the announcement of martial law. Major Jesse B. Roote, of Butte, was appointed as judge of the summary court and Frank Conley of Deer Lodge, provost marshal in charge of the police department of Butte and of the forces of Sheriff Driscoll.

While the great majority of citizens welcome the presence of the militia, objections to the governor's action in declaring martial law have been raised in certain quarters. No official attempts were made to interfere with the military authority, except that on Sept. 4 steps were taken by the attorneys of certain prisoners to test the right of the military authorities to try offenders. Writs of habeas corpus were asked of the Federal court for three miners arrested by the marshal's forces for having arms and ammunition in their possession. Judge Bourquin of the Federal court to whom the matter was presented, issued order to show cause on the governor and the military authorities. The petitioners represent that they were unlawfully and against their will imprisoned and restrained of their liberty by respondents. In the petitioners' complaint it is set forth that the conditions did not warrant the governor's action of declaring martial law, resulting in depriving citizens of their rights guaranteed under the constitution. On Sept. 7 the governor and the military authorities filed their answer in which the laws are quoted authorizing the governor to declare martial law and to call upon the militia of the state to aid him in maintaining order and enforcing said laws. In the answer are also reviewed the incidents which led up to the necessity of sending troops to Butte, such incidents being interpreted by the governor as constituting a state of affairs compelling him as a last resort to exert the rights vested in him by the constitution. Judge Bourquin took the matter under advisement and later decided against the plaintiffs.

One of the first effects of the establishment of martial law and of the arrival of troops was the starting of the mines closed down temporarily on account of local disturbances. Threats and intimidations caused such a large number of men to fail to report for work at these mines that they were forced to stop operations. Since the arrival of the militia, members of the jurisdiction committee in charge of enforcing membership in the new union and requiring men working in the mines to wear the union's button, have been kept away from the mines, a number of them having been arrested by the military authorities and put in jail awaiting trial for kidnapping and deporting men who refused to join the new union.

The placards posted at the mines previous to the arrival of the troops, containing the rules which the new union attempted to impose upon the mines, have been removed and destroyed and all men applying for work, regardless of their affiliations are put to work when needed and are protected from interference by agitators or delegates from labor unions. In all instances married men are given the preference.

This, in connection with the closing of the saloons, has resulted in fewer men failing to report for duty at the mines than has been the case in the entire history of the operations of the Anaconda company's mines. The number of minor accidents has likewise shrunk below the usual percentage.

Another salutary effect of martial rule has been the arrest of a large number of vagrants and toughs who floated into Butte and for months plied their trade of holdup and burglary without any interference whatever on the part of the city or county authorities. The men so far arrested were tried in the summary court, convicted and sentenced to fines and imprisonment in jail with sentence suspended 12 hr. to permit them to get out of town. Almost every one of the prisoners availed himself of this chance. William O'Brien, candidate for the presidency of the Butte Mine Workers' Union, who drew up the platform of the organization, being an advocate of the I. W. W. and a member of the socialist party in Butte, was arrested Sept. 6 by the military authorities at Divide, as he was boarding a train for Salt Lake to avoid service of a warrant issued for his arrest. He is charged with participating in the kidnapping of members of the Western Federation and with making inflammatory speeches prior to the arrival of troops.

Muckie McDonald, president of the new union, and Joe Bradley, vice-president, who up to the arrival of the troops had been brave in defying local authorities and bragged about the fact that the authorities did not dare to arrest them or interfere with their designs regarding the doings of the new union, made for the tall timber as soon as the troops entered the city. Two members of the union who attempted to take food and money to the fugitives were intercepted by the military and arrested. The ill feeling stirred up among the members of the new union by McDonald's showing the white feather, jumping the town and leaving others to take the punishment, led to the election of John Doran, a well known miner, as the new head of the union. No new vice-president has as yet been selected. President Doran upon assuming his new duties issued a manifesto in which all members of the union are requested to assist the local and military officials in maintaining order and in preventing acts of violence.

On Sept. 5 a petition was presented to Major Donohue asking that a grand jury be called to inquire into the affairs of the city and county and the acts of their officers prior to the arrival of the militia. In the petition it was set forth that there would never be a feeling of public security after the militia left Butte so long as Mayor Duncan and Sheriff Driscoll remained in office and that they should therefore be removed from office if found guilty of having violated their oath of maintaining order and enforcing the law; that others should be appointed able and willing to perform their duties. The petition was signed by a number of citizens. Major Donohue thereupon signed an order allowing Judge Lynch to open court to hear this matter, to call a grand jury or to permit the petitioners to file direct charges against Duncan and Driscoll. This petition was fathered by Western Federation interests.

On Sept. 8 representatives of all the Butte companies but one held a meeting, as reported in the "Journal" of last week, and issued a statement to the effect that they would not thereafter compel any of their employees to join either of the miners' unions and that no committee or representatives of either union would be permitted to visit mines to inspect cards, buttons, etc., that working hours and scales of wages would be maintained as theretofore; but that the companies felt absolved by events from living up to their contracts with the old union, while recognition of the lawless new union was impossible. The statement was signed by the Anaconda, North Butte, Butte & Superior, Butte-Ballaklava, Butte & Zenith, Elm Orlu, Timber Butte, Butte-Alex Scott, Pilot-Butte, Tuolumne, East Butte, Rainbow and Butte-Duluth companies. The Davis-Daly signature is missing, the company representative not being in the city.

It was stated on Sept. 4 that 8000 men were at work for the mining companies.

Muckie's capture several days after he had beat it, has been reported. The city is now quiet and orderly. With the exception of the closing of the saloons, business and amusements are carried on as usual without interference by the military authorities.

SALT LAKE CITY—Sept. 10

Utah Copper Has Been Experimenting With a Flotation process at its Magna mill for some time. On Aug. 24, fourteen flotation cells were in use cleaning the second-class concentrates. These cells are cylindrical in shape, 3 ft. in diameter by 3½ or 4 ft. deep, and have a spitzkasten fastened on the side near the top. About 250 to 300 tons of material per day is treated, and a good recovery is made. The mine is producing between 9000 and 12,000 tons of ore per day, working with about half forces. Operations are carried on six days a week, and at the Boston Consolidated end, three days a week. The office and engineering forces have been reduced, though an effort has been made to retain old employees and men receiving small salaries, especially those with families. It is understood some of the officials have asked for a reduction in salary, to continue while the unsettled markets last.

At Present Other Properties at Bingham are operating as follows: Utah Apex is working about as usual, treating 300 to 350 tons of milling ore per day, concentrating four or five into one, making 70 to 95 tons of concentrates. The company is also shipping about 100 tons of crude ore daily. The United States mines are operating as usual since the curtailment. Lead ore chiefly is being mined. The Utah Consolidated is working at about the normal rate on lead ore, but the copper output has been materially cut down—half normal or less. Ohio Copper is running with full forces and has been working on a flotation process. Bingham Mines is working, as is also the Yampa, the latter shipping about a car of ore daily. The Bingham-New Haven is again operating with regular forces, and is mining chiefly lead and gold. The mill is treating about 100 tons of lead ore per day, and shipments of 100 to 150 tons of first class are being [illegible] daily.

Settlements on Lead and Silver are being made in full, and the lead-smelting plants in the valley are operating at nearly normal capacity. There has been a slight decrease in shipments from smaller producers. Only one of the large silver-lead producers in the neighboring camps has temporarily suspended operations. This mine shipped to the International, which has a large tonnage of lead ores stockpiled, and can operate as usual. The lead smelteries of the A. S. & R., at Murray, and the United States Co., at Midvale, have been receiving enough ore to keep all furnaces operating that were in blast under normal conditions, though for a time there was some falling off from small shippers, who did not appear willing to take chances on the metal quotations. These are again shipping, since daily quotations on lead and silver have been established. The copper plants of the International and at Garfield are operating, though at reduced capacity. The Garfield plant has been affected by the reduction of shipments of concentrates by the Utah Copper, but has not yet reached 50%. At present there are two blast furnaces and three reverberatories in use. There are six reverberatories at this plant; on an average four to four and a half furnaces are operating at the same time. One of the reverberatories has been equipped to burn coal dust instead of crude oil, and the tests and experiments carried on have shown that powdered coal is efficient, and there has been a considerable saving from its use. The principal difficulty has been in the feeding, on account of the coal at times being damp, though this is a minor point and can easily be remedied. Castle Gate coal is used. All of the reverberatory furnaces will be equipped to burn powdered coal, as soon as possible.

HOUGHTON—Sept. 12

Among the Workingmen of the District the Calumet & Hecla's plan for partial operation was received with satisfaction, in the belief that it is the most drastic action that will be taken for at least six months, provided the war continues that length of time, and that the company has assurance of financial arrangements to carry through the three-quarters time system for that period. During the suspense, while all the men knew something had to come, there was general fear that it would be at least half time. So that the announcement, when it did become public, was cheerfully received.

The Chaotic Conditions of the European Copper Market have developed one new field for Lake Superior copper that was not suspected of possibilities up to this time. This is the market in China. Fairly large orders from China have been received at Lake Superior plants lately and two large orders for carload lots of finished copper wire have reached refineries. These orders all carry with them the possibility of future business. With the commercial expansion which seems to be developing in China since the establishment of the republican form of government the demand for copper has become a factor. Europe furnished all of the refined copper necessary up to date.

DULUTH—Sept. 12

Great Activity in Ore Shipments from local docks, was witnessed during the past week, 21 ore cargoes clearing in one day, Sept. 9. This is due simply to a clearing of accumulated tonnage, since shipments from the ranges correspond about to the season's averages.

The Cuyuna Range in August saw no additions to the list of shipping properties, although development work was active. The Rowe and Thompson pits, with the Kennedy and Armour No. 2 underground mines, continue to furnish the bulk of the tonnage. Cuyuna-Mille Lacs and Ironton shafts are the only other shippers on the range. Tod-Stambaugh keeps a shovel at work on the Pennington pit but has not shipped thus far this season. The Armour No. 1 and Meacham shafts continue idle.

In an exploratory stage, the Duluth-Brainerd shaft is attracting most attention with its high manganese assays, running well over 40%. The John A. Savage Co. has a large crew at work on the Croft mine, which it is sinking on contract for the Merrimac Mining Co.

On the South Range, the Patterson Construction Co. is opening up the Wilcox shaft underground for the Canadian-Cuyuna Ore Co., having a contract to deliver the property to the mining company in an operating condition.

After many vicissitudes, the Brainerd-Cuyuna mine, at Brainerd, is now sinking a timber drop shaft, which is down about 25 ft. Two ordinary shafts failed completely, because of quicksand and water. The new shaft is going down under the supervision of the Patterson Construction Co.

At Barrows the Barrows Mining Co. will shortly begin sinking a modern steel and concrete shaft on its property recently leased from the Northwestern Improvement Co. The Adams Mine, at Oreland, is stockpiling a small production.

SPOKANE—Sept. 10

Dividends Have Been Declared by two Inland Empire mining companies, the Bunker Hill & Sullivan, at Kellogg, Idaho, and the Standard Silver-Lead, near Silverton, B. C. The Bunker Hill & Sullivan will pay at the regular rate of 25c. per share, or $81,750, making disbursements for the current year $735,750 and increasing the grand total to $15,465,000; but the Standard directors decided to cut in half, and its stockholders will receive 1½c. per share, or $25,000, instead of $50,000. The payment will be made Sept. 10 to stockholders of record Aug. 31, making the disbursements for 1914, $475,000, and increasing the total to $1,550,000. The reduced dividend of the Standard is due to the suspension of shipments at the mine, and, while the officials state there is a considerable amount in the treasury, it is probable that no further dividends will be declared until shipping is resumed, unless there is a marked advance in the price of lead and silver, since the directors have decided that it is advisable to keep the surplus funds to finance development.

On Aug. 4 the Standard was notified by the Consolidated Mining & Smelting Co. that no more custom ores could be treated at its Trail plant, owing to the demoralization of the general metal situation. This resulted in suspension of shipments and all but 90 men, who were retained to continue development, were laid off. Small shipments of zinc are being forwarded to the smelters at Bartlesville, Okla., and the lead-silver ore extracted in development is being stored at the mill.

Charging that the Stewart Mining Co. has entered upon the Ontario claim at Kellogg, Idaho, and knowingly taken out ore to the probable value of $40,000, the Ontario Mining Co., lessor, and Jonathan Bourne Jr., of Portland, Ore., owner of the property, have filed suit in the district court of Shoshone County, Idaho, asking that the Stewart company be restrained from continuing its alleged practice and that an accounting be made for the ore which it is charged was wrongfully taken. The complaint alleges that the Stewart company knew that it was entering on the Ontario ground, and states that the alleged entry was made from the Stewart's Switchback claim and that the ore was extracted for 120 ft. east and west along the vein and for about 18 ft. in width. It is charged that the ore lay just along the north boundary of the Ontario. The Ontario claim, it is set forth, has been owned by Mr. Bourne since 1892, but that in April, 1911, it was leased to Stanley A. Easton, who shortly after assigned his interest to the Ontario Mining company. This lease was to have expired July 1, 1914, but was extended until July 1, 1915. It is charged that the Stewart company has been removing ore from the property since June 1, 1914. That there is no chance to maintain such a suit is the opinion expressed by Manager W. M. Bacon of the Stewart company. "Our engineers have carefully gone over the ground and tell us we are within our boundaries," said Mr. Bacon. "The trouble is that we are both working parallel along the boundary of the claim. I am sure we do not want any of their ore, and I don't think they want any of ours. Of course one cannot mine to an edge, because the ore breaks one way or the other from a vertical plane. It seems that the only thing is a difference of opinion and it will take more surveys to determine which is right."

RENO—Sept. 10

Mine Rescue and First-Aid Instruction in Nevada by the government mine-rescue car, was to be finished the week of Sept. 1, the car having been in Nevada since July 1. The work was in charge of E. Steidle, junior mining engineer of the Bureau of Mines, and George W. Riggs, first-aid instructor. Instruction has been given and teams drilled in mine-rescue and first-aid work at Ely, Virginia City, Goldfield, Tonopah, Blair, Round Mountain, Wonder, Fairview and the University of Nevada. In addition to this work, Mr. Steidle gave Friday-night lectures on the rescue division of the Bureau of Mines and its purposes and on the use of the oxygen helmet. A total of 4400 miners attended these lectures. Two contests were held, one at Ely, July 4, in which eight teams participated, the other at Tonopah, Aug. 9, in which five teams took part. Several thousand spectators were present at these contests. The oxygen helmets in the state were examined and found in excellent condition. These are 41 in number, distributed as follows: Ely district, 6; Virginia City, 7; Goldfield, 6; Tonopah, 13; Round Mountain, 2; Wonder, 2; Fairview, 2; University of Nevada, 1; office of state mine inspector, Carson City, 2. Deep interest was shown in the work by the miners, and the mining companies assisted greatly by furnishing transportation to camps off the railroads, providing subsistence to crew of car, giving miners time off for instruction at full pay, and furnishing smoke and gas areas in which to practice mine-rescue work.

The Mining News

ARIZONA

Greenlee County

ARIZONA COPPER (Clifton)—Copper production for August, 1869 tons. Directors instruct production be reduced as from Sept. 1.

SHANNON (Clifton)—After present supply of coke and smelting materials is consumed, in 10 to 15 days, mine and smelting plant will be closed.

Pinal County

RAY CONSOLIDATED (Ray)—Quarterly dividend, due Sept. 30, deferred.

Santa Cruz County

ORO BLANCO DISTRICT—Important discovery on Switzerland and Republic group, near Austerlitz boundary. Strong north-and-south vein appears to be formed by junction of Austerlitz and Montana veins.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Recent development work shows orebody discovered on 3000-ft. level extensive and carrying good values. Reported that flume will be constructed to carry tailings to land recently secured for dumping purposes; 30 stamps in mill are dropping.

Calaveras County

COMET (Railroad Flat)—Mill reported destroyed by fire, entailing loss $1000. Machinery badly damaged.

LIGHTNER (Angels Camp)—Company purchased and cancelled 33,000 shares outstanding stock, assessments delinquent.

Inyo County

CERRO GORDO (Keeler)—Permission asked of state water commission for power rights on Lone Pine Creek. Erection of power plant contemplated to furnish power for operation of mine and tramway.

Plumas County

ENGELS COPPER (Taylorsville)—New mill machinery being installed. Capacity 400 tons. Smelting plant, inadequate to handle ore, disposed of; flotation to be installed instead. Present mill can be enlarged when required. Should be ready Nov. 1. Power plant well under way; Allis-Chalmers impulse wheel now under 400-ft. head will drive a.c. generator built by same company. Walter H. Brown, engineer-in-charge of installation.

Shasta County

MIDAS (Harrison Gulch)—Gold Hill shaft unwatered, machinery found uninjured. Midas shaft being rapidly cleared of immense volume of water which accumulated after destructive fire last April.

COLORADO

Boulder County

U. S. GOLD CORPORATION (Sugar Loaf)—Company will reopen and operate Sphinx and Livingston properties. Estimated that ore reserve is ample to supply 125-ton cyanide mill now nearing completion. Sphinx tunnel and Livingston shaft will be repaired and equipped; 400-ft. shaft will be unwatered. Concrete foundations for roasting furnace and cooling hearths in place and await arrival of steel work.

San Juan County

CONCENTRATES WERE SHIPPED FROM SILVERTON in August, as follows: From Gold King, 750 tons; Iowa-Tiger, 700 tons; Sunnyside, 525 tons; Barstow, 200 tons; S. D. & G. Leasing Co., 125 tons; Arastra Leasing Co., 100 tons; Aspen, 100 tons; Mears & Wilfley, 75 tons; Frisco Tunnel, 50 tons; Intersection, 25 tons; 350 tons of ore shipped during month.

KITTIMAC (Middleton)—Mill being completely remodeled under direction of Mr. Card. Huff separators and Card tables being installed.

Teller County

DEERHORN (Victor)—Property being developed and operated by Hobson & Sutton, of Cripple Creek. Sublessees recently opened orebody, third level of Deerhorn shaft.

C. O. D. (Cripppple Creek)—Electrically operated compressor will be installed at shaft house in Poverty Gulch as soon as foundations, now being laid, are completed. Active development contemplated.

GRANITE GOLD MINING CO. (Goldfield)—Water in Gold Coin shaft now under control. Dillon shaft sunk to 1260 ft. without interference from seepage water and sinking continues; will be sunk to water level, approximately 150 ft. deeper. Laterals will be driven from new 1400-ft. station as soon as sinking is completed.

IDAHO

Coeur d'Alenes

TUSCUMBIA (Wallace)—Good progress being made on contract recently let for raise of 300 ft. from the Idora or No. 3 tunnel to tunnel No. 2. First of last week 107 ft. had been made. Raise is vertical to reach the oreshoot in upper levels; should make accessible 450 ft. of ore along dip of vein. Owners have under consideration several propositions for working property, but this raise will be completed first.

MICHIGAN

Iron

OTTOWA (Hurley)—A 2000-ft., direct-connected, electric-driven compressor ordered for this mine from Sullivan Machinery Co., Chicago.

RICHMOND (Palmer)—This openpit property, mining siliceous ore, will ship about 150,000 tons this season, breaking record for mine. It is one of few pit mines in Michigan and has been shipper for several years. Force is working 12 hr. per day, seven days per week.

MAAS (Negaunee)—No ore shipped from large stock on hand; more trestles are being constructed to take care of ore that will be mined during winter. Other mines in district will also have to make provision for additional stocking ground if they are to continue work.

CASCADE MINING CO. (Palmer)—Three drifts have reached ore on bottom level of Isabella property. Main drift east from shaft struck ore several weeks ago. Crosscuts were extended from that drift and two of them now in ore. Drift extended north from shaft reached good ground after little drifting, but water came in so fast that work had to be stopped temporarily to allow it to drain. Mine has small stockpile at present and will enter shipping list next year.

MINNESOTA

Cuyuna Range

ROWE (Riverton)—Shipments resumed after suspending for several weeks.

DULUTH-BRAINERD CO. (Ironton)—Company continues to report encountering high-manganese ore in underground exploratory work. Late assays said to show 45% manganese ore. Negotiations under way looking to transfer of this property to M. A. Hanna company, which abandoned Barrows mine, on south range of Cuyuna, some months ago. It is considering Duluth-Brainerd property solely from manganese viewpoint.

Mesabi Range

BURT (Hibbing)—Oliver has suspended all work. For month past one shovel was working and little ore was sent out.

ALPENA (Virginia)—This Oliver mine has already shipped 800,000 tons this year. By close of navigation, better than 1,000,000 tons will have been shipped. Mine is largest shipper of Steel Corporation in Virginia district and this year will be one of largest shippers on range. Big properties that send from 1,000,000 to 3,000,000 tons in good years will fall far below this year.

MONTANA

Silver Bow County

DAVIS-DALY COPPER CO. (Butte)—Rumors of orders received to close the mine emphatically denied by the company officers. Shaft sinking and development work still in progress, will be continued in spite of curtailment of work in other mines of camp. Due to prompt response to recent assessment, sufficient funds provided to carry on work for some time to come.

PILOT BUTTE MINING CO. (Butte)—Morning Sept. 3, fire discovered in boiler room of company's plant, which made such headway that it threatened entire surface equipment. For a while was feared fire might extend into shaft and underground workings. With prompt assistance of Elm Orlu and Butte-Superior fire department, however, flames were got under control without further damage.

NORTH BUTTE MINING CO. (Butte)—In reply to inquiries when company would resume operations, Manager Pope pointed out that though company was prepared to do so at any moment, present conditions did not warrant it. Cost of copper production up to shutdown was 13¼c. per lb., which with credit of 3½c. for silver and gold, leaves net cost of 9¾c. With curtailed output, costs would be considerably higher, and North Butte would be losing money on 12½c copper, and losing ore, too. Hence shutdown and unlikelihood of resumption until work at full blast possible. During the shutdown, repair program being assiduously carried out, including repairs in Speculator shaft and underground renovation of entire property. [Late reports are that operations were to be resumed Sept. 15 at 90% normal capacity, employing 900 men.—Editor.]

NEVADA

Esmeralda County

GRANITE MOUNTAIN MINE (Bonnie Clare)—Crosscut tunnel driven 1670 ft. and west drift on vein now being driven. Force will be increased and development work done to east.

Nye County

GOLD STRIKE AT NORTH TONOPAH made, it is stated. Strike four miles north of Tonopah and rush followed to scene of discovery. One ton of ore assaying $84 taken from discovery shaft at depth of 10 ft. and shipped.

COMMERCIAL MINES & MILLING CO. (Manhattan)—Bond taken and property being examined. Mine sampled and large amount of surface trenching done. Two Cyclone drills will be used in development.

Washoe County

PARRY [illegible] 16)—Mine buildings and a residence destroyed [illegible] night of Sept. 2. Cause unknown.

White Pine County

ELY LEASING & MILLING CO. (Lane City)—Smelter returns on first shipment of ore from Macon City mine received; ore ran $15.51 in gold, silver and lead. Mill will be built, it is stated.

NEVADA CONSOLIDATED (McGill)—All holdings of Steptoe Valley Smelting & Mining Co. transferred to this company. Property transferred includes smelting plant and all buildings connected with it at McGill, railroad tracks and rolling stock, electric power transmission line to Copper Flat, veteran property, block 46 of Park addition to Ely, several water rights in Duck Creek section, Calcite, Dolomite, Toothache and Sorehead placer claims, and Steptoe group of claims. Six roasters, one-third roaster capacity at Steptoe plant, will be closed down on account of curtailment of capacity to one-half. No further reduction contemplated. Almost full quota of men on payroll, one-half force working every other day.

NEW MEXICO

EXEMPTION OF MINING CLAIMS FROM ASSESSMENT for 1914 meeting with approval of claim holders in every mining district in state who have been thrown out of work on account of European crisis or who can find no market for ores at custom smelters. Bill introduced in Congress by Hon. H. B. Fergusson, this state, receiving widespread endorsements and petitions to members of both houses being circulated.

Grant County

CHINO (Santa Rita)—Quarterly dividend reduced from 75c. to 50c., payable Sept. 30.

MOGOLLON MINING DISTRICT has suffered destructive floods. Business houses of camp affected more than mines. Second slide of tailings from Socorro Mining and Milling Co. formed dam below Maud S mill destroying part of native camp. Traffic blocked on account of wash-outs. Greatest hindrance to progress in Mogollon is its inaccessibility, over 90 miles of deplorable highways. Many plans under way for betterment of this condition, latest being route from Silver City via Bear Mountain which would shorten distance seven miles and eliminate steep grades. Methods of financing this highway are under consideration by Silver City Chamber of Commerce. Government has asked for bids for delivery of mail from Tyrone N. M. via Mangas Valley to Mogollon.

SOUTH DAKOTA

Lawrence County

ALAMEDA (Trojan)—Messrs. Manion and Harris have taken a lease and have force at work taking out ore for shipment to Mogul mill.

ORO HONDO (Lead)—Auxiliary hoist placed in position on 1000-ft. level. Ore broken in sinking will be placed in bin on this level and removed to surface at leisure. Shaft now down over 1100 ft.

TITANIC (Carbonate)—Plans outlined for future development call for 1000-ft. tunnel under present workings. Most of ground traversed by tunnel has never been prospected. Tunnel will drain entire mine.

Pennington County

HOME LODE (Silver City)—Development by drifts and crosscuts continues in No. 1 shaft. Ore complex carrying gold, silver, lead, zinc and antimony. Oil flotation will be installed.

HILL CITY DEVELOPMENT (Hill City)—In main shaft, which attained depth of 100 ft., crosscut was driven and shows width of orebody to more than 16 ft. Drifts for 50 ft. show good-grade milling ore.

UTAH

Beaver County

LEONORA (Milford)—Zinc ore, 14 in. and upward in width, recently opened.

NOON DAY (Milford)—Work being done at this property adjoining Cave mine on southeast; 7 ft. of hematite cut in sinking shaft, and this being followed. Drifting will be done on 200 level.

CROFT MINE (Milford)—Property to be equipped with electric hoist, and work resumed in near future. Power line recently completed into Minersville crosses property. Five cars of ore shipped from development.

SOUTH UTAH (Newhouse)—Since closing of mine in April, some shipments of high-grade chalcopyrite-tetrahedrite ore made. Few weeks ago, cloudburst washed out mile of branch line from Milford, and since then all work suspended. In May and June, after the closing of the mill, ore shipped carried 120,921 lb. copper, 2192 oz. silver and 29 oz. gold.

Juab County

TINTIC SHIPMENTS for the week ended Sept. 4 amounted to 100 cars by 16 shippers. In August, 371 cars were shipped, and in July, 459 cars.

HOMANSVILLE MINING (Eureka)—Manganese deposits of this company southeast of Eureka have been examined and sampled.

TINTIC ZINC (Eureka)—Property adjoins Scranton on south; main tunnel is in 550 ft. in limestone, showing considerable iron. Raise from tunnel level at 500-ft. point shows rock slightly mineralized with zinc.

MAY DAY (Eureka)—Orebody opened under former lease found to extend into adjoining claim of Chief Consolidated, and May Day company obtained lease on this ground. Substantial royalty will be paid the Chief.

CENTENNIAL-EUREKA (Eureka)—Sinking being done on gold ore recently encountered above main working shaft; and ore taken out in the work being piled. Tunnel will be driven to cut this body at greater depth.

SCRANTON (Eureka)—New body of ore opened on 500 level this property, North Tintic. Ore is of low grade, carrying excess of iron; has been drifted on for 50 ft.; higher grade looked for. Car of silver-lead ore was shipped week ended Sept. 4.

VICTORIA (Eureka)—As soon as repair work now in progress has been completed, night shift will be added and output increased. Work in ore being done on 1000- and 1200-ft. levels. Shaft sinking from latter level being considered. Reduction has been made in overdraft since first of year.

CHIEF CONSOLIDATED (Eureka)—Foundations for experimental mill are being built. Site is near Plutus property, east of Chief, near the D. & R. G. switch to Eagle & Blue Bell. Dump at Chief Consolidated contains several thousand tons low-grade ore, and much ore of same character left in stopes and in place.

Summit County

PARK CITY SHIPMENTS for the week ended Sept. 4 amounted to 2,526,960 lb. August output, 4355 tons.

DALY WEST (Park City)—Expected new mill will be ready for operation this fall. Several thousand tons milling ore stockpiled, awaiting treatment.

REVELATOR MINING (Park City)—Development work being done at this property in Snake Creek district; ore-bearing fissures followed 40 ft. Country rock, quartzite and limestone.

SNAKE CREEK TUNNEL (Park City)—During August, new record of 419 ft. was made by J. A. McIlwee & Co., contractors, working two shifts. Air-line, telegraph line, ventilating pipe, permanent ties and track were kept up to the face. Hard drilling ground encountered. Tunnel 7½ ft. wide by 6½ ft. high, and has waterway 3½x4 ft. Two machines are used in breast. Total length is to be 14,000 ft.; more than 9000 ft. completed.

SILVER KING CONSOLIDATED (Park City)—Regular quarterly dividend 10c. per share declared, payable Oct. 1 and amounting to $62,000. Third of like amount to be paid this year; total dividends to date are $495,000. During August, 933 dry tons shipped, bringing net smelter returns in neighborhood of $40,000. Most of ore taken out in development. In July, 834 dry tons shipped. Company recently opened large bodies high-grade silver-lead ore, extent not yet determined. These of the same character as those in adjoining Silver King Coalition, which has production valued at over $30,000,000 and has paid $13,000,000 in dividends. Silver King Consolidated now second largest shipper in camp.

WASHINGTON

Stevens County

DOUBLE EAGLE MINING CO. (Valley)—Organized locally to prosecute active development on high-grade silver and lead property formerly known as Silverine or Kaiser mine, about 12 miles west of Valley. After first discovery of float in 1898, by John H. Lutjen, said to assay 120 oz. of silver, property was worked at intervals by Lutjen, Kindorf and Kaiser, partners in number of mining properties. Death of two partners left property unworked for two years prior to sale to present company. Several shipments of ore made, netting original owners about $70 per ton. New company plans tunnel to tap vein at much greater depth, with expectation of striking large body of high-grade ore. New buildings erected and work on tunnel will begin at once.

WYOMING

Crook County

WARREN PEAKS MINING & MILLING CO. (Sundance)—At meeting of board of directors, decided to complete mill started over year ago and have it in operation by first of year. Mill will employ both amalgamation and cyanidation, crushing being done by stamps. Most of machinery is on ground, but has never been set up. Mill will start operations at capacity of 30 tons per day.

CANADA

Ontario

TOUGH OAKES (Kirkland Lake)—Good progress being made on mill. Butters-Johnston syndicate retained as consulting engineers; supervision of building to be under control of James Johnston, now in charge of Nipissing mills.

DOME (Porcupine)—Monthly statement for August shows largest production of gold since January, and greatest tonnage milled since operations began. Value of gold produced was $90,893; tonnage treated, 20,170; average value of ore milled, $4.50.

McINTYRE (Porcupine)—Negotiations for transfer of controlling interest to Nipissing interests concluded, stock to the amount of $1,500,000 having been deposited in escrow, pending examination of property to verify statements made by vendors.

BEAVER (Cobalt)—Company notifies stockholders of shutdown following refusal by smelter to accept shipments. After two weeks, mill resumed, working on surface dump. Company is ready to resume any time and hopes to soon. Company in excellent condition.

HOLLINGER (Porcupine)—The four-weekly report for period ended Aug. 12 shows gross profits of $171,975 from treatment of 16,456 tons; average value, $15.46 per ton. Approximate extraction, 94.4% and working costs, $4.16 per ton. During the four weeks there was expended on plant, $30,546. Profits from Jan. 1 to Aug. 12, $1,015,451, of which $720,000 was paid out in dividends. Sixty stamps are now working and underground work continues to show good results. Winze has been started below 675-ft. level, and 800-ft. should be reached about end of October. Vein on the 675-ft. widened to 20 ft., averaging $10.90 per ton over that width.

MEXICO

A. S. & R.—Plans for resumption of operations continue. Monterey and Chihuahua plants have each three furnaces in blast. Aguascalientes should be ready to blow in part of furnaces soon. Labor situation unsettled and men scarce.

The Market Report

METAL MARKETS

NEW YORK—Sept. 16

All of the markets have again been provokingly dull and none of them has exhibited any particularly interesting feature.

Copper, Tin, Lead and Zinc

Copper—There are signs of coming events, but except for these the situation remains substantially unchanged. Producers naturally welcome such orders as come to them, but as yet they have made no effort to reëstablish a competitive market of buyers and sellers, the still existing conditions rendering the sale of the current production, not to speak of the accumulated stocks, quite impossible. Europe seems to be taking copper more freely on the old contracts, and probably will want to enter into new ones before long, as will also domestic manufacturers, but the requirements of the last appear to be reduced by a real diminution in the rate of consumption.

Exports of copper through the port of New York up to the middle of September were 8788 long tons. Exports of copper from Baltimore for the week ended Sept. 5, were 740 tons, for the week ended Sept. 12 were 969 tons, of which 633 tons were destined for London and 336 tons for Copenhagen.

Base price of copper sheets is now 17½c. for hot-rolled and 18½c. for cold-rolled. The usual extras are charged. Copper wire is now 13¾c. per lb. for carload lots at the mill.

Tin—Supplies are more liberal but demand is more restricted; hence the further sharp recession.

Lead—This market has been even weaker than at the time of our last report, sellers at concessions being found in several quarters, although the leading interest maintains its former price. The reported transactions amount to a moderate tonnage. Independent producers have sold at 3.80@3.85c., New York, with free offers at the higher figure, while lead has been easily purchasable at St. Louis at 3.65@3.70c. right through the week.

Spelter—The recession that we chronicled last week went further, this time with some real pressure to sell, some producers offering at sharp concessions in order to find the point where business could be developed. At 5.20@5.25c., St. Louis, some fair lots were turned over, but there was no general interest excited among domestic consumers, who seem to be well supplied generally and responded to offers of spelter at 5.22½c with the intimation that 5c. might be an interesting figure. However, toward the close of the week England once more bought some spelter here, and there is some expectation that the demand from there may soon develop further.

Butte & Superior in August produced 10,346 tons of blende averaging 54% Zn. Timber Butte produces about 3500 tons per month, giving a total for the district of about 14,000 tons.

Exports from Baltimore during the week ended Sept. 5 included 20 tons of Spelter.

DAILY PRICES OF METALS

NEW YORK

Aug. Sept.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
10	*	55	*	†33	3.80 @3.90	3.65 @3.70	5.55 @5.60	5.40 @5.45
11	*	55⅜	*	†32	3.80 @3.90	3.65 @3.70	5.40 @5.50	5.25 @5.35
12	*	55	*	†31¾	3.80 @3.90	3.65 @3.70	5.35 @5.40	5.20 @5.25
14	*	54⅛	*	†31¾	3.80 @3.90	3.65 @3.70	5.35 @5.40	5.20 @5.25
15	*	52⅝	*	†31½	3.80 @3.90	3.65 @3.70	5.35 @5.40	5.20 @5.25
16	*	53⅜	*	†31	3.80 @3.90	3.65 @3.70	5.35 @5.40	5.20 @5.25

*No quotations. †Nominal.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St Louis is given as the basing point. St Louis and New York are normally quoted 0 15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

Other Metals

Aluminum—The market is quiet, 20@20½c. per lb. being asked for No. 1 ingots.

Antimony—There were almost no transactions in this metal this week; prices are nominal, Cookson's, 12@12½c., U. S. 11½@12c.; outside brands, 10@10½c. per lb.

Quicksilver—This metal continues strong, with prices at $75@80 per flask, New York. No London quotations are available, stocks being held for government use.

Gold, Silver and Platinum

Gold in the United States, on Sept. 1, is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, $989,314,869; in Treasury current balances, $228,183,437; in banks and circulation, $627,104,376, a decrease of $42,667,982 from Aug. 1, 1914.

Platinum—The situation is not materially changed. Dealers ask $50 per oz. for refined platinum and $57.50 per oz. for hard metal.

Silver—Owing to limited orders, the price of silver has declined slightly. The mint in London has been the principal buyer, but has taken only moderate quantities.

Shipments of silver from London to the East, Jan. 1 to Sept. 3, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£5,108,500	£4,464,500	D.£644,000
China	572,000	42,000	D. 530,000
Total	£5,680,500	£4,506,500	D.£1,174,000

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Sept 5, 1914

The base price paid this week for 60% zinc ore was $45@47 per ton; 80% lead ore sold at $45 per ton.

SHIPMENTS, WEEK ENDED SEPT. 5, 1914

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb
Week	4,495,190	143,000	177,500
Year	106,520,840	3,721,500	24,819,070

Shipped during week to separating plants—3,721,500 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Sept. 15.

The Steel Corporation's statement of unfilled tonnage at the close of August was unexpectedly favorable, showing an excess of bookings over shipments in August of 54,742 tons, equal to about 5% of capacity. The shipments were slightly less than 70% of capacity and the bookings slightly more than 70%. Prospects for the Steel Corporation and also the independents, are that September shipments will not be much above 60% of capacity, bookings being 50% of capacity or less.

The iron and steel market has become absolutely flat throughout. No export business of any consequence has developed, and domestic trade has fallen off so that producers are now more interested in prospects of this trade being restored to normal, than they are as to whether the war will result in the development of a large export trade. The early anticipations reported in some quarters of a large steel export trade springing up as a result of the war now appear more or less ridiculous, for after six weeks of war conditions it has not been possible to restore even the small export trade in iron and steel that was being conducted before.

The mills have received a few releases on export orders booked before the war and have shipped a few cargoes, but on the whole the condition is, that much of the business already on the books is not filled and new orders in the export market are very light.

PITTSBURGH—Sept. 15

Domestic demand has so decreased as to indicate an extremely conservative attitude on the part of all buyers. There are practically no new projects as no new financing is being done. The railroads have practically withdrawn from the market.

Pig Iron—The market is extremely dull and prices are generally quoted at the levels formerly prevailing. Several merchant furnaces have gone out of blast in the last two weeks and the trend remains in that direction. We quote: Bessemer, $14, basic, $13, malleable and No. 2 foundry, $13@13.25; gray forge, $12.50@12.75, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—There is relatively little interest in the market, as the steel mills have fair stocks in most cases and have received shipments from England at rates not much below those involved in their contracts, nearly all of which run to the end of the year. The steel corporation has sold a few lots of prompt material at about $85, but the tonnage involved does not seem to have been of consequence. The English producers have reduced their quotation from $100 to $80, f.o.b. Baltimore, but consumers do not seem disposed to buy, being covered for the present and having fewer requirements.

Steel—Prices for billets and sheet bars continue at $21 and $22, respectively, at mill, Pittsburgh or Youngstown. A few lots have been sold at these prices, but not enough to indicate that consumers generally are willing to pay such advances over prices on current shipments. Rods are $26, Pittsburgh.

PETROLEUM

The monthly statement of the "Oil City Derrick" gives new wells completed in August as follows: Pennsylvania grade, 516; Lima-Indiana, 133; Central Ohio, 74; Kentucky, 20; Illinois, 142; Kansas-Oklahoma, 732; Texas-Louisiana, 142. This shows a total of 1760 wells completed, a decrease from the July report of 283. New production figures 125,273 bbl., a decrease of 6676. There were 309 dry holes, 33 fewer than in July, and 185 gas wells, a decrease of 42. At the close of August the new work amounted to 2480 rigs and wells drilling.

CHEMICALS

NEW YORK—Sept. 16

Arsenic—The market is decidedly stronger with prices at 4½@5c. No importations have been received lately and stocks are light.

Copper Sulphate—Business continues moderate with fair domestic demand but little export trade. Quotations remain unchanged at $4.50 per 100 lb. for carload lots and $4.75 for smaller parcels.

Nitrate of Soda—This market is exceedingly quiet, with prices nominally 1.95@2c. for both spot and futures.

Assessments

Company	Delinq	Sale	Amt.
Alameda, Ida.	Sept. 5	Sept 29	$0.005
Alta, Nev.	Sept. 10	Sept 28	0.03
Argenta, Ida.	Sept 1	Oct 3	0.0005
Best & Belcher, Nev.	Sept. 15	Oct. 6	0.05
Big Elk, Ida.	Aug. 25	Sept. 25	0.001
Black Bear, Ida.	Sept. 1	Oct. 1	0.01
Blue Star, Ida.	July 28	Sept. 25	0.03
Cedar Creek, Ida.	Sept. 10	Oct. 10	0.003
Columbine, Colo.	Sept. 15	Oct. 20	0.02
Con. Virginia, Nev.	Sept. 3	Sept. 24	0.10
Copper Plate, Ida.	Aug 29	Oct. 3	0.002
Davis-Daly, Mont.	Oct. 15	...	0.25
Duluth, Ida.	Sept 5	Oct. 3	0.001
Eagle Mountain, Ida.	Aug. 22	Sept. 22	0.001
Emerald, Utah.	Sept. 15	Oct. 10	0.0033
Four Timbers, Ida (post.)	July 29	Sept. 29	0.0015
Hub, Ida. (post.)	Sept. 5	Sept 29	0.001
Idaho & Los Angeles, Ida	Sept 7	Sept. 25	0.005
Idaho-Nevada, Ida.	Sept. 7	Oct. 1	0.001
Laclede, Ida. (post.)	Aug 21	Sept. 28	0.005
Lucky Calumet, Ida.	Aug 21	Sept. 21	0.005
McNamara, Nev. (post.)	Sept 4	Sept 28	0.03
Monarch-Pittsburgh, Nev. (post.)	Sept. 14	Oct. 19	0.01
Mullan, Ida. (post.)	Sept 8	Sept 30	0.002
N. Bunker Hill, Ida (post.)	July 18	Sept. 26	0.002
Ophir, Nev. (post.)	Aug. 31	Sept. 24	0.10
Oreano, Ida. (post.)	July 24	Sept. 25	0.002
Royal Copper, Ida.	Sept. 3	Oct. 3	0.001
Saltese, Ida.	Sept. 1	Oct. 1	0.002
Tuscumbia, Ida. (post.)	Aug. 20	Oct. 1	0.002
Utah Metal, Utah.	.	Oct 1	0.05

Monthly Average Prices of Metals

SILVER

Month	New York 1912	New York 1913	New York 1914	London 1912	London 1913	London 1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.642	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26.788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	69.880	60.361	58.175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25.948
July	60.654	58.721	54.678	27.919	27.074	25.219
August	61.606	59.293	54.344	28.375	27.335	25.979
September	63.078	60.640	......	29.088	27.986	......
October	63.471	60.793	......	29.299	28.083	......
November	62.792	58.995	......	29.012	27.263	......
December	63.365	57.760	......	29.320	26.720	......
Year	60.835	59.791	......	28.042	27.576	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN

Month	New York 1913	New York 1914	London 1913	London 1913
January	50.298	37.779	238.273	171.905
February	48.766	39.830	220.140	181.556
March	46.832	38.038	213.615	173.619
April	49.115	36.154	224.159	163.963
May	49.038	33.360	224.143	150.702
June	44.820	30.577	207.208	138.321
July	40.260	31.707	183.511	142.517
August	41.582	....	188.731	....
September	42.410	....	193.074	....
October	40.462	....	184.837	....
November	39.810	....	180.869	....
December	37.635	....	171.786	....
Av. year	44.252	....	206.279	....

New York in cents per pound; London in pounds sterling per long ton.

SPELTER

Month	New York 1913	New York 1914	St. Louis 1913	St. Louis 1914	London 1913	London 1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5.228	25.338	21.413
March	6.078	5.250	5.926	5.100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5.074	5.256	4.924	24.583	21.393
June	5.124	5.000	4.974	4.850	22.143	21.345
July	5.278	4.920	5.128	4.770	20.592	21.568
August	5.658	5.568	5.508	5.418	20.706	...
September	5.694	.....	5.444	.....	21.148	.....
October	5.340	.....	5.188	.....	20.614	.....
November	5.229	.....	5.083	.....	20.581	.....
December	5.156	.....	5.004	.....	21.214	.....
Year	5.648	.....	5.504	.....	22.746	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

COPPER

Month	New York Electrolytic 1913	New York Electrolytic 1914	London Standard 1913	London Standard 1914	London Best Selected 1913	London Best Selected 1914
January	16.488	14.223	71.741	64.304	77.750	69.488
February	14.971	14.491	65.519	65.259	71.575	70.188
March	14.713	14.131	65.329	64.276	70.658	69.170
April	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.996	68.807	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14.190	13.223	61.166	60.540	69.446	64.955
August	15.400	..	69.200	..	74.313	...
September	16.328	.	73.125		78.614	....
October	16.337	.	73.383	......	79.250	....
November	15.182		68.275	...	73.825	...
December	14.224	.	65.223		69.583	.....
Year	15.269	..	68.335		73.740	...

New York, cents per pound, London, pounds sterling per long ton.

LEAD

Month	New York 1913	New York 1914	St. Louis 1913	St. Louis 1914	London 1913	London 1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4.048	4.175	3.937	16.550	19.606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3.688	17.597	18.225
May	4.342	3.900	4.226	3.808	18.923	18.503
June	4.325	3.900	4.190	3.810	20.226	19.411
July	4.353	3.891	4.223	3.738	20.038	19.051
August	4.624	3.875	4.550	3.715	20.406	..
September	4.698		4.579		20.648	......
October	4.402	.	4.253	..	20.302	......
November	4.293		4.146		19.334	......
December	4.017	.	3.929	....	17.798	......
Year	4.370		4.238		18.743	......

New York and St. Louis cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer 1913	Bessemer 1914	Basic 1913	Basic 1914	No. 2 Foundry 1913	No. 2 Foundry 1914
January	$18.15	$14.94	$17.35	$13.23	$18.59	$13.99
February	18.15	15.06	17.22	14.12	18.13	14.08
March	18.15	15.07	16.96	13.94	17.53	14.10
April	17.90	14.90	16.71	13.90	16.40	14.13
May	17.68	14.90	15.80	13.90	15.40	14.27
June	17.14	14.90	15.40	13.90	15.10	13.96
July	16.31	14.90	15.13	13.90	14.74	13.90
August	16.63	14.90	15.00	13.90	14.88	14.90
September	16.65	.....	15.04	.....	14.93	....
October	16.60	.....	14.61	....	14.80	......
November	16.03	.....	13.91	.....	14.40	...
December	15.71	....	13.71	......	14.28	...
Year	$17.09		$15.57	..	$15.77	..

The Engineering and Mining Journal

VOLUME 98 SEPTEMBER 26, 1914 NUMBER 13

Smelting Ray Concentrates at Hayden, Ariz.

By Richard H. Vail

SYNOPSIS—The works of the American Smelting & Refining Co., at Hayden, Ariz., was built in the remarkable time of about eight months, and is a typical reverberatory smelting plant, no blast furnaces having been installed. The most striking feature of the smelting practice is the use of cold converter slag for fettling; a record tonnage of copper from Peirce-Smith converters was obtained at this plant.

The Hayden plant of the American Smelting & Refining Co. was built in remarkable time; ground was broken for this construction on Sept. 15, 1911, the first charges put in the furnaces on May 6, and the first copper poured on May 17, 1912. Not only did the engineers make a remarkable record in the construction, but the design of the plant shows that much attention was given to convenience of operating, doubtless the result of a metallurgist being consulted in the early stages of the work. The engineering department of the American Smelting & Refining Co. was aided in this respect by W. H. Howard, superintendent of the Garfield plant and an operating metallurgist of long experience, who has been intimately associated with the building of a number of the company's plants in recent years. This idea of benefiting by the coöperation of operating officials was further carried out by having the future superintendent of the plant, James Heggie, assigned to duty while construction was in progress.

The Hayden plant was built primarily to smelt the concentrates made by the Ray Consolidated Copper Co.: after operating a year an elaborate metallurgical cutoff was made to determine a standard figure for the metallurgical loss, and settlements for Ray concentrates were adjusted to this basis; since July, 1913, other ores and concentrates, particularly a portion of the Chino concentrates, are being smelted at this works. The Ray Consolidated mill is at Hayden, and the Ray company also began excavating for a smelting works adjoining the mill. When the American Smelting & Refining Co. took the contract for smelting the Ray concentrates, it

General View of Smelting Works at Hayden, Arizona decided to build its plant on a new site, and on a somewhat magnified scale; hence the haste necessary in the construction work, and the joint power house used by the two companies. On account of the extraordinary expedition necessary to have the plant ready to begin treating the Ray concentrates, construction work was carried on part of the time with both a day and night shift. The cost of the plant was in consequence higher than it would have been normally; a value of $1,600,000 was placed on the plant in the company's last report to the Arizona State Tax Commission.

The concentrates treated at Hayden vary from 18½ to 20% Cu, 28 to 32% insoluble, 22 to 25% Fe, 25% S, 1% CaO, 5 to 6% Al_2O_3. A considerable proportion of the concentrates is fine, and with the slimes, which are high in silica, have a tendency to form on the surface of the reverberatory furnaces, an infusible siliceous blanket, which is difficult to flux.

The Receiving System

The Ray concentrates are received in 60-ton gondola cars and are unloaded by hand and shovel sampled. The shovel sample, every tenth shovelful, is thrown into a small tram car that runs alongside the railroad track and discharges the sample on a coning floor under the trestle track. Here the sample is coned at a convenient time and removed to an adjacent sample-grinding room. Limestone and flux are crushed and sampled in the limestone-crushing plant, which contains a 15x24-in. Blake crusher, a set of 36x16-in. rolls, a bucket elevator and two Vezin samplers; all of this equipment is run by a 75-hp. motor.

The trestle bins for concentrates and fluxes are about 322 ft. long, and for the concentrates, there are three bins having a capacity of 2000 tons each. The receiving capacity, planned originally to handle only the Ray concentrates, is now too limited in storage facilities for present operations. The works, however, were planned for the enlarged operations and space was left for additions to capacity as required.

A system of three 20-in. Robins conveyors transfers the concentrates, limerock and converter flux to the roaster building. There is a horizontal conveyor under the receiving bin, an inclined conveyor to elevate the material to the roasting plant, and a third conveyor, equipped with the usual automatic tripper, distributes the material to the roaster hoppers. On the No. 2 conveyor there was installed originally an automatic electric weigher that has since been removed. Separate limerock hoppers are provided in this building, and when desired, this material may be passed directly to the calcine cars, or may be delivered on the bottom hearth of the roasting furnace. Siliceous converter flux is usually passed through No. 8 roaster, though climatic conditions prevailing at this plant do not always compel the drying of siliceous ores fed to the converters.

Roaster Building

The roaster building is a four-story structure, 233 ft. long by 48 ft. wide. It contains eight McDougal roasters; three of these are Allis-Chalmers furnaces, 19 ft. 6 in. in diameter, having six hearths; the other five furnaces are 24 ft. in diameter and have five hearths. A line shaft driven by a 30-hp. motor supplies power to all the furnaces. Each furnace has two uptakes, made of brick to avoid corrosion; No. 1 furnace, however, has steel uptakes. The dust flue has pipes leading to the calcine hoppers, so that any dust deposited within the building is delivered with calcines below. There are two feed hoppers of 35-ton capacity for each of the large furnaces, and hoppers of 32-ton capacity for the smaller furnaces. Each furnace is provided with four calcine hoppers of 10-ton capacity. The limerock hoppers previously mentioned have chutes capable of delivering directly to the calcine cars and may be used for limerock, siliceous ore or any other material that may be desired for delivery to the reverberatory or converter bins. The calcines and fluxes are transported in electric larry cars, of 5½-ton capacity, having arc gates at the bottom. On the way to the reverberatory building, the calcines are weighed on a 15-ton track scale.

One oil burner is used in each McDougal furnace, being placed at the door on the fourth floor. Oil is used intermittently for 15 or 20 min. and then perhaps not for two or three hours, as it is not desired to burn off much of the sulphur. The aim in the roasting plant is to reduce the sulphur from 25% to 12 or 14%. The warmest hearth here is the bottom one, though the temperature in the roaster is low, speaking generally. The oil consumption varies from three to four gallons per ton treated.

The roasting furnaces at this plant make but a small amount of flue dust, the dust recovered in the dust chamber being less than 1% of the tonnage charged. The draft for the furnaces is regulated by a damper in the flue, which is lowered until the last roaster in the line barely smokes; the draft usually amounts to 0.15 in. of water.

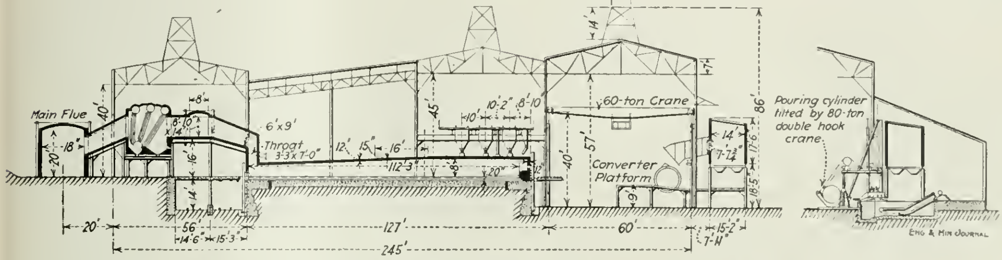
When the roasting plant was first started, the average tonnage per roaster was about 85 tons per day. The wet material was formerly inclined to bank and slide around on the top hearth; this difficulty was overcome by discarding every second rabble and substituting a longer rabble for those that remained. The roaster arms were formerly provided with cast-iron rabbles, but now when the rabbles become worn down sufficiently, they are drilled and a steel or cast-iron plate, 6x8¼ in., is bolted to the stub. An apron around the column on the second, fourth and sixth floors was eventually supplanted by a curved rabble that distributed the feed better over the hearth; with this change, the capacity of the furnaces was increased to about 100 tons per day, though the tonnage has been as high as 110 tons for 10-day periods. The capacity of the furnaces is limited by the delivery of the material from the receiving bins, as the belt crew works only on day shift; however, the plant has sufficient roasting capacity so that it is not handicapped by this fact; consequently, no increase is made in the number of shifts worked in the receiving department.

Reverberatory Department

The reverberatory building is of steel and covers an area of about 127x160 ft. It contains at present two reverberatory furnaces, 19x112 ft., and also houses six 350-hp. waste-heat Stirling boilers. At the other end of the reverberatory buildings are three converters, arranged in a converter aisle at right angles to the axes of the reverberatories. The reverberatory furnaces are built on a concrete slab, 3 ft. 6 in. thick, on top of which are 24 in. of silica. The walls of the furnaces are of silica brick, 2 ft. 10 in. thick, outside of which are five inches of fireclay brick. The furnaces are oil fired, five burners of the Steptoe type being provided, although only three of these are ordinarily used. Air is supplied to the oil burners from the converter air main, but there are also available for this service two Roots blowers, having a capacity of 3600 cu.ft. per min. at 48-oz. pressure.

The reverberatory charges are dropped from six charge hoppers, each having a capacity of 200 cu.ft. The hoppers are 6 ft. square and have the Garfield "torpedo" or plunger to close the bottom of the hopper; this operates on the principle of a needle valve; the cones are machined and there is no leakage of fine material. As in most newer furnaces, the hopper casting does not extend down to the roof, but to a "dog house," built thereon of firebrick, 12 or 15 in. high and protected on top by a casting.

At the skimming end of the furnaces, the gases are removed by a high flue, leaving plenty of "head room" above the skimmer, who is thus protected from the heat inflicted upon him in many plants by a flue only a few feet above his head. The skimming box is equipped with a Garr tilting spoon to catch the slag while slag cars are being shifted. This idea first developed by Richard Garr at the Garfield smelting works has since been adopted in most of the newer reverberatory plants. The reverberatory slag is caught below in slag cars having single-piece motor-dumped bowls of 225-cu.ft. capacity. These slag cars have been most satisfactory, the slag shells usually leaving the single-piece bowls as soon as the pot is turned over. The slag cars were built by the M. H. Treadwell Co., of New York, and are hauled in trains of four by an 18-ton Baldwin-Westinghouse electric locomotive.



Section through Main Smelting Building at Hayden, Arizona

The capacity of the reverberatory furnaces has been as high as 350 to 400 tons per day for 10-day periods, making 40 to 42% matte, and slag running from 43 to 45% SiO_2, 28 to 30% Fe, and 7 to 10% CaO. Lime flux is added to make the slag more fluid; when the CaO falls below 7%, the slag loss seems to increase. Such lime as is needed is put in the bottom of each car of calcines. For example, 1500 lb. of limerock may be drawn and then the car is filled with calcines. This method gives a fairly good mixture of limerock and calcines by the time the charge is in the furnace.

Two 5½-ton charges are dropped at about 30-min. intervals, without shutting off the oil or opening the doors. When hot converter slag is to be poured through the reverberatory roof, the converter-slag pots are taken to the reverberatory charge floor and the slag tapped into a short launder by opening tapholes near the bottom of the pots. An endeavor is made to put in the molten converter slag immediately after charging calcines, as the speed of smelting is thereby increased; the metallurgists at this plant report that a visible reaction takes place between the hot converter slag and the calcines.

Fettling with Converter Slag

The fettling practice here is unusual. A decade ago it would have seemed heretical to have used converter slag for fettling a reverberatory furnace. Nevertheless, this material has been found to be the most available for the purpose at the Hayden works. This reverberatory plant has perhaps carried the revolution in fettling material a stage farther than has been done at most places. Here, as in many other places in the Southwest, the metallurgists began by using cupreous siliceous ores for fettling, when difficulty was experienced in getting high-grade silica, or in making the silica stick to the side. As at many plants, the siliceous ore was inclined to slough off as badly as the straight quartz formerly used and it also increased the blanket that was inclined to form on the surface of the slag by reason of the siliceous slimes from the Ray Consolidated mill. The siliceous oxidized copper ore floating on the surface was pulled off in skimming, and augmented the metal loss in the slag.

At the Hayden plant there was no supply of siliceous copper-sulphide ore, and the metallurgists resorted to the use of cold converter slag shells for fettling. As already stated, the hot converter slag was regularly poured into the reverberatory furnace through the hole between the charging hoppers. The cold converter slag, which had formerly gone into the furnace through this hole, would sometimes drop to the bottom of the furnace and stick. When this happened it was difficult to remove, and the trouble experienced with "bottom building" suggested to the metallurgists that this material might also stick to the sides of the furnace. As the siliceous ores floated off into the furnace and consequently had to be smelted in a manner not contemplated in the fettling plan, it was decided to try broken converter-slag shells for fettling. This eventually proved to be the best material tried for protecting the furnace walls at this works.

There is no blast furnace at this plant, and when the broken converter-slag shells began to stick on the bottom of the reverberatory furnace, it became something of a problem to dispose of this coarse material without increasing the bottom-building troubles. The converter flu used at this time contained much alumina and its con sequence, was giving trouble in the converters, causing such a large amount of nonfluid slag that a plan had to be considered for the disposal of the cold converter slag. The use of the slag shells for fettling material proved a solution for both problems.

At the time these notes were taken, the No. 2 furnace had been in operation 10 months, and converter-slag shells had been used for fettling this furnace during the entire campaign, with the exception of the first month, when straight quartz was used; the furnace walls still appeared to be good for several months' service.

There is a fettling hopper for the bridge having eight outlets with "bootlegs" to direct the material into holes in the roof; the bridge-wall is thus fettled in a short time, usually not exceeding 15 min. Raw concentrates, converter flue dust, mixed converter slag and silica, or the cold converter slag alone is used for this purpose; these materials are also used at times for fettling the sides. On the furnace side for four or five doors there are fettling hoppers that permit the fettling to be dropped from the roof; beyond this point the sides are fettled from a movable hopper through openings in the arch; for the next furnace, movable hoppers provided with multiple openings will be used, so as to permit fettling to be done more quickly.

Fuel Consumption

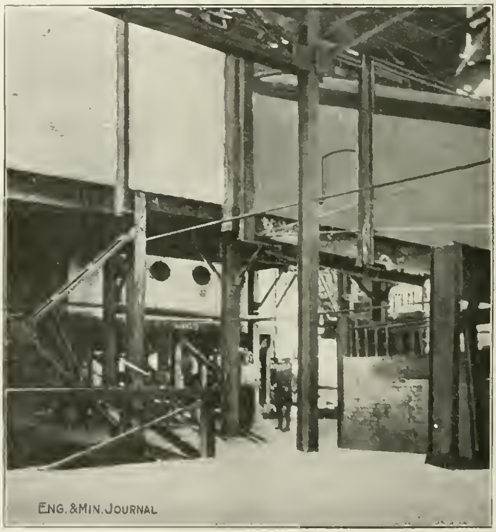
The draft in the reverberatory furnaces is so regulated as to keep the flame at the sixth door, or about the middle of the furnace. The draft at the eighth door is usually about 0.2 in. of water, 0.6 to 0.8 in. at the throat, 1.6 in. in the main flue, and 0.9 in. at the base of the stack when two furnaces are in operation. The oil consumption per furnace is from 12,500 to 13,500 gal. per day when smelting from 350 to 400 tons of charge. The oil consumption per ton of charge ranges between 0.75 and 0.85 bbl.; the oil used contains between 18,000 and 18,500 B.t.u., and has a gravity of about 13½° Baumé. The viscous oil goes to the furnace building in a 4-in. oil line; the oil is heated at the storage tank by a steam coil, and at the furnace by another coil contained in a 12-in. pipe about 12 ft. long, surrounding the oil line just before it is tapped for the individual burners. It is now aimed to heat the oil to 200° F. Formerly, in summer, the oil entered the furnace at a temperature of from 160 to 190° F., and in winter at about 150°. It is difficult to atomize the oil when the temperature falls below 120°, even with air at 10- to 13-lb. pressure. The burners are of the Steptoe type, modified. The $\frac{3}{4}$-in. oil pipe, instead of having a cap with a cross opening, has a circular opening, as the viscous oil used here is inclined to clog the cross opening.

The gases from the reverberatory furnaces pass into a silica-brick header flue, 8x19 ft., and are then distributed to the Stirling water-tube boilers, of which five are ordinarily in use when two furnaces are running. A thermal efficiency of about 35% is obtained in steam from the oil burned in the reverberatory furnace. The gases from the reverberatories are under complete control by means of the various dampers. Each boiler is equipped with individual dampers, both front and rear, and there are two dampers in the header flue for use in case either reverberatory furnace is "down." All dampers are hung from Yale & Towne triplex blocks, so that they may be conveniently operated—characteristic of the care that was taken in the design of this plant. The boilers are served by a Worthington duplex steam pump and there is a reserve installation of a Deane triplex motor-driven pump. There is also a 500-gal. steam fire pump, and hydrants at suitable places throughout the works for fire-protection.

The gases from the waste-heat boilers pass through firebrick flues, 8 ft. wide by 7 ft. 10 in. high, to the main dust flue, which is 18x22x950 ft. long. For 300 ft., the main flue has reinforced-concrete walls with brick jack arch. The main stack of the smelting works is 300 ft. high by 25 ft. inside diameter and is built of radial bricks. It is lined for 100 ft. with bricks laid in acid-proof mortar. The inside joints near the top of the stack and for 10 ft. on the outside are also pointed with acid-proof mortar.

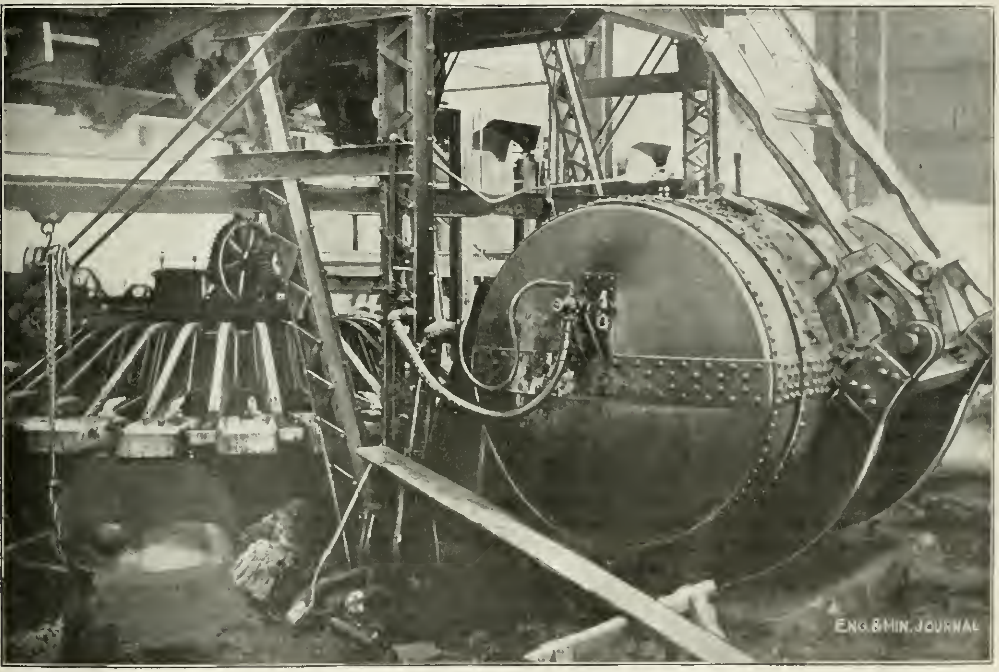
Converter Plant Free from Smoke

The converter aisle is 256 ft. long by 60 ft. wide. It contains two Pierce-Smith converters and a 12-ft. Great Falls type converter, added last summer. The converters are electrically operated and are served by a 60-ton Morgan crane, the crane rails being 40 ft. above the floor. The working platform for the converters is about 9 ft. high, and on this platform are the gages, control levers, power-house signals, and a telephone connecting with the Ray Consolidated power house, from which compressed air is conveyed in a 36-in. main about 2000 ft. long. Matte is brought to the converters in cast-steel ladles of 76 cu.ft. capacity and flux is fed from boats in the usual manner. The converters are served by a dust chamber, 14x17 ft. in section, leading to a separate stack. The passages for the gases have been designed amply large, and dampers provided for the converter hoods have never been installed; this has not been found necessary, as the converter room is as free from smoke as any other part of the plant. In this respect, the converter department is one of the most comfortable plants in the country to work in. The converter stack is of the Garfield



View Showing Height of Flue over Skimmer type, built of structural steel and corrugated siding. It is 253 ft. high and has a rectangular section, 10x12 feet.

The two Peirce--Smith converters originally installed were of the standard type, 25 ft. 10 in. long and 10 ft. in diameter. These converters made some unusual records in output, producing what at the time was the greatest amount of copper ever made on a single lining in this type of furnace; No. 1 converter in its second campaign produced 7758 tons of copper from 42% matte, the average tonnage of four runs having been 5400 tons per lining. Up to the end of March, 1914, in 22 months' operation, the two Peirce-Smith converters at this plant had produced 50,250 tons of copper. The repairs at no time have been more than a patch to renew the tuyere line and the mouth.



Copper-Casting Equipment at Hayden, Arizona

It is interesting to give some figures regarding the expense of repairs for No. 1 converter. This converter in its first run produced 6155 tons of copper and then required repairs costing $699.29, of which $495, or 71%, was for material and $204, or 29%, was for labor; of the expense for materials, 31% was for metal replacements and 69% for replacement of burned brick. The repairs consisted of patching for about 18 in. at the line of the tuyeres and some repairs to the burned places on the shell.

On the second run of this converter, 7758 tons of copper were produced after which the cost for repairing was $575.97; material in this case amounting to 73% and labor to 27% of the expense. The work this time consisted of repairs at the mouth and a patch at the tuyeres. It is interesting to note the time the converter was out of commission for this repair. The converter went down on May 16; was sufficiently cooled to begin repairs on May 22; repairs were completed May 25; the converter began blowing again on May 26. The magnesite brick lining of these converters is made 18 in. thick at the tuyeres, 12 in. at the breast, 9 in. at the arch, and 18 in. thick on the bottom. The converters have thirty-six $1\frac{1}{4}$-in. tuyeres, but it is probable that these will be changed to $1\frac{1}{2}$-in. on account of the increased duty obtained at Garfield, Utah, with the larger-size tuyeres. When two converters are blowing, about 10 lb. air pressure is maintained and about 13 lb. when only one converter is blowing.

The upright converter is 12 ft. in diameter and has twenty-six $1\frac{1}{4}$-in. tuyeres and a distance of about 12 in. from tuyere line to bottom is maintained; the converter was first started with this distance only 5 in., but this was found inadequate as has been the case in other similar installations, it having been necessary to deepen the bottom in most cases before successful running was obtained. The upright converter had not been in operation long enough to obtain a satisfactory comparison with the Peirce-Smith horizontal type. In any event, such comparisons would be of little value to another plant unless the same magnitude of operations prevailed. Both types of converters seem to give entire satisfaction when the operatives become familiar with them and the choice in the selection of the converters seems to be largely a matter of the scale of operations. The upright converter has a slight advantage by reason of its being a smaller unit, not interfering so much with the output or operations of a plant when one is down for repairs; the upright converter has a more direct escape for the hot gases, and also permits a better coating of magnetite at the tuyere line. It would be interesting to be able to compare the converting costs at a large plant using Peirce-Smith converters with a plant of equal capacity using the upright converters.

The silica flux for the converters at this plant is crushed to about walnut size and dried in the McDougal roasters. It is delivered to bins alongside the converter aisle and drawn into boats for feeding into the converters. The flux usually contains from 60 to 70% silica, and enough alumina to preserve the lining of the converter, to a certain extent. With 43% matte and the low-silica aluminous flux, the converter is inclined to run rather cold and build up; however, when high-grade flux containing 85 to 90% silica is used, the converter gets hot and is inclined to cut at the tuyeres. The character of the flux used consequently has to be taken into consideration in controlling the operation of the basic-lined converter. When crushed fine, i.e., from pea to nut size, the flux spreads better in the converter; when the flux is coarse, it sometimes forms balls which have to be broken up.

The converter charges used here usually average one 8-ton ladle of matte with one 5000-lb. boat of flux. The converter slag usually ranges from 20 to 23% SiO_2 and from 48 to 53% Fe. The converter skimmers at this plant are paid $4 per day, but receive a tonnage bonus in case the life of lining exceeds a standard amount.

Copper-Pouring Cylinder

The converter copper is handled in a pouring cylinder of the type usually employed in the A. S. & R. plants. The pouring cylinder at the Hayden plant is 14 ft. long by 8 ft. in diameter. The cylinder holds from 50 to 70 tons of copper, depending upon the amount of incrustation; about 8000 tons are handled before a cylinder requires relining. The cylinder shell is made of ⅝-in. steel plate and was formerly lined principally with silica brick, 12-in. brick being used on the bottom, 9-in. brick above the copper line, 12-in. brick at the firing end, and magnesite brick at the skimming end. Lately the pouring cylinder has been lined with magnesite "bats" to a little above the slag line, above which a firebrick arch is used. This is much better than the silica-brick lining.

The cylinder is lifted by an 80-ton Morgan stationary electric crane connecting with the cylinder frame, which is so pivoted as to keep the pouring nose at practically the same point. As will be seen from the accompanying illustration, the cylinder has a removable cover and when it is desired to pour in converter copper, this lid is raised by a small auxiliary electric hoist. The copper is poured on two shifts only, and in the interim between casting, the copper is kept molten by the use of oil, from 400 to 500 gal. per day being required for the pouring cylinder. Before pouring, the supernatant slag is skimmed off the charge through a small door at the end of the cylinder, opposite the oil burner. The cylinder delivers the molten copper to a pouring spoon, operated hydraulically, and the copper is cast in a 27-mold Walker casting wheel operated by a 5-hp. motor; a 3-hp. motor operates the straight-line bosh conveyor that delivers the copper bars weighing from 275 to 300 lb. to a loading platform on a level with the floors of the box-cars on the bullion track. Two shifts of nine men, each, stack, trim and load 110 to 140 tons of copper per day.

Power and Water Supply

The steam from the reverberatory waste-heat boilers is taken through a 12-in. line, protected by Johns-Manville magnesia covering, to the Ray Consolidated power house about 1800 ft. distant. The steam required for the operation of the smelting works is utilized in the Ray Consolidated power house in the smelting company's Nordberg engine, the excess steam being used by the Ray Consolidated Copper Co. to provide power for its concentrating mill. The steam used by the smelting company is measured through a St. John meter and another St. John meter measures that used by the Ray Consolidated company. The additional steam required by the Ray company is generated at its power plant in oil-fired boilers. While the Ray company buys steam of the smelting company, it sells the latter such electric power as is required in the smelting works. Adjustments of these accounts are made monthly.

The smelting company maintains at the Ray power house an engineer and an oiler for each shift. The 860-hp. Nordberg blowing engine is operated condensing with a 25-in. vacuum. The engine has 36x56-in. steam cylinders, 54-in. air cylinders and 48-in. stroke. At 72 r.p.m., it has a capacity of 18,000 cu.ft. per min., when compressing to 14 lb.

The water-supply for the works is obtained from wells in the Gila River bed, a short distance from the plant; the domestic water-supply is drawn from a reservoir on a neighboring hill. The water-supply is owned by the Ray Consolidated Copper Co., and is operated for the joint use of the two interests at Hayden.

The smelting works is situated in a comparatively isolated town, and consequently the company has established thoroughly equipped mechanical shops for the purpose of expediting repairs.

The Hayden works, while handicapped to an extent by the lack of a blast furnace to work up coarse material, represents a remarkably "workable" plant, convenient for the operating crew, and comfortable to work in; considering the extraordinary expedition of its construction, the results reflect much credit on its designers. With certain additions required by the increased ore supply now being received, the plant will be one of the representative reverberatory smelting works of the United States. The plant is under the general management of Kuno Doerr, and in direct charge of James Heggie, superintendent, and R. B. Green, assistant superintendent.

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Eastern Market for Ozokerite

In spite of our large exports of paraffin, natural mineral wax (ozokerite) is imported, for the reason that its melting point is very high, and although paraffin wax from petroleum can be produced with this high melting point, the process is difficult and costly, according to Bull. 599, U. S. Geol. Surv. Ozokerite occurs in considerable quantity in Utah in the region of Soldiers Summit, and has been produced there, but the cost of extracting it from low-grade material, together with the cost of transportation to the market, has made it possible for the foreign material, which comes from Galicia, to compete successfully in the Eastern States. Domestic ozokerite may now replace the foreign material.

Investigation of the Performance of Hammer Drills

By Sven V. Bergh*

SYNOPSIS—Results of an exhaustive series of tests carried out on all the drills in use at the Malmberget mines in Sweden. Comparison between various American, Swedish and German machines of different types, in their drilling performances. Special tests to show effects of replacing certain worn parts; of various air pressures; of removal of cuttings by air and by water; of different methods of feed; of different sizes and lengths of steel. Formula for relation between size of bit and rate of drilling.

⁂

The Malmberget mines are situated in the province of Lapland, at a latitude of 67° 11′ From these mines are exported yearly about 1,000,000 tons of iron ore, averaging 65% in iron The ore, both finely and coarsely crystalline, consists chiefly of magnetite, although considerable hematite is found, and it sometimes contains a good deal of apatite. The orebodies exist as lenses with a steep dip and are imbedded in a country rock consisting of different varieties of gneiss.

TABLE I—SPECIFICATIONS OF THE DRILLS IN USE

Name of Drill	Type of Drill	Weight of Piston, Lb.	Length of Stroke, In.	Diameter of Piston, In.	Length of Feed, In.	Length of Drill, In.	Weight of Drill, Lb.	Type of Valve
Ingersoll, U. S. A.:								
Little Jap	Handle	...	$4\frac{3}{16}$	$1\frac{3}{16}$	..	..	20	Axial
MC 22	Telescopic	...	4	$2\frac{1}{2}$ $1\frac{3}{16}$	20	50	65	Valveless
MC 32	Telescopic	...	$3\frac{1}{2}$	$2\frac{11}{16}$ $1\frac{3}{16}$	20	$53\frac{1}{2}$	70	Valveless
Atlas, Sweden:								
Cyclop 32	Handle	2	5	$1\frac{1}{4}$	..	21	30	Spool valve
Cyclop 32	Telescopic	2	5	$1\frac{1}{4}$	$17\frac{3}{4}$	50	52	Spool valve
Cyclop 42	Telescopic	3.1	$2\frac{3}{4}$	$1\frac{5}{8}$	$17\frac{3}{4}$	$48\frac{3}{4}$	66	Spool valve
Dux	Telescopic	3.6	$2\frac{3}{4}$	$2\frac{1}{4}$ $1\frac{1}{2}$ 1	$18\frac{3}{8}$	$48\frac{1}{4}$	67	Valveless
Finspong, Sweden:								
F I	Handle	1.3	$4\frac{5}{16}$	$1\frac{3}{16}$	..	$16\frac{1}{2}$	23	Tubular valve
AF I	Telescopic	1.3	$4\frac{5}{16}$	$1\frac{3}{16}$	$19\frac{11}{16}$	$43\frac{5}{16}$	47	Tubular valve
F II	Handle	...	$9\frac{1}{4}$	$1\frac{3}{16}$	..	$21\frac{5}{8}$	29	Tubular valve
AF II	Telescopic	...	$9\frac{1}{4}$	$1\frac{3}{16}$	$19\frac{11}{16}$	$47\frac{1}{4}$	52	Tubular valve
Flottmann, Germany:								
D-hammer	Handle	...	$2\frac{3}{8}$	$2\frac{3}{8}$	..	..	40	Ball valve
Air-supply pipe, ¾ in.								

Mining and Drilling Practice

Methods of mining include the use of opencuts and of underground rooms with or without filling. The drilling practice at the mines at the time that I conducted the tests to be here described was as follows:

Hammer drills with handles were in use for overhand and underhand stoping and in driving narrow drifts. In all other cases telescopic air-feed drills were employed, either mounted or unmounted. The cuttings were removed by exhaust air, live air or water, introduced into the bore hole through the hollow drill steel. At most of the mines the gage pressure of the air was kept between 80 and 90 lb. per sq.in. The depth of the holes drilled varied from less than 1 ft. to 11 ft. Round-section, hollow drill-steel with star bits was used, running about 0.65% in carbon. The steel with few exceptions was upset at the shank. When the dust was removed by air, the hexagon shank, shown in Fig. 1, was used, in which case the front head bushing of the drill was supplied with a leather cuff. When, however, the dust was removed by water, the Atlas shank and patented water-flushing arrangement, shown in Fig. 2, was employed.

The diameter of the drill steel varied from ⅞ in. to $1\frac{3}{16}$ in., the diameter of the bit from 1 in. to 2 in. The angle between the cutting faces was for soft rock, 90°: for hard rock, 105°.

In Table I are given important dimensions and data concerning the drills used at Malmberget.

The Cyclop 32 was used in the hard rock, which gave comparatively fine cuttings; the Little Jap, Finspong F I and F II and the Flottmann D-hammer in the soft rock, which naturally gave coarse, heavy cuttings. The Finspong F I and F II drills were run on test in order to find out if they could replace the Little Jap and Flottmann D-hammer. In adits and tunnels, the heavy types of Atlas, Finspong and Ingersoll drills were used.

The stock of Cyclop 32 in use consisted both of old and new drills. The Little Jap and the Flottmann D-hammer had been running for a long time without any parts having been renewed. The Cyclop 42 and the Ingersoll MC 22 had been working for one year; all the other drills for a few months only.

The cost of rock drilling in 1911 was:

Number of feet drilled	1,069,740
Labor, per ft.	3.98c
Power, per ft.	1.17c.
Drill material, including smaller piping, repairs, etc., per ft.	2.00c.
Sharpening bits, per ft.	0.77c
Total	7.92c.

Manner of Test

In Table II, a summary is given of "three-minute" tests carried out during the months of August and September in 1912, on all the drills in use at the Malmberget mines; 294 machines were tested altogether.

The drilling was done on big, solid blocks of homogeneous granite, placed outside the various repair shops. Vertical holes were drilled by machines with handles; horizontal holes by those with telescopic feed. Air and water were flushed through the steel as when used in the mines. All the granite blocks were compared by drilling them with the same machine.

The drill steel used had the following dimensions:

Length	20 in.
Diameter of bit	$1\frac{3}{16}$ in.
Diameter of inside hole in the hollow steel	[illegible]–¼ in.
Angle between cutting faces	90°

For every test special attention was given to the shape of the bit and the leather cuff in the front-head bushing. The method of conducting the tests was as follows:

---

*Mining engineer, Chrome, N. J.

(1) Speed of drilling and air consumption per minute were taken during a three-minute run. Time was taken with a stop watch. Drill was left in condition as taken from the mine.

(2) General inspection was made of the drill. Micrometer measurements were taken of piston and valve. Stroke was measured during the run of the drill.

TABLE II. COMPARATIVE RESULTS OF DRILLING TESTS

	Ingersoll			Atlas			Finspong		Flott-
	Little Jap	MC22	MC32	Cyclop 32	Cyclop 42	Dux	F I AF I	F II AF II	man or D
Percentages of Machines Drilling at the Various Rates.									
Depth Drilled per Minute, Inches	%	%	%	%	%	%	%	%	%
1 4—1.6.	5 0								
1 6—1 8.	10 0								
1 8—2 0.	9 0								
2 0—2 2.	19 5								
2 2—2 4.	21 5						7 7		
2 4—2 6.	11 0			2.9	33 3	100	15 4		
2 6—2 8.	15 0			2 2	33.3		50.0	50	
2 8—3 0.	7 0			5 7	33 4		23 1		4.3
3 0—3 2.	2 0			12 1			3.8		
3 2—3 4.				12 9					13.1
3 4—3 6.		100		17 1					13 1
3 6—3 8.				17 1					26 0
3 8—4 0.				22 2					21.8
4 0—4 2.			50	6 4					8 7
4 2—4 4.			50	0 7					4.3
4 4—4 6.				0 7					
4 6—4 8.									8 7
4 8—5 0.									
5.0—5.2.									
5 2—5 4.									
5 4—5 6.									
5 6—5.8.								50	
	100	100	100	100	100	100	100	100	100
Notes. Diam of bit = $1\frac{3}{16}$ in. Test run for 3 min.									
Percentages of Machines using Various Quantities of Air.									
Free Air per Minute. Cu.ft.	%	%	%	%	%	%	%	%	%
28 25—30 02							7 7		
30 02—31.78							42 3		
31 78—33 55	1 1						27 0		
33 55—35 31						100	15 4		
35 31—37 08	2 1							50	
37 08—38 85	3 2			7					
38 85—40 61	4 3			2 1				50	
40 61—42 37	6 5			4 1			3 8		
42 37—44 14	13 0			6 9					
44 14—45 91	15 0			9 7			3 8		
45 91—47 67	13 0			8 9					8 7
47 67—49 44	11 8			21 4					4 4
49 44—51 21	15 0			11 7					
51 21—52 97	7 5		50	9 7					8 7
52 97—54 74	3 2			8 3					
54 74—56 51	2 1	100	50	6 2					
56 51—58 27				1 4					8 7
58 27—60 04	1 1			2 7					17 3
60 04—61 80				2 1	33 3				13 0
61 80—63 57	1 1			2 7	33 3				4 4
63 57—65 33				7	33 4				8 7
65 33—67 10									13 0
67.10—68 87				7					8 7
68 87—70 63									4 4
Total	100	100	100	100	100	100	100	100	100
Percentages of Machines Drilling at Various Efficiencies.									
Inches Drilled per Cu.ft. of Free Air.	%	%	%	%	%	%	%	%	%
.022—028.	3 1								
.028—034.	7 3								
.034—040.	12 5			7					
.040—046	12 5			1 4	100				
.046—052	18 7			3 5					4 4
052—057	13 5			6 4					17 3
057—063	23 0			9 1					26 2
.063—068	7 3	100		15 5			7 7		17 3
068—074	2 1			13 4		100	7 7	50	17 3
.074—079			50	20 5			7 7		4 4
.079—085.				18 4			31 6		4 4
085—090.			50	6 9			26 9		8 7
.090—096.				2 1			11 5		
096—101.				1 4					
101—107.				7			3 9		
107—112.									
112—118.									
118—123.									
123—129.									
.129—134									
134—140.									
140—145.									
145—151.									
151—156.								50	
Total	100	100	100	100	100	100	100	100	100
Number of Drills Tested	99	1	2	137	3	1	26	2	23

All the tests are reduced to 85.4 lb. air pressure

(3) Adjustments of drill were made. Worn-out parts were changed for new ones. Stroke was again measured.

(4) Speed of drilling and air consumption per minute were taken during three minutes of run.

Discussion of Table II

In Table II, an abstract is made of the results from test No. 4, as just outlined. These figures are not claimed to be an absolute measurement of the drilling efficiencies of the machines, but will give a good relative idea thereof. The great variations in drilling speed, air consumption and relative efficiency between the different drills and types of drills are, of course, due to various factors, such as the age of the drills, their handling in the repair shops and in the mines, inequalities in manufacture, and the relation between the conditions of the test and the real working conditions. It is quite possible that the best drills had been chosen for the different kinds of work in the mine where varying conditions existed, since the hammer-drill plant at Malmberget had been handled for many years by an expert in this line, H. J. Nathorst; the tests would not apply to special cases or show up features in the machines adapted to special conditions.

The following data may be given to complete Table II: The number of telescopic air-feed drills tested was: Atlas Cyclop 32, 48; Finspong AF I, 2; Ingersoll Little Jap, 21; equal to 24.2% of all the drills. The number of drills tested with water flushing through the drill steel was: Atlas Cyclop 32, 6; Atlas Cyclop 42, 2; Atlas Dux, 1; Finspong AF II, 1; Ingersoll MC 22, 1; Ingersoll MC 32, 2; equal to 4.4% of all the drills. The Atlas patented water-flushing arrangement was used with satisfaction on the Ingersoll MC 22 and MC 32.

On the Finspong F I, AF I and the Ingersoll MC 32, nearly all the front-head bushings were worn out, which caused a lower drilling speed (Table III). This appears to be especially a weakness of the Finspong drills.

TABLE III—EFFECTS ON DRILLING SPEEDS OF NEW AND OLD CHUCK BUSHINGS

Name of Drill	Air Pressure (Gage) Lb. per Sq.In.	Net Time of Run, Minutes	Depth Drilled Inches	
Finspong F I......	84	3	7.8	New front head bushing
	84	3	6.3	Worn out front head bushing
Ingersoll MC 32....	78	3	14.6	New front head bushing
	78	3	12.2	Worn out front head bushing

The cylinder of the Atlas Dux consists of three pieces, and was so fitted together by construction that the piston was liable to stick. The drilling results are shown in Table IV.

TABLE IV—EFFECT OF A STICKING PISTON

Name of Drill	Air Pressure (Gage) Lb. per Sq.In.	Net Time of Run, Minutes	Depth Drilled Inches	Free Air Used per Minute, Cu.Ft.	
Dux with old piston	81	3	11.3	33.5	Piston did not stick
	83	3	10.3	33.5	
Dux with new piston	83	3	10.0	35.3	
Dux with old piston	84	3	7 2	32.8	Piston did stick
	84	3	7.0	32.8	

Special Tests

By a preparatory study of drilling shallow holes, and also a research into the properties of different kinds of drills, certain results were obtained, which will be discussed now.

In Fig. 3 is graphically shown how the drilling speed and air consumption per minute of a Cyclop 32 for each minute of a 5-min. run vary with the time. A similar record is shown in Fig. 4 for an MC 22. The increase of the air consumption per minute during the drilling performance is due to the bits running away on head. That is to say, as the bit becomes dull and the force of the piston recoil increases, the number of blows per minute also increases. From this fact, a method is obtained for getting the proper design of a drill bit. Among other things, Fig. 3 also shows that the average drilling speed for a 5-min. run is about 12% less than that for a 3-min. run.

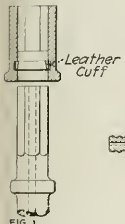

FIG. 1.

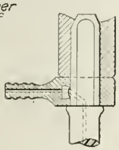

FIG. 2

TWO TYPES OF WATER FEED

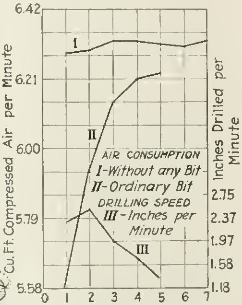

FIG. 3. CYCLOP 32. TELESCOPIC AIR FEED
CUTTINGS REMOVED BY AIR.
(ROCK, GRANITE)

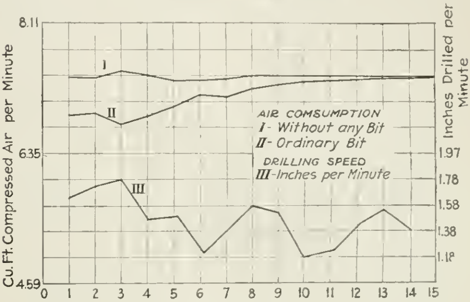

FIG. 4. M.C. 22. TELESCOPIC AIR FEED;
CUTTINGS REMOVED BY WATER.
(ROCK, SYENITE.)

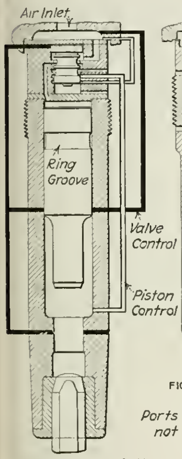

FIG. 5. ATLAS CYCLOP 42
ENG. & MIN. JOURNAL

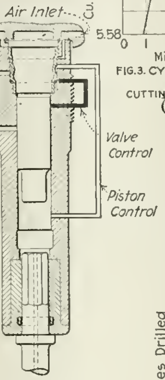

FIG. 6. FINSPONG F1.

Ports Diagrammatic,
not to Scale

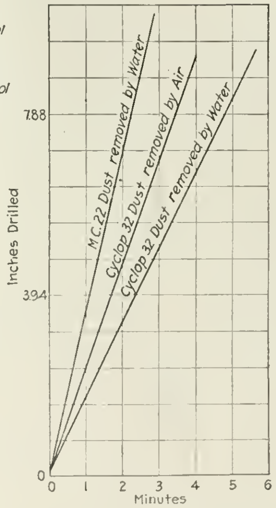

FIG. 7 METHOD OF REMOVING
GRANITE CUTTINGS

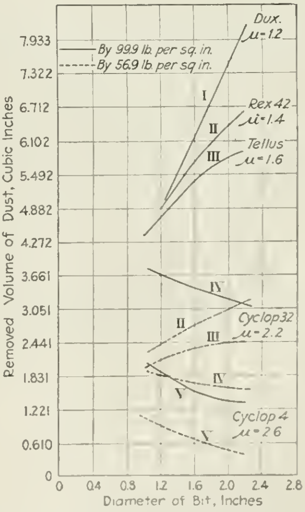

FIG. 8. VALUES OF μ
J. BRING JERNKONTORETS-ANNALER 1912.
(DRILLING IN GRANITE)

SOME DETAILS OF CONSTRUCTION AND CURVES OF PERFORMANCE OF CERTAIN SWEDISH, AMERICAN AND GERMAN DRILLS

Table V shows how the stroke varies with the air pressure in tests carried out on the different types of hammer-drills. With the Cyclop 32 and 42 and the Little Jap, the valve is controlled by the position of the piston, together with the ring groove in it, Fig. 5, while with the Finspong AF I, AF II, the valve is controlled by the position and motion of the piston, the latter compressing air behind the piston and thus throwing the valve, as shown in Fig. 6.

TABLE V—EFFECT OF VARIOUS AIR PRESSURES ON LENGTH OF STROKE

Air Pressure (Gage) Lb. per Sq. In.	Length of Stroke in Inches				
	Cyclop 32	Rex 42	Little Jap	Finspong AF I	Finspong AF II
85.4	4 9/16	2 5/8	4 [illegible]	4 [illegible]	8 5/16
71.2	4 [illegible]	2 3/8	3 1/8	4 [illegible]	7 3/4
56.9	3 15/16	2 1/16	3 7/16	4 1/4	6 15/16
42.7	3 5/8	2 1/8	2 [illegible]	4 [illegible]	...
28.5	3 1/16	...	2 13/16	3 11/16	...
14.2	2 3/4	...	2 5/8	3 [illegible]	...
Greatest possible stroke	5	2 3/4	4 [illegible]	4 5/8	9 1/4

Referring to Fig. 7, the drilling speed is higher for a Cyclop 32, when the cuttings are removed by air, than when removed by water. This seems not to depend upon the incapacity of the water to remove the cuttings, because a greater volume was removed by drilling under similar conditions with a MC 32. The inclination of the borehole was 20° above the horizontal. In Table VI, the same state of things is shown for holes drilled horizontally. The difference in drilling speed may be caused by the fact that in one case the drill is working in water, which is an inelastic medium. The data given in

TABLE VI. EFFECT OF REMOVING CUTTINGS BY AIR OR WATER

Name of Drill	Air Pressure (Gage) Lb. per Sq.In.	Free Air Consumption per Min. Cu.Ft.	Drilling Speed, In. per Min.	Length of Stroke	Removal of Cuttings
Cyclop 32 Telescopic	82.5	40.5	2.92	$4\frac{9}{16}$	By air
	71.2	33.0	2.48	$4\frac{3}{16}$	
	56.9	25.8	1.64	$3\frac{13}{16}$	
	42.7	19.0	1.28	.	
	28.5	11.6	0.56		
	81.1	37.0	2.60	$4\frac{15}{16}$	By water
	71.2	31.8	2.05	$4\frac{3}{4}$	
	56.9	21.1	1.36	$4\frac{1}{2}$	
	42.7	14.7	0.64	. .	
	28.5	9.5	0.28	. . .	
Finspong AF II	83.9		3.22	. . .	By air
	71.2		2.70	. . .	
	83.9		2.64	.	By water
	71.2		2.30	.	
Cyclop 50	81.1		6.60		By air
	81.1		5.85	.	By water

Test run for 3 min.; rock, granite; diam of bit, $1\frac{9}{16}$ in.

Table VII, however, show the opposite fact, in which case the bit, when air cooled, ran hot.

TABLE VII—EFFECT ON SPEED OF MC 32 DRILLS OF REMOVING CUTTINGS BY AIR OR WATER

Air Pressure, Lb. Sq.In.	Drilling Speed, In. per Min. 1st Min.	2d Min.	3d Min.	Average	
81.1	4.35	3.50	3.28	3.70	Cuttings removed by air
71.2	....	....	....	3.30	
81.1	4.55	4.10	3.65	4.10	Cuttings removed by water
71.2	....	....	....	3.37	

Rock, granite.
Diam. of bit, $1\frac{9}{16}$ in.

RELATION BETWEEN DRILLING SPEED, SIZE OF BIT AND FEED

The manner of feeding a drill against the rock during the drilling operation seems to influence the drilling speed. In Table VIII some data are given for a Cyclop 32.

TABLE VIII—EFFECT OF DIFFERENT METHODS OF FEED

	Cuttings Removed by Air, Diam. of Bit 1½–1¼ in., Average: Air Pressure, Lb. per Sq.In.	Min. per Foot Drilled	Cuttings Removed by Air, Diam. of Bit 1¾–1½ in., Average: Air Pressure, Lb. per Sq.In.	Min. per Foot Drilled	Cuttings Removed by Water, Diam. of Bit 1½–1¼ in., Average: Air Pressure, Lb. per Sq.In.	Min. per Foot Drilled	Cuttings Removed by Water, Diam. of Bit 1¾–1½ in., Average: Air Pressure, Lb. per Sq.In.	Min. per Foot Drilled	Kind of Rock
Type of Feed									
Telescopic	78.3	5.10	79.7	6.16	79.7	6.17	79.7	8.02	Granite
Hand	83.9	4.10	83.9	6.00	83.9	6.89	82.6	8.50*	Granite
Telescopic	85.4	3.05	83.9	3.70	83.9	3.60	85.4	4.50	Ore
Hand	85.4	3.00	85.4	3.35	85.4	3.40	85.4	4.25	Ore

*In this case the recoil of the tool was too great for hand feed, which accounts for the low rating.

TABLE IX—VALUES OF EXPONENT μ

(Derived by G. Bring)

Name of Drill	Drill Measurements: Weight of Piston, Lb.	Diam. of Piston, In.	Length of Stroke, In.	Approximate Number of Blows	Exponent, Granite, Quartzite, Pyrite, Air Pressure, Lb. per Sq.In.: 99.6	56.9	85.4	99.6	45.5	Cuttings removed by air	
Cyclop 4	...	$1\frac{1}{4}$	$2\frac{3}{4}$	....	2.6	2.6	2.5	2.8	..	Valve drill	Cuttings removed by water
Cyclop 32	2	$1\frac{1}{4}$	5	900	2.2	2.2	1.8	2.3	2.3		
Rex 42	3.1	$1\frac{5}{8}$	$2\frac{3}{4}$	1200	1.4	1.5	1.4	1.2	...		
Tellus	3.6	$1\frac{13}{16}$ $1\frac{3}{4}$ $1\frac{3}{8}$	$3\frac{9}{16}$	....	1.6	1.6	...	...	...	Valveless drill	
Dux	3.6	$2\frac{1}{4}$ $1\frac{1}{2}$ 1	$2\frac{3}{4}$	1400	1.2	...	...	...	...		

In connection with this question, some investigations carried out by G. Bring, Falun, Sweden, can be given. According to Mr. Bring, the following mathematical relation exists between the drilling speed and the diameter of bit:

$$L = \frac{K}{D^{\mu}}$$

L = drilling speed in inches per minute.
D = diameter of bit in inches.
μ = an exponent.
K = a constant.

The value of K is determined by using the same drill, working in the same rock, with the same manner of cleaning the holes, the same length of steel and depth of hole and with the same gage pressure of air.

When μ equals 2, equal volumes of rock are removed per minute of drilling time by using any size diameter of bit. When μ is greater than 2, more rock will be removed by the smaller diameter of bit, and when μ is less than 2, less rock will be removed by the smaller diameter of bit. (Fig. 8.) In Table IX, some values of the exponent are given.

TABLE X—VARIATIONS IN DRILLING WITH DIFFERENT SIZES OF STEEL

Drill Steel: Diameter, Inches	Length, Feet	Air Consumption in Cubic Feet of Compressed Air for Length of Run	Depth of Hole Drilled, Inches
$1\frac{3}{16}$	2.10	31.6	7.70
	3.30	31.8	....
$1\frac{1}{16}$	4.72	30.6	8.20
	6.25	30.8	....
	7.79	30.9	8.70
1	11.00	30.7	9.70

Air pressure, 85.4 lb. gage in all cases.
Cuttings removed by water.
Five minutes run in all cases.
Rock, granite.
Diam. of bit, $1\frac{9}{16}$ in.
All holes drilled horizontally.

The exponent μ seems not to change for a Cyclop 32, when different air pressures are used, although the volume of cuttings removed per minute varies greatly. The value of μ seems to be greatly influenced by the number of blows struck per minute. This fact, together with an evident variation of μ, when the drilling is performed in rocks of different hardness, seems to indicate that the variation may be caused by the manner of feeding the drill against the rock.

VARIATIONS WITH LENGTH AND DIAMETER OF STEEL

In Table X there is shown, finally, by a test on a Cyclop 32, how the air consumption and drilling speed vary with the length and diameter of the drill steel. That the drilling speed is increased by the increasing length of the drill steel has also been proved by Mr. Bring. His results, published in "Jernkontorets Annaler," 1912, are shown in Table XI.

These seem to oppose the results of an investigation carried out by Prof. O. E. Westin, Stockholm, in which he found "that it is indifferent to the transmission of power through a round steel bar, whether the bar is long or short." In his tests, however, the steel bar was allowed to resume its condition of rest between every blow, which was not the case in the above mentioned tests.

The additional mass of the drill steel may also cause an increase of the drilling speed by counteracting the pressure of the telescopic air feed. A complete investigation concerning some of these facts would, without doubt, be of interest for the right understanding of the properties of hammer drill steel.

TABLE XI—INCREASED SPEEDS WITH LONGER STEELS

Name of Drill	Length of Drill Steel, Feet	Air Pressure Lb. per Sq. In.	Drilling Speed, In. per Minute
Rex 42	4.80	85.4	2.68
	1.39	88.2	2.49
	4.70	88.2	3.63
	1.32	88.2	3.07
	4.72	82.5	3.27
	1.33	88.2	3.27
Rex 32	4.81	86.8	2.33
	1.40	88.2	2.13
	4.71	88.2	2.32
	1.30	88.2	2.36
	5.22	88.2	2.68
	1.49	88.2	2.18

All holes drilled horizontally.
Cuttings removed by water.
Quartzite rock.
Diameter of bit, 1⅜ in. in all cases.

⁂

Effect of Dredge Pond Water on Steel Hulls

By W. H. Wright*

For several years, thick water in the dredging ponds of the Folsom and Natoma fields of American River district, California, has been the bane of the dredge operators. The cause is primarily due to the strenuous objection of Sacramento people to having the city mains filled with discolored water, the city intake being near the junction of the Sacramento and the American Rivers. The prevailing red clay around Folsom easily discolors water, and it is carried in suspension a long time. In order to prevent the discoloration of the water of the American River, most of the dredging ponds have no outlets, except the natural seepage. This causes the water in the ponds to become so thick with slime that an increase in the flotation of the dredges is very noticeable.

The following test of increase in weight of the pond water over clear water was made by Natomas Consolidated on the pond water of No. 10 all-steel dredge. A 5-gal. can with a small screwed cover was used. This allowed the can to be filled exactly to the same point each time. The weights are as follows:

	Lb.
Weight of can before filling	3.835
Weight of can filled with pond water	53.151
Weight of can washed and filled with clear water	49 100
Net weight of pond water	49 316
Net weight of clear water	45 265
Difference in weight	4.051

This sample was taken near the surface. With every foot of depth, the weight of the pond water rapidly increases.

To the increased wear on pumps and piping, the probable decrease in gold recovery, the increase in power consumption and other troubles caused by the thick, heavy pond water has been added its injurious effects on the steel hulls of the later dredges. In the latter part of May, 1914, Natoma No. 8 all-steel dredge was shut down to strengthen the center spud-kick diaphragm and to make several other repairs. A coffer-dam was built. When this was pumped out, it was discovered that the stern plates were badly pitted. At first appearance the pits seem harmless enough. On the surface of the steel occur small protuberances of clay, varying in size from a pin head to the size of a ten-cent piece. When these spots of clay are scraped away, a pit will be found underneath each one, while the clay shell is lined with iron oxide. The pits are $\frac{1}{16}$ in. deep. At the time of my visit, the plates had been scraped, sand blasted and repainted, but the pitting was still prominent.

Before launching in January, 1913, the hull was painted with a paint of a well known brand that has given excellent service on sea-going vessels. At the time of these repairs four different strips of paint were placed on the stern in an effort to discover a mixture with a greater resistance to the action of the water. The following mixtures were used:

Strip No. 1:	Per Cent.
Hematite	65
Kaolin	15
Red lead	15
Zinc chromate	5

Mixed with raw linseed oil.

Strip No. 2:	Lb.
Red lead	25
Litharge	5
Hematite	5

Mixed with 1 gal of boiled linseed oil and 1 gal. of turpentine.

Strip No. 3:	Per Cent.
Zinc white	20
Zinc oxide	20
Corroded white lead	45
Kaolin	10
Zinc chromate	5

Mixed with boiled linseed oil.

Strip No. 4:	
Hematite	95
Zinc chromate	5

Mixed with boiled linseed oil and litharge added for drier.

The water has been found to be slightly acid. There is a difference of opinion as to the cause of the pitting. Some claim it to be electrolytic action and others that it is chemical. The company plans a complete analysis of the water of all the ponds, but this has not as yet been done. While seemingly of slight moment, this hull corrosion, if continued at the present rate, will have a decided bearing on the question of the economy of all-steel hulls over those constructed of wood, in this particular field at least.

The Yuba River fields are singularly free from any injurious action of the pond waters. Plates that have been immersed for years, unprotected by paint of any kind, appear unaffected by the water. In fact, the dredging ponds of this field are as clear and limpid as mountain lakes in comparison with those of the American River fields.

⁂

Oil Possibilities in Illinois

The Illinois State Geolgoical Survey, which has performed highly important work in indicating where to prospect for oil, has issued a bulletin reviewing the oil and gas possibilities of Bond, Macoupin and Montgomery counties. The most promising structural features of the region for oil and gas exploration are enumerated in the following list: (1) Ohlman arch, (2) Hillsboro flat, (3) Carlinville dome, (4) Staunton dome, (5) Sorento dome, (6) Ayers anticline, (7) Irishtown anticline.

It is impossible to say definitely that oil or gas exist in any unproved locality. After a careful study of all available data, however, it is possible to outline the areas in which the lay of the coal indicates structure favorable to the accumulation of oil and gas, provided the sands are approximately parallel to the coal.

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Tube Milling at Cobalt

By John G. Mueller*

SYNOPSIS—A test of the comparative grinding abilities of a short tube mill with quick discharge, an ordinary long tube mill and a Hardinge mill. The quick-discharge device is not considered of vital value under the circumstances. The Hardinge mill does more satisfactory work, although it does not entirely follow theory. The long tube mill has less capacity, but discharges less oversize. Screen analyses of feed and discharge each are shown.

⁂

The data herewith presented is an attempt to throw light upon the general subject of coarse tube milling or regrinding, through experience derived in the operation of the plant of the McKinley-Darragh-Savage mines of Cobalt, Ontario. Numerous articles upon the subject have appeared in the technical press in the last few months, but in none of them has any definite decision been reached, and their results have been so varied as to convey practically no information on the subject.

The McKinley-Darragh-Savage mill is a 200-ton concentrator, which embodies three different types of regrinding machines. Ideal conditions for obtaining accurate figures on the comparative capacity, power, pebble and water consumption of each have not been always available, so that in such cases careful estimates are given. This fact should be borne in mind when considering the figures presented.

Description of Mills and Liners

The first regrinding machine is a 5x14-ft. Chalmers & Williams tube mill, equipped with the adjustable quick-discharge device and perforated diaphragm in each end. It is semi-automatically fed with jig tailings, a flaky mine and preliminary-crusher product, the undersize of 4-mesh and the oversize of 20-mesh. The second regrinding machine is an 18-in. (cylinder) by 8-ft. Hardinge conical mill, elevated 6½ in. at the feed end; all but 5 ft. of the apex end is lined with hard-iron El Oro ribbed, or flat liners with lifter bars in alternate liners of the cylindrical section. Its feed is directly dependent on 30 of 50 stamps, from which it receives a screen-separated undersize of 4, and the oversize of 8-mesh. The third regrinder is a 5x20-ft. Gates tube mill of the ordinary center-discharge type. It is fed with sand-table tailings, the undersize of 8- and oversize of 40-mesh.

Liners of the "Globe" type are used in each of these except the conical mill. Four-in. French flint pebbles are fed to all. The 14-ft. tube is chain driven from the mill main shaft and revolves at 28 r.p.m., consuming approximately 40 hp. Its feed is derived from either of two Harz jigs, as the conditions require. It is fairly uniform, the water being regulated by means of the jig water system, but is manipulated with an eye to the tube-mill requirements. Since the tonnage depends on the run-of-mine ore entirely, and this fluctuates considerably, a large storage bin has been provided to insure regular feed at all times.

Effect of Quick-Discharge Paddles

When this mill was started in June, 1913, the paddles of the quick-discharge device were closed so as to secure the coarsest grinding effect. After nearly four weeks of constant effort to secure the results expected, during which time every conceivable scheme was tried out, and an enormous quantity of feed material had accumulated, it was decided to hang up and open its paddles to the sliming position. They were so tightly wedged with small pebbles that it was impossible to move them and they had to be broken or cut out entirely. After replacing the diaphragm and refilling with pebbles, the mill was again started and the accumulated feed was rushed through at an estimated rate of 40 tons per 24 hr. The mill gave no further trouble except to discharge large quantities of "tramp" and oversize for which temporary means of screening out were provided.

No means were ever considered necessary for returning oversize, since the mill was supposed to grind a product identical to that produced by the conical mill and make a smaller proportion of minus 150-mesh slime. From our experience with the conical mill on the same feed, we had previously found that we could economically treat the oversize of 150-mesh by passing it directly over a Deister size "A" sand table, the tailings going to waste. With even a small proportion of oversize, this method of treatment becomes impossible for reasons which are quite apparent.

If the quick-discharge device is to be of any practical value, it should, theoretically, be effective in a coarse-grinding machine. By its nature, however, it draws the vitals out of the machine, since every particle that passes the perforated plate is immediately discharged, leaving a corresponding void in the working pebble load. This automatically throws just that much more work on the pebbles remaining and, as a consequence, the surviving largest cascading pebbles are deprived of that body of rolling pebbles in the mill which presents the crushing surface to them. Returning this material by hand or otherwise would result in a loop-the-loop effect, with consequences that can be imagined, and to feed new pebbles as fast as they were worn down and discharged would require the services of an extra man.

In connection with this, the fact that the initial pebble load included all the pebbles from the conical mill had absolutely no bearing on the excessive consumption of the pebbles when the mill was started, since they amounted to less than a third of the total and were essential for properly filling the liners.

Function of the Diaphragm

The suggestion of using a diaphragm with smaller holes is impossible, because cost and upkeep would not be commensurate with the supposed advantages and, further, the smaller the holes the nearer the approach to a solid plate, or its equivalent, the end wall of the tube mill. The perforations in the original diaphragm were the size of a pigeon's egg, and the second set were ½ in. in diameter.

The logical place for a diaphragm is in a mill arranged in closed circuit. The quick-discharge device might be advantageous on certain ores and under certain conditions where it is expedient to force-feed a machine for the desired results. In the granulating mill, where a finished product is required, the diaphragm has no advantage in connection with the discharge device and none without it. This last is demonstrated by consideration of the fact that the feed-end diaphragm was discarded when it became worn out after six months and no difference in the performance of the mill was noted, the "tramp" and oversize discharge continuing. On the same date the original discharge-end diaphragm was replaced with the small-hole plates, and again there was no improvement except for a slight decrease in the number of small pebbles discharged. Finally, on May 1, 1914, this plate was removed and the mill thereby converted into an ordinary center-discharge tube. Although there was still some oversize and "tramp" discharge, it was very much reduced, but still enough to bring us to the decision to rearrange this tube-mill unit, providing means for classifying it for return.

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Conical Mill Is Conveniently Adjusted

Referring to the conical mill, this oversize and "tramp" discharge cannot occur except as a direct consequence of overloading, for the reason that such material must remain in its zone until its reduction is effected to such a point where it rises out of the pebbles to be discharged. In this a rapid feed-water circulation and increased slope of the mill materially assists. Effective crushing in the last 24- to 30-in. section of the cone is by abrasion only, and I agree that it cannot be much. However, if a perforated plate were inserted 30 in. from the apex at right angles to the axis, no such "tramp" or oversize would issue. It has not been necessary in three years to reline this section, and the only difference I would expect, if this experiment were made, would be a slight increase in the proportion of the coarser sand of the discharge, say that which would pass 40-mesh and be retained on sixty.

The conical mill will respond admirably to coarse feeding up to a point where from 12 to 15% of the discharge is retained on the screen mesh governing the size of the coarsest particle of the ideal product. After this stage is reached, actual choking takes place, the cascading pebbles are retarded by the slush which binds the rolling pebbles, and finally the discharge includes pebbles of all sizes. This will, of course, occur in any tube mill, but in the conical mill its approach is rapid, and the remedy, when instantly applied, causes a correspondingly quick return to normal conditions without any mechanical aid. A uniform product is delivered, but if accidentally overloaded, the fact is easily detected by the mill man, who reports it to the shift boss. A half-hour usually suffices to bring it back to normal condition again. The action is readily observed by inserting a light into the mill.

The conical mill is belt driven in the usual manner from a 50-hp. motor, and makes 26 r.p.m. The motor gives ample power under all conditions and normally runs perfectly cool, so that the actual horsepower is not more than 40. A 30-hp. motor, which was replaced by this 50-hp. machine, was too light by about seven horsepower.

Judging from this information, I should say that in a conical mill there are zones where the particles are of the desired size, that is, the largest particle in any zone of the conical section is no larger than the aperture size of the coarsest sieve to which the mill has been adjusted for producing the ideal product. In our case this would be 20-mesh.

Normal Work of Tube Mill

The detailed description of the Gates tube mill is not necessary beyond saying that it has given entire satisfaction under our conditions. It runs 24½ r.p.m., and takes approximately 40 hp. to grind 40 to 45 tons per 24 hr., with water at the uniform rate, equivalent to 75% moisture, in the feed. There is a slight oversize discharge, but not sufficient to cause any losses in the subsequent treatment.

In referring to "tramp" particles, this name has been applied to those pieces of ore accidentally included in the feed through a break in the mill sizing screen, but never larger than ½ in. "Marble" is the name applied to the worn-down, 4-in. pebbles that pass the diaphragm perforation or are discharged as a result of overloading. "Oversize" is essentially a part of the uniformly sized feed, usually about 8-mesh, which seems to float through the mill, not showing the slightest trace of having been in contact with the pebbles.

Screen analyses are according to the Tyler screen standard unless otherwise noted. "Ton-Cap" type of mill screens are used throughout with aperture widths as follows:

Four-mesh	0.180 in.	
Four-mesh battery	0.187 in.	× 0.375 in. actual aperature
Eight-mesh	0.080 in.	
Twenty-mesh	0.022 in.	

Results of a recent test after the discharge-end diaphragm was removed, on a reduced capacity of about 30 tons per 24 hr. is shown in the accompanying table. The oversize is included between + 6 and + 48 mesh, but does not include several pieces of "tramp."

TEST ON CHALMERS & WILLIAMS 5x14-FT. TUBE MILL

	Feed		Product No. 1 Sample		(Check Samples) No. 2 Sample
+4		1.69%			
+6		40.31	0.05%		
+8		17.18	0.05		0.05%
+10		16.00	0.05		0.10
+14		10.72	0.10		0.10
+20		7.23	0.25		0.24
+28	—20	6.87	0.59		0.62
+35			1.77		1.81
+48			2.96	average	3.33
+65			6.16	(on 48 mesh)	5.87
+100			12.91	6.03%	13.19
+150			14.93		14.90
+200			10.69		8.90
—200			49.06		51.00

The screen analysis of a sample taken some time ago, before the diaphragm was removed, gave 10.10% on 8-mesh, and 0.07% on 6-mesh.

The accompanying table shows the average of 6 screen analyses of feed and discharge of the Chalmers & Williams machine:

AVERAGE OF FEED AND DISCHARGE SCREEN ANALYSIS

Feed

All Passes Four-Mesh Ton Cap Screen

		Cumulative %	
+6	32.78%		35 tons per 24 hr.
+8	22.05	54.83	Pebble load level with discharge
+10	17.39	72.22	6.5 tons pebbles per ton of ore
+14	11.11	83.33	35 to 37½ hp.
—14	16.46	99.79	32 imp. gal. water per min.

Product

	(1)	(2)	(3)
+48	6.69%	9.57%	
+65	7.85	13.20	25.42
+100	11.58	16.88	11.06
+150	17.60	13.87	13.52
—150	55.96	46.18	46.92

(1) is an average of five tests after the discharge device was removed, much experimenting was done in this period.
(2) is an average of ten tests before diaphragm with small holes was inserted more constant running conditions prevailed during this period
(3) is an average of eight tests just before this diaphragm was removed

In connection with the product averages, it should be borne in mind that the proportions on 48-mesh always included "tramp" and oversize in such quantities as to cause losses in the treatment if temporary return apparatus had not been installed.

A later special test on the Chalmers & Williams tube mill, after the unit was entirely rearranged for returning the tramp and oversize, was made. This was the first test and allowance should be made for errors in judgment, particularly in reference to the revert classifier which should have been given more hydraulic water.

SPECIAL TEST OF C. & W. TUBE MILL

Feed

	Jig Tails	Sand Table Middlings		Revert
+4	0.49%			
+6	30.49			
+8	21.07			
+10	19.85			
+14	12.78			
+20	8.05			
+28	4.63			6.00%
+35	2.64	10.48%		7.36
+48		11.45		20.88
+65		13.91		25.51
+100		18.12		24.49
+150		17.68		9.61
+200		11.93	—150	6.10
—200		16.43		

Product

	No. 1	No. 2
+4		
+6		0.14%
+8	0.02%	0.19
+10	0.05	0.19
+14	0.07	0.29
+20	0.10	0.62
+28	0.38	1.95
+35	0.95	4.10
+48	3.25	9.29
+65	6.49	12.67
+100	13.56	15.38
+150	16.23	12.48
+200	11.89	6.00
—200	47.01	36.52
	32.4 tons per 24 hr	52.5 tons per 24 hr

The time interval between the first and second samples was two hr. No separate revert sample was taken.

Power test was made about two weeks later, which gave 34.31 hp. for an estimated capacity of about the average of the two samples, or 42 tons.

29.3 Imperial gallons of water per minute.
Pebble load level with discharge.

The accompanying table shows a special test made recently when circumstances allowed diverting the usual Chalmers & Williams tube feed to the conical mill:

TEST WITH TUBE-MILL FEED IN HARDINGE MILL

Feed		Product	(No. 1) (Normal Feed) 0.049% of the total remained on 10 mesh	(No. 2) (Forced Feed) 0.05% of the total remained on 10 mesh
+4	5.15			
+6	36.01			
+8	18.39			
+10	14.61			
+14	8.94	+14	0.19	0.24
+20	7.46	+20	0.44	0.57
—20	9.42	+28	1.71	2.71
		+35	3.95	5.76
		+48	9.81	13.71
		+65	11.67	12.81
		+100	15.58	14.52
		+150	12.60	10.86
		+200	6.10	6.19
		—200	37.94	32.63

For No. 1 sample, the feed was at the measured rate of 32.1 tons per 24 hours with 25 gal. (imperial) water per minute.

For No. 2 sample, the feed was at the rate of 56.16 tons per 24 hours, with 30.4 gal. (imperial) per minute. The 50-hp. motor handled both loads with ease. After taking the No. 1 sample, the feed was gradually increased to a point where the discharge overloaded the tables to the maximum, then the forced-feed sample was taken.

DETAILS OF HARDINGE MILL WORK

Feed Battery		Feed Oversize	(Tyler Screen Standard) Sand Table Middlings
+6	27.24%		
+8	32.05		
+10	28.33		12.75%
+14	7.38		7.99
—14	5.00	+20	6.03
		+28	10.69
		+35	10.05
		+48	13.09
		+65	8.47
		+100	11.37
		+150	11.03
		+200	4.85
		—200	3.68

Product (Ordinary Screens)

+60	11.63%
+80	16.49
+100	16.36
+120	2.88
+150	4.29
—150	48.24

33.27 tons per 24 hr.
30 Imperial gal. of water per min
40 hp.
7 lb. pebbles per ton of ore
Pebble load level with discharge

Feed to the 18-in. by 8-ft. Hardinge mill is the undersize of a 4-mesh battery screen and oversize of 8-mesh impact screen. In addition, there is a small portion of sand-table middlings, running into the feed box by a separate launder.

A recent individual test on the Gates tube mill is shown in the accompanying table.

WORK OF GATES TUBE MILL

Feed All passes 8 mesh		Product	
+10	12.38%		
+14	12.62		
+20	11.83		
+28	15.59		
+35	12.48		
+48	12.38		
+65	9.06		
+100	13.56	+100	32.73%
+150			15.60
+200			11.80
—200			39.67

80% water by weight
31.09 hp.
50 tons per 24 hr. (est.)
7.6 lb. pebbles per ton of ore
Pebbles 8 in. below level of discharge

An average of 10 tests over a period of 10 weeks gives results as follows, on the same size feed as that shown in the foregoing table.

10-WEEKS' TEST ON GATES TUBE MILL

+100	27.69%
+150	13.05
+200	13.43
—200	45.59

Ordinary Screens

* * *

New Texas School of Mines

SPECIAL CORRESPONDENCE

All preparations are completed for the opening of the new Texas State School of Mines & Metalurgy at El Paso, Texas, on Wednesday, Sept. 23, and from the present outlook the new institution will command distinction with similar institutions in the Southwest. Primarily, the school has been given the hearty support of the citizens of El Paso, who assisted the Chamber of Commerce in purchasing the commodious buildings of the El Paso Military Institute, the deed of which was then given to the State. The school is under the control of the Board of Regents of the University of Texas. S. H. Worrell is Dean of the institution and has complete charge of the local affairs, a selection which has met with approval by all interested in the new branch of the University.

The State School of Mines is favorably located. Within one to 10 miles of El Paso are found in great variety those geological formations that are usually associated with the mining industry. The El Paso Smelting Works is situated within a mile from the school. The use of a tin mine in the Franklin mountains has been granted the institution and many opportunities are presented the students for practical work.

There are three buildings now on the grounds of the School of Mines. The main building is a two-story brick structure with an assembly hall seating 300, offices of the faculty, class rooms, chemical laboratories, drawing room, surveying-instrument room, blueprint room, the mineralogical collection, geological laboratory, etc. The dormitory contains 30 rooms, in addition to baths, lavatories, cement swimming pool, gymnasium, etc. The third building is a one-story brick building which will be used as the assay laboratory. The Carnegie Library is available to the students.

Many opportunities are offered students who wish to work their way through college.

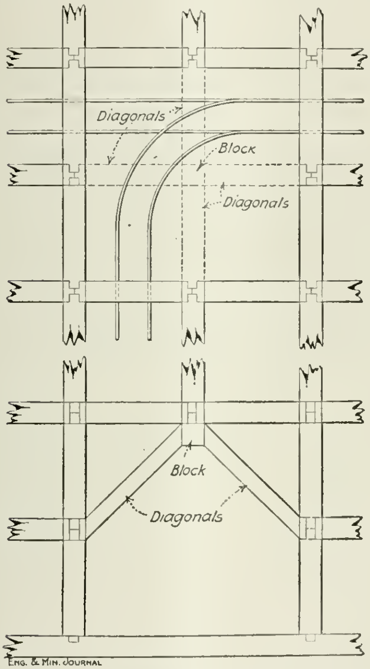
Details of Practical Mining

Square-Set Timbering at Switches

By Frederick W. Foote*

At the Butte & Superior mine, Butte, Mont., the haulage tracks in places pass through large stopes which require special care in timbering. The insertion of switches and curves was accomplished without disturbing the general system of timbering and without bringing undue strain on any of the parts.

At the point where the switch or curve was to be placed, a post of the sill floor, and the corresponding post of the floor above were left out. Where the top of the upper post would have come, a block was placed. Four diagonals reached from this block to the tops of the sill sets. In this way the post of the floor above was supported.



Method of Obtaining Room for Curves in Sill Floor of Square-Set Stope

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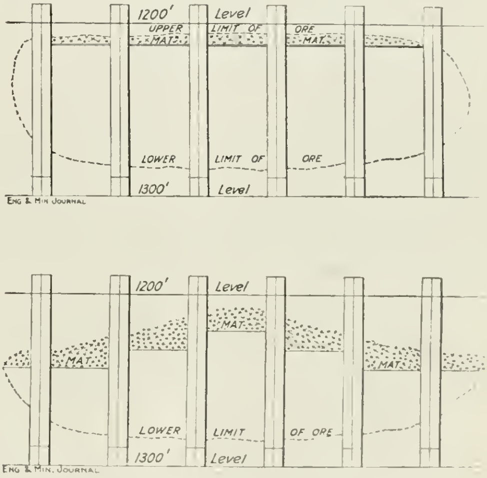
The Schneider Shaft Sinking Process was used by the Julius Wilhelm Mining Co. Ltd., of Celle, Hanover, according to the "Mining Journal." A driving cylinder is closed at the lower end by a heavy shaft bottom similar to a tunnel shield. A rotary shaft drill is operated under this by a turbine in the cylinder; simultaneously the cylinder is forced down with hydraulic presses. The rock bored out is sluiced out with water by a special apparatus and hoisted to the surface by an electric pump.

Top Slicing in Bisbee*

Top slicing consists in first driving the main-level drifts, cross-cutting and finding the extent of the orebody, putting up raises to the top of the ore and commencing operations at the extreme top of the orebody.

The slicing simply consists of driving lateral drifts and taking out the ore in small blocks, making sure to clean the top of the orebody, placing lagging upon the sill of every individual slice as the operations are continued downward, and thereby forming a mat upon which the overburden and débris will rest after caving. It is usually found that the heaviest weight from the overburden is manifested when the first three or four slices are being extracted. After this, the mat is in a measure self-sustaining. This system is applicable and desirable in soft or wet ground.



Successive Stages in Top Slicing

Top slicing has been commenced at the Copper Queen in what is known as the Dividend slice of the Czar mine. This orebody contains perhaps 750,000 to 1,000,000 tons of exceedingly soft, wet, aluminous ore, and wherever square-setting was tried, it was found to be extremely expensive; it was almost impossible to complete a section successfully. As a preliminary to starting this slice, a drift was driven in the foot wall on the 400 level, the orebody lying on the foot wall and extending about 50 ft. above the 200 level. Raises were then put up to the 200 level in the foot wall, as it has been found that raises in the orebody will not stand the terrific pressure which is brought to bear upon them. On account of the ores being wet and sticky, it is hard to handle in the chutes, and concrete-lined pockets were designed; these resemble great bottles with the big ends down.

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*Britannia Beach, B. C.

*From A. I. M. E. "Bulletin," August, 1914

The work has not progressed to a point where a comparison of costs can be made, but it is thoroughly believed that the operation will be successful.

One advantage of top slicing is its elasticity. Drifts for prospecting may be driven in any direction from any floor, and the waste disposed of in the workings. Another advantage is that the ore is mined clean, and still another is that, wherever desirable, inclined raises may be put up at any point from main raises to the mining floor in order to lower the cost of tramming. Several orebodies in the Czar, Gardner and Sacramento mines are being developed upon this plan, and the management is of the opinion that they will show a material lowering of costs, as compared to square-setting. It must be understood, however, that top slicing can be used only where it will not damage any portion of the mine, and particularly, it must be demonstrated that there are no orebodies above the territory worked upon this system.

Fig. 1 shows a slice started and the mat formed. Fig. 2 shows extremities of the orebody being taken down in advance of the central portion. This is done where a main haulage drift is immediately below the slice, in order to obviate repair costs in main levels.

Blasting Box for Sinking*

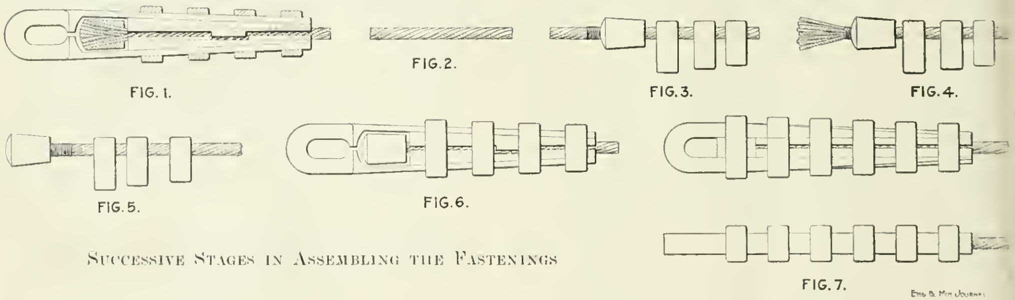
A device which is ingenious and, so far as known, unique, was employed in sinking the Palms shaft of the Newport Mining Co. It was a paraffin pasteboard box, 9x3½x1½ in. deep. In the sides of this box, near the bottom, holes were made with an iron punch just large enough for a fuse to fit snugly. As first used, a positive electric wire was led through one end and a negative through the other, and the ends of these connected with a one-ampere electric fuse. Two of the boxes were used at once to blast the cut, which consisted of about 40 holes. From the surface, two positive wires of 14-gage copper were strung, one for each box; the negative wires from the boxes were connected to the air pipe. After fuses of proper length were inserted through the holes in the box, a small quantity of F. F. rifle powder mixed with ordinary black blasting powder was strewn over the one-ampere fuse and the box was covered with a wooden lid.

When the men reached the surface they tested with a galvanometer to find out whether the wire connections were satisfactory when the circuit was closed. Then a 250-volt current was thrown on and the one-ampere fuse was melted so that the powder ignited, and in turn ignited the fuses leading into the boxes. The cross spitting of the fuses across the boxes made it almost impossible for a misfire to occur. The lengths of the fuses were adjusted to get the proper sequence of holes.

It was found, however, that the preparation of the one-ampere fuse box required too much labor, so that later an electric blasting squib was used to ignite the powder in the box. A squib was placed through a hole in each end of the box, two being used to insure igniting the powder, and the boxes were connected in series with only one No. 14 positive copper wire from the surface and with a single negative wire connected to the air pipe. Finally, a du Pont relay electric fuse igniter was used and connected with the squib.

The powder was 80% du Pont gelatin, the stick being 1x8 in. in size. From 250 to 300 sticks were used on the 7-ft. cut, and 200 to 250 on the 5-ft. cut.

Two Wire-Rope Attachments



Successive Stages in Assembling the Fastenings

A capel type of wire-rope attachment described in *Science & Art of Mining,* has important advantages. One is that the rope can be quickly capped, another that the conical block can be adjusted so as to stand clear of the wedges, as shown in the illustration, Fig. 1, thus enabling it to be constantly seen that the wedges are performing their function. In this capel, instead of the taper or enlarged end being formed by turning the wires back on the rope, a conical block is put on the rope, and this is run up with white metal. The necessary operations to attach this capel are: Bind the end of the wire tightly with two lashings of soft annealed wire, each lashing being of approximately the same length as the conical block. The wire should be of suitable size, for an average-sized rope, say No. 14 gage, and should be put on with a wire binder. If the rope has to be cut it should be tightly clamped on the top of the first lashing, and should be cut with a sharp, well tempered knife as near to the clamp as possible. This facilitates cutting and prevents undue displacement of the wires. Cutting the rope by a hack-saw does this work much better. Remove the clamp, pass the rings on the rope and then the conical block, Fig. 3. If desired, the clamp can be replaced at the front end of lashing No. 2. In the case of a nontwisting rope of locked coil, or other type, the clamp should always be used. Take off the first lashing, untwist the wires, it is not necessary to straighten them, and if the rope has a hemp core cut it out, Fig. 4, after which with the aid of a brush and kerosene, clean off any grease that may be on the wires. Burn off the kerosene over a coke fire and dust the wires with powdered resin. Draw the conical block back to the end of the rope, Fig. 5; wrap a piece of tar cord at the base of the block to keep it in position and to prevent the white metal from running through; then hold the block upright and pour in the white metal. The block should be slightly heated before the white metal is poured in. Take off the tar cord and the remainder of the binding wire. Clean off any excess of grease that may be on the rope and put the capel on, but first grease the backs (not the grooves) of the wedges. In putting the capel on, the conical block can be kept a little way back from the wedges, as shown in the illustration, so that it may be seen whether the wedges are performing their function. The conical block is put on rather as an extra safeguard, but it will stand the full breaking strain of the rope.

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*An excerpt from an article presented before the Ishpeming meeting of the Lake Superior Mining Institute, Aug. 31, 1914.

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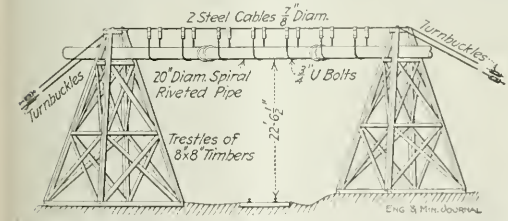
Suspension Bridge for Water Pipe*

In the construction of the 20-in. discharge line for the mud and water from Kerr Lake drainage operations, the most difficult job was getting the line across the Temiskaming & Northern tracks. It proved more feasible to take it over the tracks than under. For this, two towers were constructed as shown. They were built of 8x8-in. posts on a 16-ft. square base, well tied and cross-braced. The angle of crossing made the span from one support to the other 90 ft. Saddles for the pipe were provided 4 ft. below the top of the towers. Over the tops, which were iron-shod cross-pieces, two $\frac{7}{8}$-in. steel-wire cables were passed, 20 in. apart, and carried to ground. These were anchored by dead-men, made of stout logs, sunk to a depth of 6 ft., and weighted with stone. Turnbuckles were provided, by which the cables were stretched as taut as possible.



Towers and Cables for Carrying Pipe over Tracks

The pipe was laid and joined up as far as the first tower. Three flanged lengths were then laid alongside on the bents of the pipe line and bolted together to make the span. One end of the joined lengths was slung in a carrier, made of an iron loop ending in sheaves to run on the two cables, and was pushed out over the railway to the far tower. Connection was then made with the pipe already laid. The span of pipe across the railway was supported by 2x½-in. strap-iron hangers, passing under the pipe and hooking over the cables at 8-ft. intervals. Each hanger had a turn-screw and nut to take out all sag in the pipe. An angle flange and two connecting lengths carried the line from the tower to a rock-filled crib pier where another angle flange was connected, and anchored by long eye-bolts passing to a dead-man, to guard against displacement of the pipe by the force of the water coming over the sudden drop from the tower.

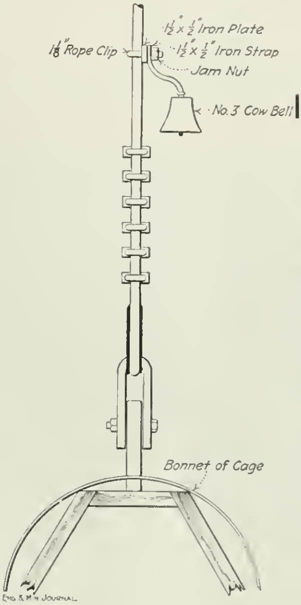
In operation, it was found necessary to add two more of the $\frac{7}{8}$-in. cables to the pipe support to prevent the pipe from sagging, and to shorten the span 24 ft. by means of props from each tower out over the track, held by bolts from the top of the towers and set in notches.

⁂

Alarm Bell for Cage

By W. H. Jobe*

The accompanying illustration from my annual report for 1912-13 shows a bell attached to the hoisting rope of a cage; it is caused to ring by the vibration of the rope and thus indicates the approach of the cage. The arrangement was devised by Capt. Edward Jacka, of the Armenia mine.



Bell on Hoisting Rope to Indicate Cage Approach

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Jackhamers for Sinking†

In sinking the Palms shaft of the Newport Mining Co., jackhamers were used. To the end of the 6-in. compressed-air line, a flange fitting was connected containing eleven ¾-in. valved outlets for hose connections. Ten Ingersoll-Rand jackhamers were used, and the eleventh connection served the timbermen for running an air auger when drilling their holes in the shaft sets.

Forty holes were drilled in the bottom of the shaft per cut, the outside dimension of the shaft set being 10 ft. 10 in. by 17 ft. 6 in. In the soft slate, 8-ft. holes were drilled. During drilling, the holes were cleaned by using a blowpipe, this being found indispensable if rapid drilling was desired. The steel was $\frac{7}{8}$-in. hollow hexagon. A No. 5 Leyner sharpener was used, and the proper dies were found to be satisfactory for shanking this steel. The bits ranged in size from $1\frac{1}{4}$ to $1\frac{3}{4}$ in.

⁂

Wire Rope for Slings is preferable to chains or hemp rope (N. F. A. Safety Bulletin, June 1, 1914). It is stronger for the same weight and gives evidence of wear more quickly. Spliced ends made by experts are preferable to clamped ends; conical sockets filled with spelter are also good. When the sling is to be subject to heat, a hemp center is inadvisable.

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*From a paper, "Draining Kerr Lake," presented at the Salt Lake meeting of the A. I. M. E.

*Inspector of mines for Iron County, Crystal Falls, Mich.

†An excerpt from an article presented before the Ishpeming meeting of the Lake Superior Mining Institute, Aug. 31, 1914.

Details of Milling and Smelting

Mechanical Shops at Hayden Smelting Works

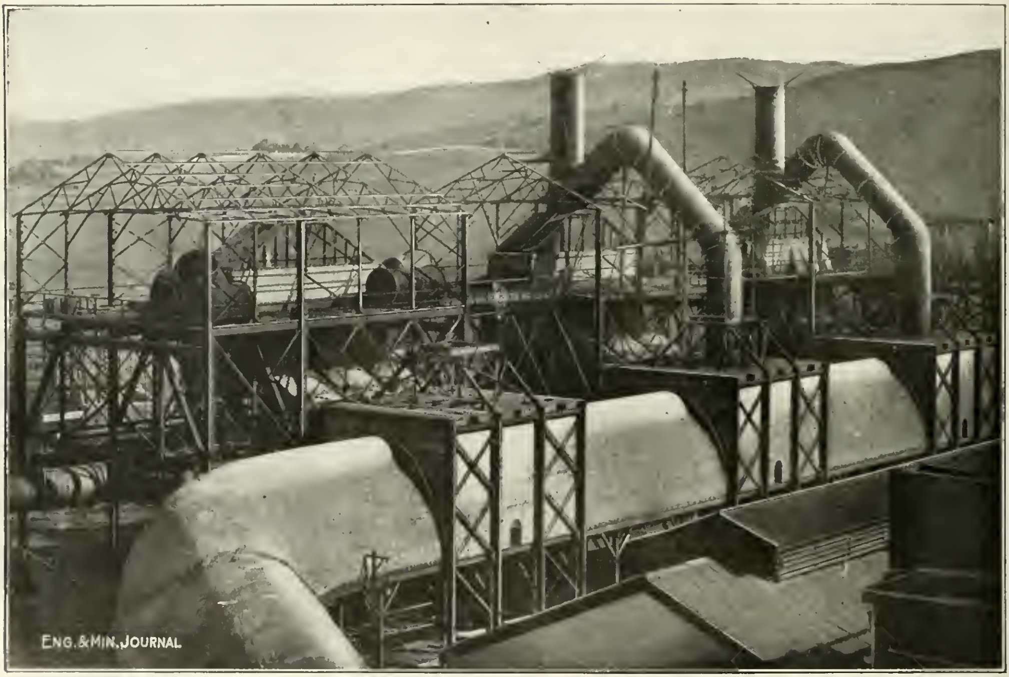
The Hayden smelting works of the American Smelting and Refining Co. is situated in a comparatively isolated Arizona town and in order to expedite repairs the company has established thoroughly equipped mechanical shops.

The machine-shop equipment includes: One 48-in.x 16-ft. American lathe; a 32-in.x10-ft. Woodward & Powell planer; a 24x24-in. Cincinnati shaper; a Racine high-speed draw-cut power hacksaw; a 180-ton Caldwell hydraulic press, 38 in. between guides; a Blount double-emery wheel; a 5-ft. grindstone; a Niles-Bement-Pond circular saw for sawing copper samples; a Reliance double-chuck bolt machine; a Barnes 18-in. drill press; a 6-ft. Dreses radial drill; a Bignall & Keeler 10-in. pipe machine; a Bignall & Keeler 4-in. pipe- and bolt-threading machine; a Hendey 12-in.x7-ft. lathe; two Allis-Chalmers 15-hp. three-phase motors operate the above machinery.

In the blacksmith shop is a 1500-lb. steam hammer made by the Chambersburg Engineering Co. and a jib crane to assist in handling heavy pieces. In the boiler shop, the equipment includes a set of 8-ft. Bertsch & Co. rolls; an 18x36-in. Hilles & Jones shear; a 36-in. Hilles & Jones combined punch and shear; and a 10-ft. Hilles & Jones flanging machine. A 15-hp. Allis-Chalmers motor supplies power to the boiler-shop equipment.

New Mount Morgan Furnaces

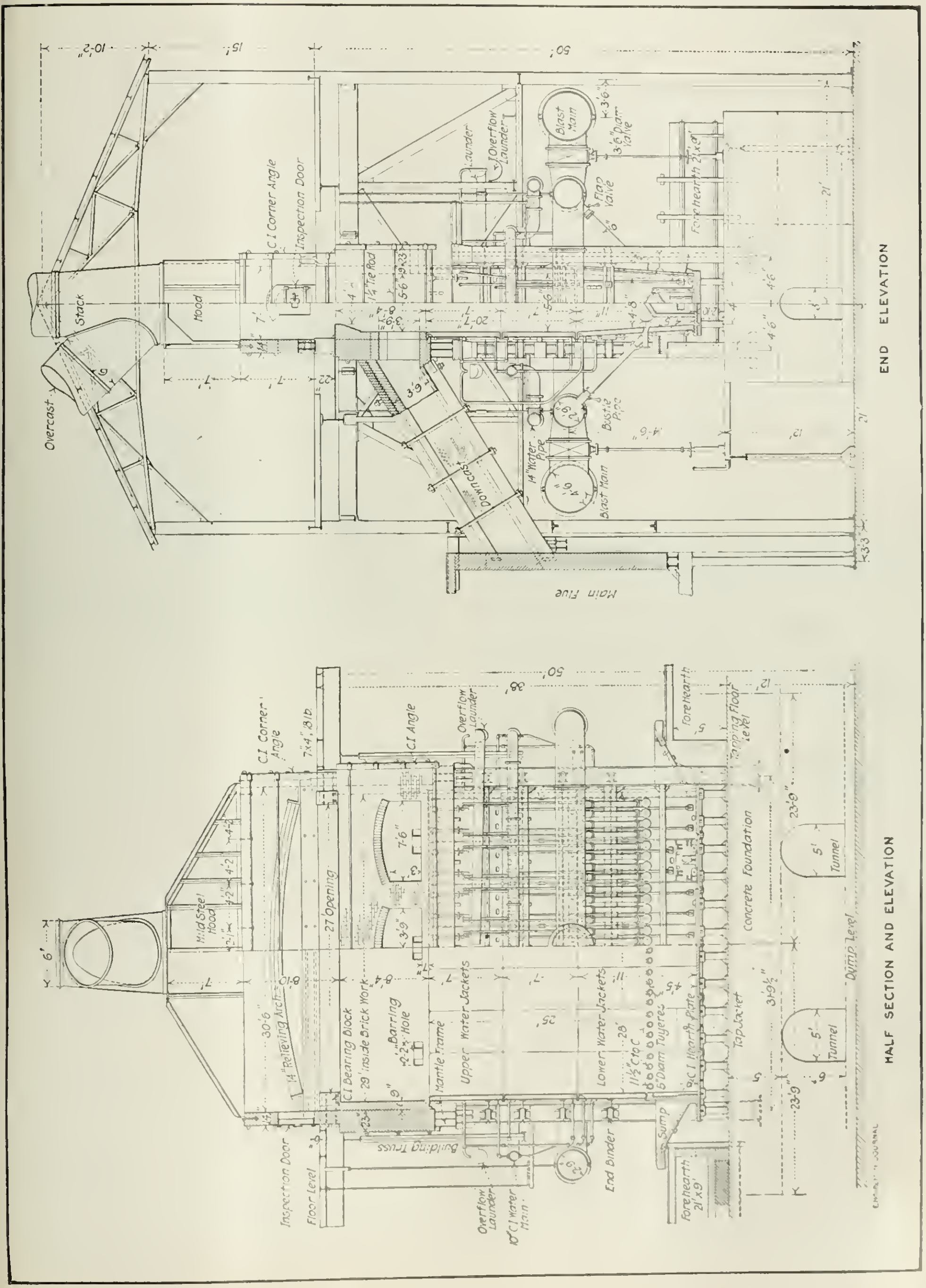
On the opposite page are presented general drawings of the new furnaces that have recently been built at Mt. Morgan for pyritic smelting. In the letter of transmittal accompanying the drawings, B. Magnus, general manager of the Mt. Morgan Gold Mining Co., Ltd., stated that he expected to blow in the new furnaces in June. From the accompanying photograph, we assume that three of these new furnaces have been erected.



REAR VIEW OF MT. MORGAN FURNACES, DURING CONSTRUCTION

The Mt. Morgan furnaces are interesting as showing the difference in practice in Australia and America. Perhaps the most striking difference is the height of the furnace shaft, as compared with those used in America for pyritic smelting. The new furnaces are 56x336 in. at the tuyeres, and the shaft is water-jacketed for a height of 25 ft. Another feature of interest is the removal of the flue dust and the furnace gases below the feed floor. While this has been the practice in many lead smelting plants for a number of years, it has not been extended to copper work at the larger plants in this country.

The tuyeres of the new furnaces are 5 in. in diameter, rather larger than in American practice, and are 4 ft. 5 in. from the bottom plate. One might infer from the



New Blast Furnace, 56x336-In., Designed for Pyritic Smelting at Mt. Morgan, Queensland, Australia drawing that the spout and bottom plate were of cast-iron and not water-cooled, but this is hardly likely to be the case, in view of the fact that a hot low-grade matte will probably be made: the reproduction is from a general drawing, and it is probable that no attempt was made to show such details. The furnaces are tapped at the ends, and oval settlers are placed between the furnaces, so as to give the greatest opportunity for matte settling before discharging the slag to waste.

As already mentioned, the furnaces are provided with a downcast below the feed-floor plates, but there is also an overcast leading to the main flue, as well as a vertical stack, which is closed ordinarily. It is assumed that most of the furnace gases and flue dust will be drawn off below the feed floor. The arrangements for feeding are also somewhat unusual; the charge is tipped on a plate near the charge door and a mechanical pusher pushes the charge into the furnace, this being designed to give complete control of the placing of the charge at any desired point in the furnace. It is interesting to note that no special provision has been made for settling the dust out in a large general chamber immediately behind the furnaces, as in many American works.

Production of Free Sulphur in Sintering

The installation of four Dwight-Lloyd sintering machines at the U. S. Smelting Co.'s plant at Midvale, Utah, introduced an unforeseen complication in connection with the operation of the baghouse. Soon after the Dwight-Lloyd machines were placed in operation, mysterious sudden rises of temperature and pressure began to occur in the flue system. The dust caught in the bags changed in character, becoming sticky and clogging them so that vigorous hand shaking was required to free them, reports Supt. L. D. Anderson (July *Bull.* A. I. M. E.). Finally, one of the sudden rises in temperature became so great as to set fire to several hundred bags, the dust in the hoppers and flues also burning vigorously. It began to appear as if the gases from the Dwight-Lloyd machines could not be filtered.

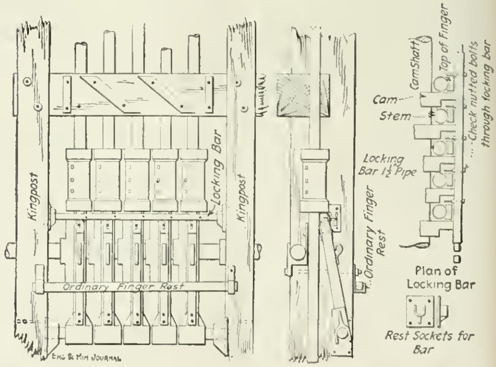
As the plant could not run unless all gases went through the baghouse, extensive experiments were set under way in an effort to solve the difficulty. It finally became clear that the trouble was due to the production of elemental sulphur, which occurred in the gases in a state of vapor. This free sulphur vapor would apparently ignite on small provocation, there appearing at times to be an actual spontaneous combustion of the material with the arsenic present, considerable arsenious sulphide being produced, while at other times probably sparks drawn through the wind boxes of the sintering machines were the cause of ignition. The steam generated from the moisture contained in the sintering-machine charges probably produced the neutral or reducing atmosphere required in the Hall process of producing free sulphur. Here, however, this free sulphur was most unwelcome, and every effort was made to oxidize it or arrest it before it reached the baghouse, but with small success. Water sprays of many types were tried, but the free sulphur vapor proved practically as elusive as lead fume, which all metallurgists know is scarcely touched by water.

Strangely enough, the percentage of free sulphur produced became less and less as the weather became warmer and the air drier. Probably if the machines could be supplied with dry air, after the manner of the pyrites burners in the Mannheim contact process for the manufacture of sulphuric acid, the production of free sulphur could be prevented. The cost, however, appeared prohibitive. Among many other schemes tried was the use of crushed limestone on the grates under the ore charge proper. This did to a small extent diminish the percentage of free sulphur produced. It was not sufficient, however, to prevent a second explosion in November, 1913, when the atmospheric air had again become damp. When this occurred, the machines were shut down except for sintering preroasted matte, which operation did not appear to generate free sulphur, and for sintering sulphide ores low in pyrite.

Dick's Device for Securing Stamps

The attached drawing shows the working design of a device which has been prepared by O. E. Dick, of Geldenhuis Deep, Ltd., a practical mill man, who has had many years' experience in South Africa, and who received a severe injury to his hand some time ago, the result of a stamp falling accidentally on it.

The locking bar has not necessarily to be fitted to each set of five stamps, since it is interchangeable and can be moved, provided that the necessary sockets are attached to each kingpost. The bar can be made of any cheap material, such as old boiler tubing, provided it is sufficiently strong.



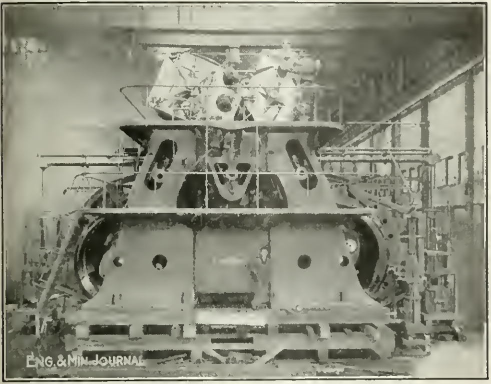
Arrangement of Locking Bar for Stamp Fingers

This device was originated in response to an appeal to employees by the manager of the Geldenhuis Deep, Ltd., at the instance of the Prevention of Accidents Committee of the Rand Mutual Assurance Co., Ltd. It was put before the Mine Managers' Association on the understanding that for each of such mines as the suggestions given in the drawing are acted upon, a bonus of £5 should be paid to Mr. Dick by the company using the device. Such payments may be made either through the Association of Mine Managers or the Rand Mutual Assurance Co., Ltd.

Mining & Metallurgical Machinery

Large Compound Condensing Hoist*

The largest compound condensing hoisting engine in the world was recently ordered by the Homestake Mining Co., and built by the Nordberg Manufacturing Co. The engine is of the duplex inclined cross-compound type, as shown by the side view. The two high-pressure cylinders are 28 in. diameter, the two low-pressure cylinders are 52 in. diameter, all with a common stroke of 42 in.



Nordberg Compound Condensing Hoisting Engine

The hoist is built with two reels, each on separate crankshaft. The reels are driven by axial plate clutches and equipped with gravity post brakes, air-operated. The hoist lifts 12,000 lb. net of ore per trip from a depth of 3200 ft. in a vertical shaft. The rope is ⅝x7¾ in., and the total rope pull is 41,900 pounds.

The initial steam pressure is 150 lb. gage. All cylinders are steam-jacketed and the exhaust pressure is maintained at 26-in. vacuum by a special design of countercurrent jet condenser developed by Mr. Nordberg for hoisting-engine work. The circulating and dry-air pumps are direct-connected and driven by a simple corliss engine.

The unique arrangement of this hoisting engine having two main crankshafts connected with side rods and a reel mounted on each shaft, was made a necessity, owing to the topography of the ground around the shaft where this hoist is being installed. The only desirable location for the engine house bore such a relation to the shaft that the two ropes from the head sheaves to the hoist stand 12 in. center to center. With two ropes each 7¾ in. wide and their centers 12 in. apart, it is obvious that it would be impossible to mount two reels on one shaft, as is commonly done.

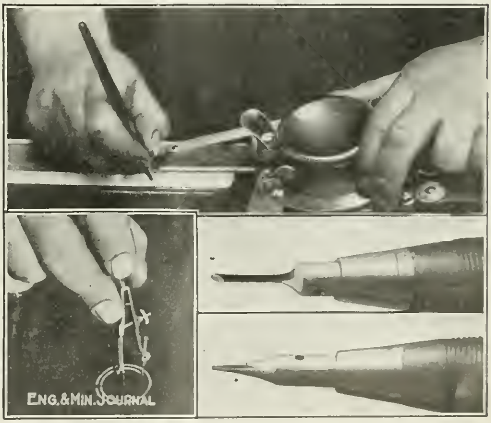
The inclined cylinders and relative position of cranks are such as to give practically a uniform turning effort.

On small compound condensing hoisting engines working from depths of less than 1000 ft., the Nordberg Manufacturing Co. has obtained economies of less than 30 lb. of steam per shaft horsepower-hour, including the steam used by the condenser and it is expected that the Homestake hoist will break all records for low cost of hoisting as soon as it is put in operation.

*

Something New in Drafting

The Universal Drafting Machine Co., of Cleveland, has just placed on the market a new material for drafting purposes which is distinctly an innovation. It is called Unidraft fabric and looks like a brown-print paper mounted on cloth. Its use involves a reversal of the ordinary process of drawing. Instead of making a dark line on a black background, a light line is made on a dark background; the brown coating of the fabric is lifted off with a steel point, leaving a white and translucent line.



Scribe, Compass and the Universal Drafting Machine

From such a drawing, printing can be done direct and the result is ordinarily a positive, i.e., a dark line on a white background. The material thus takes the place of both paper and tracing cloth. No pencil drawing is supposed to be done. Furthermore, the labor of getting a positive print is cut in half. By the old system, a pencil drawing was made; this was traced on tracing cloth, a negative print on a brown paper was made, and from this, positives could be printed. Using Unidraft fabric, a negative drawing is made, and a positive print taken from this. The lines can, of course, be blue on white or black or brown on white.

Two drawing tools are shown in the illustration; other forms have been tried, but the upper tool on the right shown has proved most satisfactory in general. In use, this tool is held with the beveled side away from the direction of motion and with the handle end inclined forward, leaving the bevel face about vertical. The weight or width of line is varied by varying the pressure on the tool. It is not difficult to use. Similar points are fitted to compasses, as illustrated.

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*From data furnished by the manufacturers.

Erasing is done by simply inking over a line so that it is again as opaque as the original coating. Such a line inked over can be drawn upon as before, the tool removing the ink and part of the undercoating. Dotted and other broken lines can be made in a similar fashion.

The surface is not scratched by drawing tools. The speed of the blueprinting is about the same as through tracing cloth. Sharp, clean prints are obtained. The process of printing can be reversed in several ways and white lines obtained on a blue background. The drawings show a brilliant contrast and do not change color with age.

The manufacturers claim for the material the following advantages: Saving of time in the combined process of drawing and printing; elimination of pencil sharpening, pen filling and waiting for ink to dry; saving in total cost; elimination of errors in tracing, with consequent ease of checking; production of a more beautiful and more legible drawing; freedom from soiling; reduction in eye-strain; possibility of making prints at any stage of the drawing; ease of erasure; durability because of the cloth backing.

The great question that will arise in the mind of the reader is, of course, that of erasure. Most draftsmen find it necessary to do a great deal of erasing of pencil lines. Part of this is due to slovenliness, part is almost unavoidable. Erasing on Unidraft fabric is apparently easier than erasing ink, but would not seem to be as easy as erasing pencil marks. In much drafting, however, where the work is standardized and the drawings vary only in a few details, no erasing should be necessary. Pencil lines, furthermore, can be made to show slightly and could be used as limit lines for the scribing tool. Finally, if the drafting be done with the Universal drafting machine, as in the illustration, a constant guide for the lines is provided.

It is stated that Unidraft fabric costs between 25% and 50% more than the combined cost of drawing paper and tracing cloth.

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Iler Disk Pulverizer

A machine for grinding crushed ore or sand to very fine pulp has been brought out by Frank M. Iler, of Denver, Colo. The feature of this machine is the two disks revolving in opposite directions about a common axial line. They are constructed of radial segments of alternating steel and chrome steel. In each disk there are two concentric sets of these segments.

The feed is handled automatically and passes through the first disk. It then is thrown outwardly to the contact surfaces where it enters the slight dish-like depressions in the faces of both disks produced by the natural wear of the softer steel. The revolution of the disks pulverizes the sand, while centrifugal action keeps it moving outwardly. Since there are two sets of the segments on each disk, there is small chance for coarse grains of sand to reach the surrounding discharge space.

Sets of thrust journals are provided on each shaft midway between the driving pulleys and the disks. The right-hand shaft is supported on stout rocker arms and its disk is kept in close contact with the left-hand disk by a tension rod underneath. Upon this rod two toggles are so disposed as to bear upon an intermediate small plate providing, in emergency, release of pressure between the grinding faces by the breakage of the plate.

But one machine has been put to practical use and its service was interrupted, through no fault of its own, before details of its performance could be worked out. The best figures available state that the machine, with 18-in. disks, pulverized 2 tons of hard vein-quartz sand per hour, consuming 6 electrical horsepower. No screen analyses of the feed or product were made, but the product is described as apparently uniformly fine.

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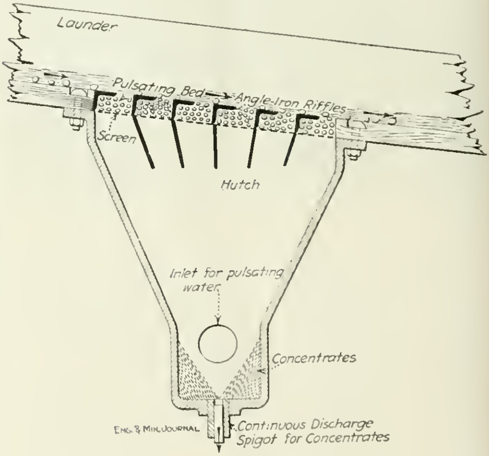
Richards' Pulsator Riffle

A late addition to the family of Richards' pulsator classifying and concentrating machinery, manufactured by the Denver Engineering Works Co., is the pulsator riffle, intended for use in hydraulic mining. The accompanying drawing shows the device, which consists of the ordinary Hungarian riffles, on a wire-screen bed, placed a jig hutch. Blades extending into the hutch are for distributing the pulsating water equally through the feed. In operation a gravel bed is formed on the screen, through which the pulsating water passes, keeping up a constant agitation. Gold and black sand particles work through the bed into the hutch and are continuously discharged, doing away with the labor usually necessary in cleaning up.



The Richards Pulsator Riffle

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"Giant" Fuel Oil Engine

The Chicago Pneumatic Tool Co. has just put a new line of oil engines on the market, known as the "Giant." They occupy floor space from 3 ft. 1 in. by 9 ft. 2 in., up to 4 ft. 7 in. by 13 ft. 6 in., and are rated from 12 to 45 brake horsepower.

Welfare Work of the Calumet & Hecla*

SYNOPSIS—Description of the branches of welfare work carried on by the Calumet & Hecla Mining Co. and its subsidiaries. The aid fund, to which both company and employees contribute, was originally used to provide help in case of sickness, accident and death. Since the Michigan compensation law came into effect the aid fund has been used to relieve cases of sickness only. Employees contribute to medical fund, on which the company loses, however. Houses are rented to employees at low rates and land is rented on which employees build their own houses. Schools and churches taken care of by the company. Pension fund established. Miscellaneous charities and public works. Pastures and farms provided.

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It is admitted that the Calumet & Hecla has taken good care of its men and their families and of the community in general. Its activities along this line include an aid fund, hospital service, a pension system and many other branches of work.

The Calumet & Hecla aid fund was organized in 1877 to provide help for the company employees in case of sickness, accident or death. The rules provided that every man desiring to accept benefit from the fund should be charged 50c. per month through the mine office, and every boy whose wages were under $30 per month should be charged 25c.; and to the amount thus collected the Calumet & Hecla added a similar amount each month. A contributor disabled by reason of an accident while engaged in work was to receive from the fund $25 per month or fractional part thereof.

From July 1, 1877, to Jan. 1, 1913, the men contributed a total of $504,881, and the amount added by the company was $625,483. The total disbursements to members were $1,596,707. The excess of disbursements over contributions is due to the fact that some of the surplus in early days was invested in Calumet & Hecla shares, and the dividends accrued to the credit of the fund. At one time the fund had borrowed money on its stock to the extent of $110,290, and owned 472 Calumet & Hecla shares, valued then at $193,520.

CONTRIBUTIONS NOT CONSTANT

Beginning in 1897, there was a period of 40 months in which no collections were made from the men, and during this time the company paid into the treasury the sum which would have been paid by both men and company, if the latter had contributed. When collections from the men were begun again, the amount was raised 2½% in order to take care of the lack of contributions. There were no contributions, furthermore, made by men after Jan. 1, 1913, inasmuch as the surplus was large and it was thought best to reduce it somewhat. On Jan. 1, 1914, the balance was $76,931.

RELATION TO COMPENSATION LAW

In the fall of 1912 the new Michigan compensation law came into effect, and the rules of the aid fund were changed to provide for payment therefrom only in case of sickness, the compensation fund taking care of accidents. All kinds of sickness were included, whether connected with the occupation of the employee or not. There was, furthermore, a contribution entirely outside of the aid fund, made by the mining company in case of death from sickness not connected with the miner's occupation. This contribution amounted to from $200 to $250, and the practice of making it has been followed from the time the rules of the aid fund were changed.

The manner of assembling the fund just described applies only to the Calumet & Hecla Mining Co. proper; in the case of the funds maintained by its subsidiaries there are no contributions made by the companies.

REPORTS AND ADMINISTRATION

All of the funds issue annual statements, and the Calumet & Hecla fund issues monthly statements, showing disbursements for each month of the entire year preceding, and an annual statement showing receipts and expenditures, assets, liabilities and the credit balance. The monthly statement gives the names of the men receiving aid and the cause therefor.

The fund is administered by a committee of five, of whom the mining company appoints two and the men elect three. The elections are carried on by a ballot system. At the Calumet & Hecla, Mr. Knox, the general superintendent, together with the company's head physician, represents the company on the administrative board. Under the old rules the mining captain, the head physician and a miner were selected to administer the fund. The only difference between the Calumet & Hecla fund and those of the subsidiary companies lies in the fact that in the case of the latter the companies do not contribute. The system of administration is the same.

THE HOSPITAL AND DOCTOR FUND

Each married man of the Calumet & Hecla and all its subsidiaries pays $1 a month to a hospital and medical fund, and this entitles him and his family to medical and surgical attendance, with all medicine. Each single man pays in 50c. a month, with the same privileges. This is a source of loss to the company. For instance, with the Calumet & Hecla company, from May 1, 1871, to Jan. 1, 1914, the operating expenses of the hospital, not taking into consideration the cost of the plant itself, which is provided by the company, were $1,528,291. The collections from the men were $1,061,912, so that the net loss to be borne by the company was almost a half a million dollars. This holds true with respect to the subsidiary companies, but not to so great an extent, since they are usually smaller and younger than the Calumet & Hecla proper.

The money for this fund is collected from the employees through the office and goes into the general treasury of the Calumet & Hecla, while the company pays for medicines, supplies, physicians' salaries and salaries of other employees. At the time the strike started, the company was about to begin the foundation for a $200,000 hospital.

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*From testimony given by James MacNaughton, manager of the Calumet & Hecla, before the Congressional Committee investigating the recent strike of the miners in the Copper Country.

The hospital charge for a man or any member of his family, except a small child, is $20 per month for board while he is in the hospital; there is no other charge made for medical or hospital service.

Company Houses

The Calumet & Hecla company owns in Calumet 764 houses for renting to its employees. The average rent for these is about a dollar per room per month, and this includes free water, the removal of garbage and repairs, such as painting, carpenter work and papering. There is usually a lot attached to the house large enough for a small vegetable garden. The water is obtained from Lake Superior, about five miles away. The houses are electrically lighted by the Houghton County Electric Light Co., and, at the instance of the employees themselves, the system was begun of making collections for electric lighting through the company office, a lower rate being thus obtained. A year or two ago a general appraisal of the houses by independent appraisers resulted in a valuation of $981,500. The total average annual expenditure for repairs, improvements, etc., during a period of 10 years up to 1913 or 1914, was $61,229. The total amount of rent collected per year was $61,863. Therefore, the total annual profit on the investment was $634.

Employees' Houses on Land Leased from Company

There is a greater demand for houses than can be supplied and no employee is required to live in a company house. The company, however, leases lots to its employees, upon which the latter build their own houses. These lots are about 120x50 ft. and are rented at the rate of $5 per year, free water and the removal of garbage being included. The house owner is not at liberty, however, to buy his lot; the reason for this, as given by Mr. MacNaughton, being that it might become necessary to move the house at some time for construction purposes connected with the mine. In such case, the company would move the house at its own expense and give the man an equally good lot somewhere else, usually a selection of three or four lots. This case has arisen several times.

The Calumet & Hecla has about a thousand houses on leased lots at the present time, which would be valued at about a thousand dollars apiece. When the system for leasing lots for buildings was originally installed, the thousand houses were built in a period of two to three years, and the company bound itself for a period of 20 years from the date of the lease to repurchase the house at an appraised valuation, one appraiser to be appointed by the company, one by the house owner, and these two to select a third.

This limitation expired in 1911, and at present, if a man is discharged or vacates his house, he has a chance to sell it to some other employee. Failing this, he has an opportunity to rent it, inasmuch as houses are in strong demand; if he leaves the district entirely, the company attends to renting his house, collecting the rent and remitting it to him. It is stated that the company has never at any time forfeited or taken possession of any improvement that a man has put on a leased lot.

Schools and Churches

The company is the largest taxpayer in the township where Calumet is situated, its payments being 85% to 90% of the total receipts. Consequently, the company feels that it does not make much difference whether it builds a school house and leases it to the township or whether the township builds it, so far as expense to the company is concerned; and it has been accustomed to build school houses and lease them. About 12 have been built this way, 11 of them costing $352,270. The annual rental obtained from the township for these is $11,027, amounting to about 3% on the investment. Of course, this is to a large extent merely a repayment by the company to itself. At the subsidiary mines the school district usually pays for the schools and owns them, taking a lease from the mining company for the land on which the schools are erected. These leases are for the life of the corporation, which is usually 30 years, and then may be renewed. A somewhat similar policy is followed in regard to churches.

Pension Fund

In 1904, the Calumet & Hecla company started a pension fund for its employees. Those who had attained the age of 60 years and had been in the employ of the company for 20 years or more were retired on a pension proportionate to the length of service and wages earned and payable for a period of five years. Such pensions ran from $9 to $30 per month. The amount thus paid to the date of the hearing was about $87,000.

It is evidently necessary, in the case of a mining company, to have a definite limitation on the length of a pension, since the mining company's own life is limited and the pension would become most burdensome just at the time when earnings became less.

There is a pension board made up of the heads of departments, which decides when a man shall be retired. The man is recommended by the head of his department for retirement, and so far there have been no cases where such a recommendation has been turned down. Usually the man himself makes application, but if he does not the head of the department has a right to recommend him, and the employee then has no choice as to whether he is pensioned or not.

The 40-Year Age Limit

The company today has in its employ more than 300 men who are over 60 years old. As a matter of fact, many men have been getting pensions without its being so specified, since, although too old to be of any real service, they have been kept on at their regular wages. The company felt that, in view of this, it ought to take on as new men only those under 40 years of age, in order to keep the average low. This led to some complaint on the part of the men, who claimed that if a man were discharged at the age of 40 he could not get back to work with the company.

The rules governing the administration of the pension fund are extremely flexible, about the only one fixed being that a man must be 60 years old and have worked with the company 20 years. In practice the 40-year limitation is not applied rigidly, but only in the case of men whom it is undesirable to reëmploy for other reasons. The employees make no contributions to the pension fund.

The Calumet & Hecla company engages in many other activities for the benefit of its employees. For instance, it maintains a system of free fuel distribution among the poorer classes, especially in the case of widows and famit maintains a system of free fuel distribution among the poorer classes, especially in the case of widows and families of widows. This is not maintained as a separate fund, but is kept track of on what is called a "charity account." The mere delivery of the fuel costs $100 a month.

There is also a voluntary relief fund provided wholly by the company, which takes care of widows whose circumstances seem to require it, for as long as necessary after the death of the supporting member of the family. In some cases, payments of this kind have been continued for 12 years. In one case over $1200 was paid to a widow in less than four years, at the end of which time she remarried; 180 widows and orphans, only a few of the latter, have been paid from this fund to date.

SPECIAL RELIEF FUND

Then, again, there is a fund established by the company, or, rather, an expense account maintained by it, used to relieve the wants of men who are not entitled to aid from the employees' aid fund, according to its rules. For instance, under the rules of the latter, aid to a sick man is maintained for eight months only. He can in some cases be reëstablished on the fund, and in other cases, such as an incurable disease, he is not so reëstablished, but the mining company takes care of him from this special expense account. In some cases a man who is not really fit for work is allowed to go back to work for a day or so, almost at the expiration of an eight months' term, in order that he may be reestablished on the aid fund for another eight months.

Mr. MacNaughton himself usually determines the necessity of relief in the cases just mentioned. A record of all widows is kept and their circumstances are continually being investigated to see that they do not suffer, even though they do not make application.

The company some time ago built a $40,000 library and maintains it and the 30,000 volumes which it also provided. About four years ago it built a bath house at an expense of about $45,000, and at this any male member of the community may bathe for an extremely small amount, while women and children are entitled to bathe there free. At the time of the strike, the company had planned club houses for the various subsidiary companies and had outlined a plan for the Calumet & Hecla, afterward to be extended to the subsidiary companies, calling for visiting nurses. There is employed a social worker, who keeps in touch with the condition of the employees.

The company maintains pastures on which any employee of the company can pasture one cow free. For more than one he is charged a nominal amount. The company also leases land for farming purposes. Such farms may run from 40 to 160 acres, there being no fixed limit on the size. The rental received is about $10 per year for a 40-acre tract to $40 as a maximum. The question of improvements on such land has never come up, since no tenant has had to be asked to vacate up to date, although there is one tenant said to be in arrears for 10 years' rent, having had bad crops for several years.

The company has coöperated with the Bureau of Mines rescue car in instructing its employees in first-aid work, and maintains first-aid stations underground. In case of an accident, a man is put on a stretcher, taken to the shaft and a man car signaled for. The man at the surface sees that the man car is lowered and immediately calls for an ambulance and a surgeon from the hospital. The surgeon meets the injured man at the collar of the shaft.

Frederick A. Thum

Frederick A. Thum, for many years eminent as a mining engineer and metallurgist, died at his home in Newark, N. J., Sept. 9, aged 80 years. He was born at Freienseen, in Oberhessen, Germany, where his father was pastor of the Lutheran Church. He received his education at the Mining Academy of Clausthal, making copper, lead, silver and zinc his special studies and also taking great pains to acquaint himself with the methods of the classic industry of the Harz Mountains.

FREDERICK A. THUM

His first practical experience was gained in a position with the Vieille Montagne company, of Belgium, and among the zinc mines and smelteries of the Rhine and Ruhr districts of Germany; later with the extensive zinc and lead industries of Silesia and the neighboring parts of Poland and Galicia. After that followed an inspection tour in the service of the Austrian government under the direction of Dr. Lypold, then Austrian state geologist. This tour included geological studies and the examination of the lead and zinc mines and deposits in the Klagenfurt, Villach and Bleiberg districts. Later, he extended the tour into Croatia and Servia and his discoveries of zinc deposits there resulted in the development of mining enterprises and the installation of reduction works, which was entrusted to Mr. Thum. Considerable initiative and ingenuity had to be displayed to find in the neighborhood necessary raw supplies, such as refractory clays for retorts and furnace linings, and to install the necessary appliances to produce the finished materials used in the operations of the mine and smelter.

With such extensive practical experience in mining and metallurgical operations, Mr. Thum went to England in the early '60s and remained there with short intermissions for approximately 17 years. During this period he was identified with the development of the zinc industries of Great Britain, examining a large number of mines for English companies all over Europe, especially in Spain, Italy, Sardinia and Corsica. Several zinc smelteries were erected and managed by him and his work in developing the metallurgical methods of zinc recovery is well known to the profession, having been described by him in numerous contributions to technical literature, especially in the *Berg und Hüttenmannische Zeitung*. His paper on the rolling of zinc was published in pamphlet form in nearly all modern languages.

At the age of 46 years, in 1880, Mr. Thum emigrated to the United States, perceiving with keen forethought the wonderful possibilities of this country as a metal producer and the opportunities offered here to mining and metallurgical men. Shortly after his arrival, he accepted a position with the smelting and refining works of Ed. Balbach & Son, of Newark, N. J., later the Balbach Smelting & Refining Co. Here his association was with men of keen foresight and capital, who had developed the first important smelting and refining plant in the United States by the introduction of the Parks process for desilverizing lead. His creative ability brought out some wonderful results in the development of the electrometallurgical refining industry in the United States. These results were the more remarkable when it is considered that, as an engineer of the old school, he had received his training before the era of electricity.

The first work taken up at the Balbach plant by Mr. Thum was the introduction of the Oker blue-vitriol process for the extraction of gold and silver from granulated black or blister copper in which gold and silver had been collected in high concentration. It was soon evident that this process could not begin to handle the quickly increasing quantities of gold-silver bearing copper on account of the over-production of copper sulphate. Most of the gold-silver bearing mattes and copper bullions were then shipped to Europe for refining. It was then that Mr. Thum proposed the electrolytic treatment of copper bullion as the only remedy; and he was immediately entrusted by Mr. Balbach with the experimental work on electrolytic copper refining. In an incredibly short time, Mr. Thum achieved the desired success and in 1882-3, the first electrolytic copper-refining plant was in successful operation.

All the problems involved, such as arrangement of tanks and conductors, the making of starting sheets, the correct chemical and electrical conditions, the important problems of circulation of electrolyte, insulation of tank system and all the hundreds of details, were successfully worked out and are, with slight modifications, standards of the so called multiple system to this day. The series system was a later development. A further important invention of Mr. Thum, developed at the Balbach works, was the refining of crude-nickel anodes by electrolysis. Many thousands of tons of nickel cathodes were produced in this manner from the crude nickel of the Orford Copper Co., which now uses this process. Most of this was absorbed by the armor-plate makers of Europe.

In connection with this nickel work, Mr. Thum invented a very useful apparatus in the shape of an anode basket arrangement for electrolytic series refining work, which eliminated the necessity of casting nickel anodes and making nickel starting sheets. Important improvements in the methods of electrolytic parting of doré bars were made jointly with Mr. Balbach. This development constituted an improvement on the Moebius method.

Mr. Thum never acquired patent rights for his epochmaking inventions, but in later life he patented a few processes of minor interest, among which a tilting anode mold and the above mentioned nickel series basket deserve special mention.

Mr. Thum was a contributor to the ENGINEERING AND MINING JOURNAL before he came to the United States, but since 1880, he contributed but sparingly to technical literature, centering all his efforts on his work. Of 60 years of active life, 29 years were spent at the Balbach work. On his retirement, he was retained in a consulting capacity. The successes attained in all of Mr. Thum's undertakings were remarkable, but they were the well earned reward of extraordinary knowledge, experience and energy, and a devotion to his professional work and duties, but rarely met with.

Mr. Thum leaves two sons, William Thum being superintendent of the Grasselli plant of the United States Metals Refining Co. He leaves also three grandchildren.

Courses for Practical Men at Michigan College of Mines

The Michigan College of Mines will introduce this year a series of special short courses in mining, metallurgy, mapping, drawing, concrete construction and like subjects, open to any practical man who can read and write the English language. The college proposes to afford the ambitious workman in the mining and related industries an opportunity to gain the amount of technical training that may be necessary for advancement in his line of work. This step has been under consideration for many years and is now a permanent extension designed to broaden the usefulness of the institution.

The admission requirements for these short courses are simple, and of two classes, the first requires that the man be able to read and write the English language to a fair degree. The second will require a man to be of good character and to have had experience in the mine, mill, smeltery, shop and the like. The college, however, will not admit the highschool boy who can get training in his own school. Successful practical work will be held a strict requirement.

The courses will be 5, 10, 11 or 12 weeks long, and will probably run coincident with the regular college terms so that a special man will not have to undertake too long a term of work. The same teachers and equipment will be used as in the regular college courses. Every course will be given under the head of the department to which the subject belongs.

There has been no attempt to place definite limits on the number of courses or the ground to be covered. They are to be arranged to suit the demand. It is planned to pay particular attention to men who come for special work whether they have had previous technical training or not. It is thought that this opportunity for specialization may appeal to many technically trained men who in their later practical experience have seen keenly the limitations of their training in certain branches.

In this connection President McNair has stated: "The foundation on which we propose to build is the foundation of experience and mental training that these men have gained in working with the materials and conditions of their jobs and in every course the instruction will start from those things which are already familiar to the men."

Full particulars regarding the proposed courses may be secured from the college at Houghton, Mich.

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Henry Bratnober

Henry Bratnober, whose death in California, on Sept. 14, was briefly noted in the JOURNAL last week, was one of the most widely known of Western mining engineers. Although his home was, for the most part, in California, he also lived for a good while in Tacoma or Seattle, Wash., and for a number of years the larger part of his time was spent in Alaska. He was not unknown also in the Transvaal and in Australia. Not much is known of his early mining experience, which was mainly in California, but he first came into prominence as manager of the Drumlummon mine, in Montana, for a number of years worked by the Montana Mining Co. He was also connected for a time with the Elkhorn Mining Co., in Montana. Later he was employed by the Exploration company, of London, and in the service of that company he traveled extensively. He was, for several years, in the Transvaal, and he also traveled in Australia, visiting all the principal mining camps on that continent. During this period of his life, while connected with the Exploration company, he was interested in the management of the Leroy No. 1 mine, at Rossland, B. C. He was instrumental in the exposure of the London & Globe Co., of which Wittaker Wright was the leading spirit.

Mr. Bratnober left the services of the Exploration company in 1899, and thereafter conducted business on his own account as a mining engineer and explorer. He was one of the pioneers of Alaska, having gone there in the early days of the Klondike rush and later having visited, or been identified with, almost every prominent district in that territory. In 1897, on his first return from Dawson, he contributed to the columns of the JOURNAL the first reliable article on the Klondike gold placers, which had appeared; it was a brief but clear and concise account, the correctness of which has never been seriously questioned. From that time on, most of his work was devoted to Alaska. Some years previously, he had coöperated with W. R. Rush and the Bunker Hill & Sullivan interests in building the smelting plant at Tacoma, Wash., and he retained an interest in that plant.

Mr. Bratnober was the first, perhaps, to realize the importance of railroad communication with the Alaskan coast and he laid out substantially the route afterward adopted by the White Pass & Yukon R.R., which was built and is still operated by an English syndicate. He was at Nome in the early days, and was in the Tanana district, building the first steamboat to navigate the upper waters of the Tanana River. His last trip into Alaska was made last winter, when he went up into the Shushanna district in company with D. C. Sargent, to investigate the placers there. He came out by way of the Tanana and the Yukon; he was thrown from his horse while crossing the Tanana and narrowly escaped drowning, and this accident, which developed later into some serious complications, was the cause of his death.

He leaves a wife residing in Tacoma and two brothers, one of them head of the Bratnober Lumber Co., of Tacoma.

In 1892 he was present at the memorable but resultless monetary conference in Brussels. He was a man who was known to most mining engineers in the West—to all those of the older generation. He was a conspicuous figure wherever he went, being a man of extraordinary stature, and with his high boots, which he always wore, and his long beard, he reminded one of the pictures of a Boer general. His old friends esteemed him most highly, and placed great confidence in him.

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Miami Copper Co.

For the first six months of 1914, the Miami Copper Co., Miami, Ariz., drove 20,688 ft. of drifts and raises for development purposes and ore extraction. There were mined 639,656 tons of ore, and 638,456 tons were treated at the concentrator, producing 25,668 tons of concentrates averaging 39.12% copper.

Copper production was 20,083,096 lb., divided into January, 3,315,617 lb.; February, 3,316,482 lb.; March, 3,468,936 lb.; April, 3,406,528 lb.; May, 3,410,743 lb., and June, 3,164,790 lb. Net production of merchantable copper was 19,078,942 lb. Average ore assay was 2.275% copper, and actual extraction 69.14%, or 31.45 lb. per ton in concentrates and 29.88 lb. per ton in merchantable copper.

By some modifications in the mill, the extraction was improved, giving an increase of about 3 lb. of copper per ton. Experiments are still being continued on flotation and leaching. Reductions of cost have been made of 29c. in mining and 9c. in milling.

Average cost of copper, after deducting miscellaneous income, was 8.9743c. per lb. Gross income was $2,716,681; cost, $1,752,713; profit, $963,968. Dividends Nos. 8 and 9 amounted to $746,877, and surplus, $217,090.

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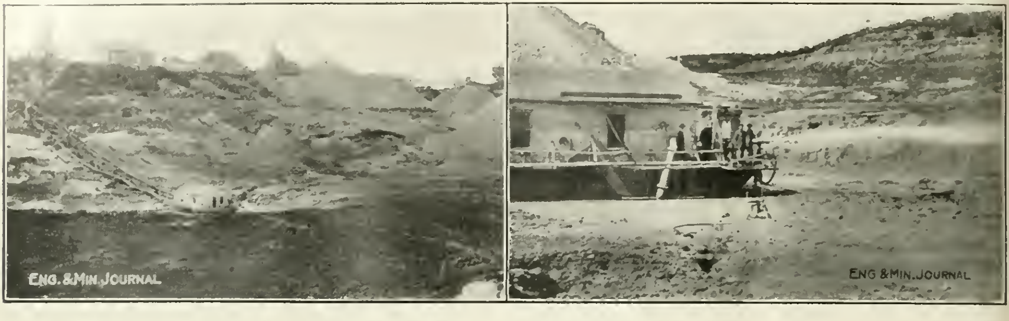
Ohio Copper Co. Bankrupt

A friendly petition in bankruptcy was filed in New York on Sept. 16 against the Ohio Copper Mining Co. by certain Utah creditors. Under a joint bond of $20,000, M. J. Hirsch and George C. Austin were named receivers in New York.

The Ohio Copper Mining Co. is a successor to the Ohio Copper Co. and it is stated that its liabilities amount to $170,000, aside from its mortgage bonds on which it defaulted interest payment Sept. 1. The affairs of the company have lately been in the hands of a new management headed by Pres. W. O. Allison. For a number of years the management had been controlled by F. Augustus Heinze, who still controls the Bingham Central railway, which transports the Ohio ore. The Ohio company sued to recover for alleged excess transport charges and the Bingham Central retaliated by suing for money due for services. The Ohio accounts were attached and these steps, in conjunction with the business situation and the decline in the price of copper, prevented the management from carrying the company's operation to a satisfactory conclusion.

The mine in the Bingham district and the mill at Lark, Utah, have been closed.

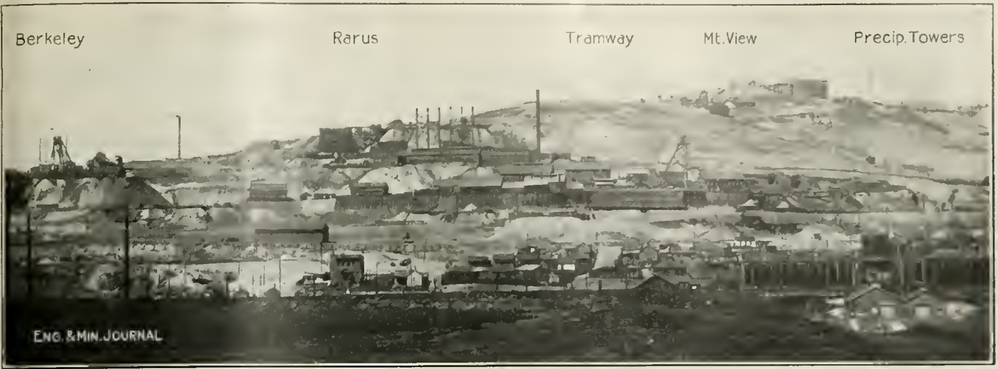
Photographs from the Field



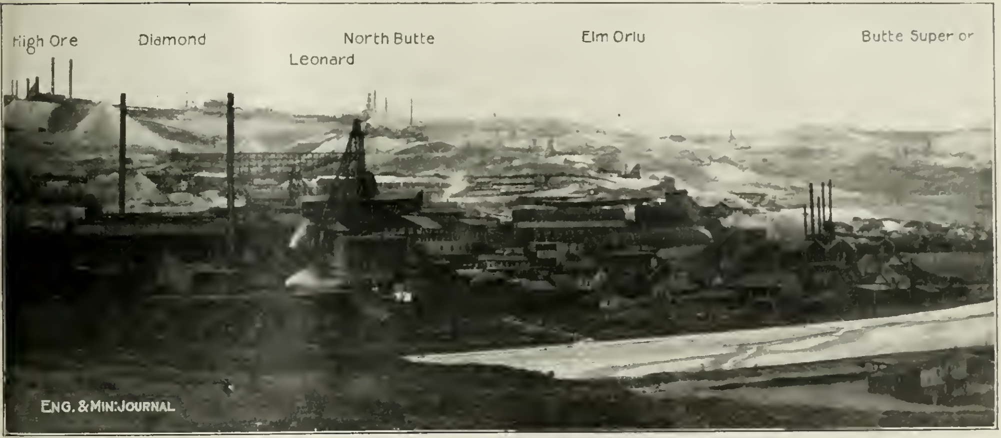
DRAINING KERR LAKE, IN THE COBALT DISTRICT
[Pump float and pipe lines. Washing the sludge into the pump intake.]

ERNESTINE MINING & MILLING CO., MOGOLLON, N. M.
Maude E shaft house and ore pack train on the way to the mill

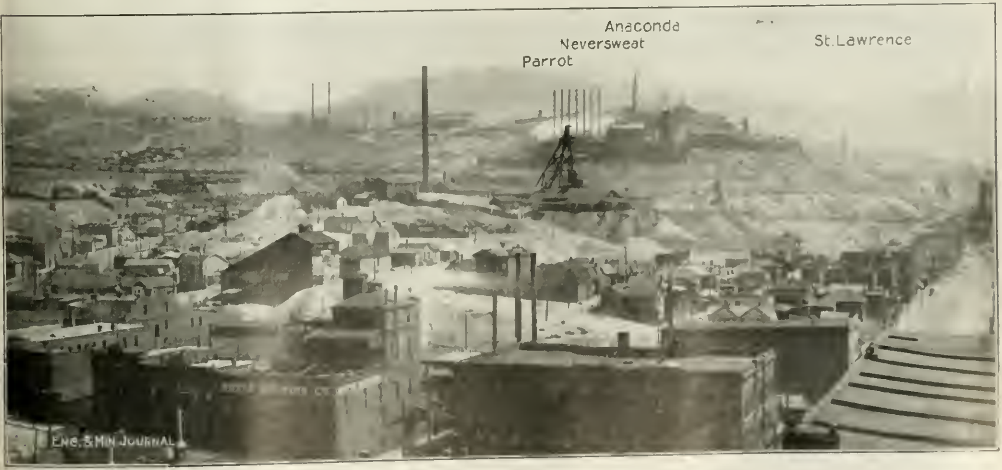
INLAND STEEL CO.'S THOMPSON PIT, CROSBY, MINN.



East Slope of Butte Hill, Looking Westerly



East Slope of Butte Hill, Looking Northwesterly



Butte Hill, Looking East from Hennessy Building

Correspondence and Discussion

James MacNaughton

I notice in the editorial column of the JOURNAL of Sept. 12 some reference to Mr. MacNaughton's testimony before the Congressional Committee. Mr. MacNaughton's attitude all through the trying times which have come to him has commended itself to all of his colleagues, the great body of mine managers who have had so severe and irksome a time in dealing with labor problems in the last few years. It is high time that a good word was said for the men who have had to bear the brunt of the fight popularly dubbed "The war between Capital and Labor." Men like MacNaughton, who are in positions of trust as to the property under their control and feeling their responsibilities to every man in their employ, be he an American or a Slav, deserves some consideration at the hands of the press of the country.

It is difficult to obtain the ear of the editorial sanctum of any of our dailies on questions of this kind. I appreciate that it is a delicate question to discuss, but I am sure the JOURNAL will publish some tribute to Mr. MacNaughton for his stand for the right in the face of tremendous pressure.

The situation in Colorado with regard to the coal strike has been grossly misrepresented by the newspapers of the country, as was the case in 1901 and 1902, when the troubles with the Western Federation brought disaster to the mining industry. I know that all readers of your admirable journal will be glad to hear further from you on these matters. I note the inclosed letter to the New York *Sun*, which seems apropos where the State of Colorado is concerned and the troubles which have followed upon the heels of the coming of the unions to that state.

BENJAMIN B. LAWRENCE.

New York, Sept. 16, 1914.

The letter in the *Sun* to which Mr. Lawrence refers is well worth reprinting. It is as follows:

> You ask: What has become of Colorado? I guess you mean: What is the matter with the state, anyhow? I can tell you something about the trouble out there, if you won't give me away to the rednecks who are making all the fuss in the mines. They don't like me because on one occasion I raised hell with them. It's about this way:
>
> When I first came to Colorado during the Leadville excitement, about '78, Colorado seemed to me as a young fellow from the city, as big as all outdoors and as free and fine a place as any young fellow could strike. The big mountains just seemed to welcome you. Everybody was glad to help, and there was something doing every minute. Why, if you were wandering over the hills and got hungry, having strayed a bit far from camp, all you had to do was to look about for a prospector's cabin or tent, and help yourself. It was considered etiquette to leave some sort of writing behind like: "Your beans is good, but you ain't much on biskit." "Ett some of your chuck, thanks!" signing your name of course. The good old days are past. If you leave a cabin unlocked these days you come home to an empty house.
>
> The mines made Colorado—gold, silver, lead and copper, coal and iron. What's the matter now? Well, first of all, the old time American stock, the pioneers, strong men and women who came to Colorado in the early days, don't live there any longer. The land is all fenced in. The mines are owned by the big fellows. The miners no longer come from Cornwall and Wales; the Germans and Swedes and the Blue Noses (the fellows from Nova Scotia, who were the dandies with the ax in the pine forests, have quit. The miners in these day are Huns and Finns and all sorts of foreigners. They don save up to buy a small farm in the valley, not they! The live in shacks, and send their money to the countries fro which they came, or else they save up and go home an take the money with them and live on it forever after an become big guns in the little villages.
>
> I got to be a mine foreman when I was about 25. Th boys that worked for me called me "the old man" and w were a regular family.
>
> By and by, about 1900, the miners' union got busy in th State, and with the help of the politicians started troubl in the mining camps. The union leaders could do much a they pleased with the foreigners that worked in the mine. and it wasn't long before all the miners in the small minin towns scattered around the mountains had to join the Western Federation of Miners or "get it in the neck." I was superintendent of a mine at that time and told my men the could join the union or not as they pleased, but I wasn' going to stand the union running the mine, dictating ho much a man should do. The fundamental idea of the unio was then "all men are equal as to the amount of work the shall do," meaning that the best man should do no mor work than the poorest and laziest; the pulling down of th good workman to the level of the poorest. To kill all ambition in the good workman was to me nothing short of crime. The union leaders in our camp were men taught b the Haywood type, agitators, not wanting to work themselves, delighting in disorder, baiting capital and sowing th seeds of discord far and wide.
>
> You know what followed: Colorado was plunged i civil war lasting two years. One of my neighbors, a min manager, lost his life. He was shot down in cold blood by follower of Haywood. No jury could be found to convict union man, not much! The people were scared to death The confessions of Orchard give you a true account of th conditions prevailing in Colorado in those days.
>
> Could the industry of mining thrive under these conditions? No coöperation between the enterprising man anxiou to develop Colorado resources and the workman; nothing bu war, and a bitter war. What was the result? The people o Colorado were terrorized. Capital was driven from the stat and from that day metal mining steadily declined in Colorado.
>
> And now comes the coal fight. The same principles are involved; "recognition of the union" is the cry. Turn you property over to us to run, or we won't work. Political claptrap, referendum, recall, put the finishing touches on th prosperity of the state. If it wasn't for the fruit raising i would be a dead one.
>
> I was driven from the State of Colorado by the Wester Federation of Miners after living there 25 years and hav never gone back.
>
> OLD COLORADO MINER.
>
> New York, Sept. 12, 1914.

⁂

Drilling Costs at the North Star

In the JOURNAL of Sept. 5, 1914, under the headin "Drilling Costs at the North Star," are published som tables which give figures taken from an interesting pape read at the Salt Lake meeting of the A. I. M. E. b Messrs. Robert H. Bedford and William Hague. Thes tables, without the paper in full, and without the general discussion on the subject, are likely to create a mistaken impression. One would suppose by glancing at th tables that a comparison has been made between the cos of operating a Water Leyner No. 8 drill and a Waug No. 12. It is plain, however, that there is no comparative test intended, because, in the first place, one machin is a rock drill of the mounted type while the other is a unmounted stoper. In these tests the Leyner drill used for heading work, which means that a larger proportion of the holes are flat and down-holes.

Such work, as everyone knows, is more difficult and is harder on the steel than work, commonly known as stoping, with air drills, which is usually up-hole work, the drills clearing themselves of cuttings during operation. This point has a bearing upon the statement showing the amount of steel consumed and the cost per shift for sharpening the steel. There can be no comparative value placed upon tests of steel cost except when used in the same class of work. Furthermore the Leyner drill was used with round steel, while the stoper used the cruciform pattern. The statement is also made in this paper that 2-in. bits were used with the stopers and 2¼-in. with the Leyners.

Another point worth mentioning is that the Leyner drill (No. 8) referred to is no longer made, it being an obsolete pattern, the present type being No. 18.

W. L. Saunders.

New York, N. Y., Sept. 8, 1914.

⁂

Kimberley Diamonds and De Beers

The article in the Journal of July 18, "Kimberley Diamonds and De Beers," by Frank Conly, needs correction. Mr. Conly evidently did not have a good time in Kimberley and his peevishness over this fact permeates his whole article and perhaps led him into errors.

To begin with, Kimberley is far from being the primitive town Mr. Conly would have us believe. One can hardly call a town with many fine streets, public library, water-works, electric lights, electric street railway, large completely equipped hospital, several fine public buildings, excellent schools, many beautiful private residences, etc., etc., primitive. In fact, Kimberley is the reverse of primitive and is in advance of most towns of 25,000 inhabitants in this country. There are at least four hotels in Kimberley, two of which, the Savoy and the Sanitorium (which is run by De Beers) are first-class. In fact, the Sanitorium, while not a large hotel, is far superior to any hotel in the same class of city in the United States. The average hotel in Kimberley is as good as the average small-city hotel in this country. In 1908, Wesselton mine was rapidly approaching the point where open-pit work would have to be abandoned and as over five years have passed since that time, I venture to say that Wesselton is also at the present time an underground working.

It is not a fact that most of the machinery used is American. With the exception of rock drills, air compressors, electric pumps and locomotives, and the equipment of the central power station, practically everything is of English manufacture.

The discovery that the blue ground crumbled and disintegrated on exposure to the air was practically contemporaneous with the discovery of the blue itself, and this phenomenon was taken advantage of by the earliest diggers.

Mr. Conley's description of the final recovery of the diamonds is sketchy in the extreme. If he imagines that it is vaseline that is spread on the grease tables, a simple experiment of spreading a layer of vaseline on a board and shaking the same under water for a few minutes will show him his error. Vaseline emulsifies with water and flows off with it. Vaseline would also flow almost like water during the hot summer months in Kimberley, and would, therefore, make, *if used alone,* a hopeless medium for the recovery of diamonds.

One would judge that Mr. Conly's statements in regard to the treatment of the natives were based on conversations held with some anti-De Beers crank or cranks. There are many such in Africa with real or fancied grievances against De Beers just as there are many such in every country with grievances against any successful corporation or individual. Africa has as many cheap politicians per capita as the United States.

I challenge anyone to visit any or every mining camp in the world and to find anywhere a more contented, happy, and on the whole more efficient body of workers than the natives and white men employed by the De Beers company.

The term "Kafir" is a general one applied in speaking of the native tribes, and to say that the workers in the mines are Kafirs with a few Zulus, is incorrect. Nearly all the tribes of South Africa are represented at Kimberley. The compounds are models of uptodate sanitary barracks, in which everything is done for the care of the natives, and to make their recreation hours happy. No profit is made by the company's stores in the compounds. Everything is sold at cost, and the native may obtain anything he desires, from a needle to an automobile, at cost in these stores. The minimum contract is three months and no compulsion is used to force the natives to work in the mines or about the company's plant. At most times of the year more natives present themselves at the gates applying for work than are required. They know the conditions and willingly accept them. Whatever tribal laws they may have or dealings with their chiefs are entirely within their own tribal customs and the company has nothing whatever to do with them. The number of wives who gather at the compound gates on pay-day is ridiculously small when the number of workers is considered. I venture to say that 90% of the wives are hundreds of miles away, living in the native krals on pay-day and every other day. There are instances far too numerous to mention of natives signing new contracts at the expiration of the old without even leaving the compound. Many only leave for a week or two and some have lived continuously for years in the compounds of their own free will. Surely this speaks volumes for the treatment received.

The use of the term "slavery" in connection with the compound system is the height of South African political bombast. If it were not for the compound system and the I. D. B. Act, the diamond industry would have a hard struggle for existence.

In conclusion I beg to state I had the privilege of being, for a number of years, an official of the De Beers company, and never during my service with them did I feel that I was under espionage, nor did I have a feeling of suspicion toward any of my brother officers or men. I was never aware of the atmosphere of suspicion which Mr. Conly says exists there. A man is seldom suspected of wrong doing unless there are good grounds for such suspicion. The illustration on p. 124, labeled "Headframe at the DuToits Pan Mine," is the headframe over the rock shaft at Wesselton mine.

John T. Fuller.

Little Rock, Ark., July 21, 1914.

Editorials

Zinc Smelting

The zinc situation of the world, broadly considered, offers some interesting grounds for reflection. These have been brought into prominence by the disturbances created by the war.

Up to a few years ago, the zinc supply of the world came chiefly from a multiplicity of small mines. There were indeed two great districts, viz., the Joplin district and Upper Silesia, which yielded a large tonnage of ore of somewhat uniform character, to which metallurgical practice was adjusted, but even in those districts there was a multitude of small producers with whom negotiations had to be conducted by the smelters to secure their supply of ore. Especially was this the case of the Joplin district, where it has never yet been possible to introduce the contract system for the buying and selling of ore except in a sporadic way.

Outside of these two districts, however, the smelters had to contend not only with obtaining ores in relatively small quantities from many sources, but also with ores of widely different qualities. This involved great skill on the part of the smelters in compounding their furnace charges, and created a more or less different smelting practice in almost every smelting works. We are now speaking especially of European smelting conditions. In America there was also a difference in smelting practice, but it was a difference by districts rather than by works until the Rocky Mountain ores began to be used.

In Europe there happened a great change a few years ago when the successful development of the flotation process enabled the Broken Hill blende to be offered in huge quantity. This ore supply was furnished by a few large mining companies, which were just as anxious as the smelters to put the zinc business upon a steady basis. They were able to employ all the metallurgical advice they needed and knew respecting the cost and profits of smelting as well as the smelters themselves, but they recognized that the smelters ought to realize a liberal profit and they were willing to contract their ore upon such terms for long periods.

The result was that an ore supply furnishing a large proportion of the world's supply of spelter was shipped from Australia to Germany. Introduced into Germany by the great metal houses, it was by them parceled out among the several smelters and became the basic supply of nearly all of the works of Germany, and many of those of Belgium. The smelters have mixed with the Australian ore such other ore as they could obtain so as to make furnace charges to their liking, but in the main the German smelters in recent years have been operating upon the basis of a uniform charge and a uniform smelting practice. It is next to needless to say that this has promoted peace of mind and metallurgical efficiency and has been due to the large and regular supply of Australian ore.

Since the beginning of the war, the German smelters have been unable to take in this ore and the mines of Broken Hill have had to shut down. Their owners naturally began immediately to seek other outlets and, of course, turned to the United States. It is probable that arrangements will be made to bring some of this ore here, but the negotiations are greatly hampered by our tariff restrictions, which not merely impose a duty on the zinc value of the ore, but also a specific duty of ¾c. per lb. on the lead content thereof, although the zinc smelters cannot expect to recover more than five-eighths of the lead content of a zinc ore.

In the meanwhile there is a very serious consideration in Great Britain of an enlargement of the small zinc-smelting industry of that country. It is pointed out that Wales was the original home of the zinc-smelting business, that Welsh coal has been supplied to continental smelters, and that it is British mining companies that are concerned. We referred last week to the project of increasing the zinc smelting of Great Britain and remarked upon the long time that would necessarily be involved. Of one thing we may be sure, however. Great Britain is going to take advantage of the plight of Germany to grab every one of her industries that she can. Her only competitor will be the United States.

The United States also is building great hopes upon expanding her export trade, and doubtless will succeed in doing so, but she finds herself continually running against handicaps imposed by former legislation. One of these is our antiquated navigation laws, kept on our books at the behest of the labor unions, which are the real reason that has prevented the upbuilding of a merchant marine. Another is our tariffs, which handicap our importing. If we are going to export we must import too. Our whole system has been designed to help the producers of natural products rather than to promote manufacturing and the competition in world markets.

The zinc situation is of particular interest. The existing smelting capacity of the world is ample. America at least has a surplus. If England builds while the American surplus remains unused, there will be a waste of capital. But here the American tariff on zinc ore is a stumbling block. Perhaps Australian ore can be imported and smelted in bond, inasmuch as we are bound to supply England with spelter, but we have no seaboard smelteries. No doubt Clarksburg, Meadowbrook, Langeloth and Palmerton, situated in spelter-consuming districts, can take in foreign ore, but if the spelter therefrom has to be sent back to the coast for exporting, there would be double freight. If the Pennsylvania-West Virginia works could take in foreign ore and supply the Ohio Valley and Eastern markets, while Oklahoma and Kansas supplied England via New Orleans, there would be no waste, but our provisions for smelting in bond could hardly be managed to effect such a thing. Thus we find ourselves handicapped in seizing a business which we probably could keep if once we secured it. Nevertheless, it is likely that we shall see some Australian ore brought into this country in spite of all.

The Study of Rock Drilling

The question of rock drilling is one of continual interest and one about which much remains to be studied. The relations of the many factors influencing the efficiency of a drill are only imperfectly understood even by experts, and scarcely at all by the ordinary drill users. We fancy that some of the results described by Mr. Bergh in this issue will be a surprise to most of our readers, as showing what unsuspected effects will follow changes in certain small points of design.

The drill user is concerned with the drilling speed of his machine, its air consumption, its cost, its life and the cost of repairs; he ought also to be concerned with its drilling speed and its air consumption after it has been some time in use, but he frequently overlooks these points. The performance of the drill in these particulars is influenced by many factors, such as the size and weight of the hammer, the length of stroke, the type of valve action, the pressure of the steel against the rock, the fit of the parts, the manner of removing the cuttings, the size and design of bits, the air pressure, the presence or absence of an anvil block, together with innumerable other features, and especially does it depend on the character of the rock. This last variable is by far the most important; in fact it appears to make the problem insoluble. It hardly seems worth while to standardize designs in order to get the most efficient drill, when all calculations will be upset by a slight change in the character of the rock. Yet such a study as this of Mr. Bergh's while not determining the ultimate design for all hammer drills, may have the result at least of eliminating designs faulty under all conditions and of clearing up many points in the operation of the machine.

The material in the article was first published in the *Jern Kontorets Annaler*, Oct. 15, 1913. It has been condensed, the Swedish text translated into English, and the metric figures into English units; this latter change accounts for the fact that many of the figures are not given in round numbers. Tests of this kind are carried on in this country; it is regrettable that the results are not more often available for publication.

In regard to the tests themselves, it will be noted that there are two American drills in the list, and that these stood up well by comparison, in spite of the fact that they were a year old and would not today be the latest model, while their type, the valveless, is supposed to have its efficiency most seriously impaired by wear. It may be stated that a drill working as well as these did after a year's use is a mighty good drill.

The Atlas machines, which were most numerous among those tested, were described in the JOURNAL, June 6; they have lately won favor and created a mild flurry on the Rand. The Flottmann is a well known German machine, also used on the Rand.

The gage pressures used were in general rather low compared with the nominal gage pressures used in this country, but it is not unlikely that the latter are not so high in actual practice as supposed, due to excessive friction in small pipes. The air consumptions look low, as compared with catalog figures; since the tests were accurately conducted, however, it seems likely that catalog figures on air consumption are not so understated as is popularly supposed.

A point of design, original so far as this country is concerned, is the use of a cuff, or gasket, in the front head, to prevent leakage of air. This is particularly useful when no anvil blocks are inserted, as was the case in the tests described, inasmuch as the anvil block itself prevents a good deal of leakage. The cuffs, we understand, cost about $\frac{1}{3}$c. each, and will last about two shifts. If the men can be persuaded to use them, they are an excellent investment; compressed air is an expensive fluid. The question of anvil blocks has been about decided in the affirmative in this country. They probably reduce drilling speed somewhat, but they eliminate shanking the steel, an expensive and often weakening operation.

In Table II the efficiencies of the machines, based on drilling speeds and air consumption, are set forth. This is the accepted way of rating a machine. To our mind it is not the right way, since it makes the air consumption of equal value with the drilling speed as a criterion, whereas the air consumption is really of minor importance. A machine drilling 10 in. per minute on 50 cu.ft. of air gets the same rating as one drilling 20 in. per minute on 100 cu.ft. of air; with labor paid from $3 to $4 per shift, as against compressed air costing, say, $1 per shift, any superintendent would choose the faster drill, other things being equal. The efficiency of a drill is relatively unimportant, it should be considered a tool and not a machine; its desirable features in order of importance are fast drilling, handiness, sturdiness, economy of air, and low first cost.

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Welfare and Wages

To those of our readers who want a bit of interesting autumn reading, we would prescribe Part IV of the report of hearings held before the Congressional subcommittee which investigated the recent strike in the Michigan copper country. Part IV covers chiefly the testimony and crossexamination of James MacNaughton, manager of the Calumet & Hecla, and presents the most complete account of the operations of this company that we have seen; the Calumet & Hecla has always been notably reticent with technical information.

One thing stands out clearly in the report of proceedings, namely, that Mr. MacNaughton was an unusually fine witness, explaining everything clearly and in detail, and answering questions with a manner excellently compounded of good nature, frankness, temper and wit.

At the time the committee began its investigation, there was a good deal of criticism to the effect that it was a foolish move on the part of the government, inasmuch as there was nothing to investigate, and only trouble would be caused by such interference, but, judging from the reports of the hearings, the committee itself did its work in an intelligent and businesslike manner. The members were impartial and fair in general, although Congressman Casey was frankly on the side of the employees; we believe he is called the "coal-miner congressman." Among the others, Chairman Taylor, from Colorado, seemed to have had some previous acquaintance with mining, and the other three members must have felt that they had some acquaintance therewith before the hearings were over. In fact, the investigation was a liberal first course in mining for the Congressmen concerned, and one cannot but envy them their opportunity.

The JOURNAL has published some short articles based on Mr. MacNaughton's testimony, and will publish others. There appears in this issue a rather detailed account of the activities of the company in looking after the well-being of its men and the community in which its properties are situated. We are of the opinion that the liberal policy which the officers of the Calumet & Hecla pursued in this respect was inspired both by commercial and humanitarian motives. The company probably believed it paid to have its employees and its employees' families healthy, well educated and protected against poverty following misfortune. It probably did pay, but we must hand it to Boston that its citizens have often been inspired by a considerable real sense of responsibility and duty toward the less fortunate.

From the figures given, it does not appear that copper-country wages were so low as has been generally supposed. They were lower, however, than those prevailing in a typical Western camp, Butte or Bisbee or Tonopah, and while living expenses were proportionally lower, the absolute margin of saving was also lower. In fact, the policy of the C. & H. was excellent treatment and moderate wages. It was an eminently successful policy for many years. It is a policy, however, that makes small appeal to the more Americanized and independent Western miner. Such a one prefers to get all the money he can and spend it as he pleases. He detests deductions from his pay checks and has little appreciation of hospital facilities, good schools, libraries, pensions and insurance. It seems not unlikely that there was enough of this feeling among the C.&H. employees to aid perceptibly the Western Federation in its efforts to start trouble.

Mr. MacNaughton testified that he considered himself more or less of a socialist, and the policy of his company has embodied many principles of socialism. It was distinctly paternalism, and between paternalism, socialism and communism, and many other plans for the control of the world's wealth, the man-in-the-street can no more distinguish clearly than can the sponsors of the plans themselves.

The tendency toward paternalism is marked in our industrial life today, which has run its course from the small privately owned and managed concern, where the manager had personal acquaintance with his men and took a friendly interest in their affairs, through the large impersonal corporation which paid no attention whatever to its employees outside of working hours, until it has arrived now at the intelligently and humanely directed corporation, which assumes control over the health, diversions, education and religious instruction of its employees, their personal habits, domestic economy and provisions for old age. The Pennsylvania R.R. and the Steel Corporation are examples of the tendency in other industries, as the Calumet & Hecla was in mining. We do not propose here to argue the merits of this system; there is much that may be said both against and for it.

The Calumet & Hecla was distinctly what the miner calls a "home" mine. Its men were married, for the most part, and were firmly settled in the district. The company at the time of the hearing reported in its employ 1660 men, who had been hired between 15 and 45 years ago, and 344 of their sons. The total number of sons of employees or of former employeees working for the company was 1352; of grandsons, 56; of daughters, 25, and of granddaughters, 3. The Homestake in the Black Hills and the mines in Grass Valley, Calif., are also "home" mines, where, however, the companies do not so much concern themselves with their employees' doings outside of the mine.

It would be interesting to know how much this welfare work of the C. & H. cost the company per man per day and whether the same amount added to the men's wages would in the long run have pleased them and have profited the company more or less. It is certain that the region around Calumet would have been a much less pleasant place in which to live.

BY THE WAY

The Calumet & Hecla Mining Co. during the panic of 1907 did not find it necessary to use scrip. Mr. MacNaughton, testifying before the Congressional Committee, said that his company bought gold and distributed it among the banks in Houghton County in order to meet its payroll. During the entire period of the panic the men were paid in cash.

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While the discussion on the subject of what becomes of all the mining engineers has been closed, Wayne Darlington, of Philadelphia, suggests that the reason this discussion ran to such length was the absence of a satisfactory definition of a mining engineer. So many elements enter into his makeup that Mr. Darlington's definition, presented below, ran into four stanzas. This may not seem too long when one recalls that a famous poet required just as many to define a "man." So, why should this be considered too great a length for defining a mining engineer? Who is prepared to say that he is less than a man? Mr. Darlington's poem is really an abridged definition, for it has not given all of the mining engineer's actual requirements, to say nothing of his accomplishments; most everybody will note the absence of any reference to "yellow leggings" and the "leather coat," but those things are so elementary that they hardly need be mentioned.

THE MINING ENGINEER

(With humble apologies)

If you have been to any school or college
And possibly have got a sheepskin, too;
If you absorbed a fair amount of knowledge,
Or knowing not can look as if you do;
If you can run a survey like a "civil"
And analyze an ore by wet or dry;
If you can build with neither square nor level
And lay out towns with just the naked eye;

If you can wear your dress suit, sack or jumper
And look at ease in each one just the same;
If you can take the job of "Supe" or pumper
Or any other man that quits the game;
If you can set a bone and tie up sinews,
Or later preach a sermon for the dead;
If you can talk like Webster, Clay or Depew
And turn a dinner table on its head;

If you can go to some dead far-off land-end
And see its glorious future from the start;
If you can stick through troubles till the grand end
And never lose your patience nor your heart.
If you can run a buck-saw or a kingdom,
Or turn a petty monarch inside out;
If you are there to see the final thing done
That justifies the blows you dealt about;

If you can hold a board of cross directors
In happiness against their ganzy schemes;
If you can dodge the wrath of the electors
Till dividends will flow as in their dreams;
If you can make a mine pay from the grass roots
No matter what the time or place or year;
Then on my soul until the final blast shoots
We'll add the title "MINING" when we call you
"ENGINEER."

PERSONALS

Donald F. Irvin sailed from Boston this week for Costa Rica.

Lindon W. Bates has gone to Alaska to make an examination before returning to Brazil.

Anton and Karl Eilers returned to New York last week. They were in Munich, Germany, when the war broke out.

W. M. Drury, manager of the Mexican mines of the American Smelting & Refining Co., is in New York for a few weeks.

Theodore J. Hoover, who has been in California, is spending a few weks in New York before returning to London.

F. Lynwood Garrison was in Seattle, Wash., last week, having just returned from Nome and the Kotzebue district in Alaska.

J. Parke Channing was operated upon for appendicitis on Sept. 18. The operation was successful and recovery is progressing favorably.

J. W. McAlpine, president of the United States Copper Co., at Hanover, N. M., is in Milwaukee, Wis., attending a meeting of the stockholders.

Morton Webber is making an examination of the McIntyre mine at Porcupine, Ont., on behalf of the Nipissing Mining Co., the prospective purchaser.

H. H. Stoek, head of the department of mining in the University of Illinois, who was in Europe when the war broke out, returned Sept. 9, to Urbana.

Percy Wilger has been appointed professor of civil engineering in the Queens School of Mining, Kingston, Ont., to succeed the late A. K. Kirkpatrick.

Prof. H. S. Munroe is now at his summer place in Litchfield, Conn. He is still far from well and does not expect to be able to return to New York until the middle of November.

J. W. Astley, who has been examining and reporting upon some of the Pacific Coast mining districts for the British Columbia government during the summer, recently returned to Toronto. He left New York Sept. 23 for England.

Evans W. Buskett has purchased the Petraeus assay office at Joplin, Mo., and is prepared to make analyses of zinc, lead, gold, silver and copper ores and metallurgical products. Mr. Buskett has had a number of years' experience in assaying and metallurgical work.

Robert E. Cranston, consulting engineer with Breitung & Co., has returned to San Francisco from an extended professional visit in Colorado. He made a number of examinations including mines at Telluride and Cripple Creek. Development was undertaken on the Last Dollar at Cripple Creek, where a 400-ft. shaft is contemplated.

The wide publicity given to the death of James B. Haggin and the fact that he was probably the last of the California Forty-niners has called out several of his colleagues in that early rush. Among others, John Colgate, of Townsendville, N. Y., now 87 years old, sailed from New York for California in 1849, but did not reach San Francisco for nearly a year, the vessel on which he was, having been nearly shipwrecked, and having to put into Rio Janeiro, for repairs.

J. C. W. Chipman, who for the last 25 years had been chief clerk for the United States Steel Corporation on the Marquette range, has retired and has been placed on the pension roll. Mr. Chipman had been eligible for a pension for upwards of a year, but was prevailed upon to remain at his post. When the company began reducing its working forces, he decided to make room for a younger employee. Mr. Chipman came to the Lake Superior region from Boston a quarter of a century ago. The company has never had a more capable or more popular official than he.

OBITUARY

A party of eight members of the ill-fated Stefansson expedition to the Arctic region, who were marooned on Wrangel Island, have been rescued by the United States revenue cutter "Bear." Among those who died on the island was George S. Malloch, chief geologist of the expedition, who succumbed to an attack of nephritis. Mr. Malloch was born in Hamilton, Ont., in 1887. He graduated from the Kingston School of Mining, and in 1906, joined the staff of the Canadian Geological Survey. He spent several years in exploration work in the coal regions of Alberta and British Columbia and then took a post-graduate course in geology at Yale University. He joined the Stefansson expedition as chief geologist and topographer.

J. P. Evans, vice-president and general manager of the Colorado Iron Works Co. of Denver, died at his home in that city, Sept. 13, after a short illness. He had long suffered from asthma, but contracted pneumonia a few days before his death. He was born at Zanesville, Ohio, in 1860 and went to Denver in 1881. He engaged in railroad work there and became auditor of the Denver & Rio Grande Express Co. In 1895 he resigned and joined the Colorado Iron Works Co., with which he had since remained. He was active in furthering the advancement of the organization and in the study of milling and smelting methods. He had many friends in mining and machinery circles. He was a prominent Mason and a member of the American Institute of Mining Engineers. He leaves a widow and one daughter.

SOCIETIES

American Mining Congress—Notice has been given from the secretary's office that the 17th annual session will be held at Phoenix, Ariz., Dec. 7-11. The convention will be composed of members of the Association, especially invited guests and delegates appointed by various official bodies as at previous meetings. The meeting of the incorporated body will be held Dec. 8 for the purpose of electing directors. An effort will be made to have the leading papers to be presented printed and distributed in advance, as was done at the Philadelphia convention last year. As that convention was largely devoted to coal mining, the present meeting will naturally pay more attention to gold, silver and copper mining; but the general subjects of mining investments, mining law, safety, taxation and the labor question will not be neglected.

American Institute of Mining Engineers—The Pittsburgh meeting will be held in Pittsburgh, Oct. 8, 9 and 10. Headquarters will be at the Hotel Schenley. Besides several excursions to works in and about Pittsburgh, several technical sessions will be held, one of which will be a general session, at which papers of general interest will be presented, including an exhibition of safety methods in mining, provided by the Bureau of Mines. The remaining papers will be read in separate sessions of the committee on petroleum and gas; the committee on electricity and miscellaneous mining topics the committee on iron and steel; the committee on coal and coke, and the committee on non-metallic minerals. A number of interesting and valuable papers have been prepared for this meeting.

INDUSTRIAL NEWS

The Deister Machine Co. at Fort Wayne, Ind., has moved into a new factory, so that office, foundry and factory are now altogether.

The Gun-crete Co., of Chicago, announces that it has purchased all the rights, titles, contracts and interests of the Cement-Gun Construction Co. and also the construction department of the General Cement-Gun Co. The firm name of Cement-Gun Construction Co. will be used, with offices at 914 South Michigan Ave.

At the meeting of the Engineers' Society of Northeastern Pennsylvania on Sept. 24, a series of industrial motion pictures will be presented illustrating the manufacture of National pipe from iron ore to finished product. There are three films, prepared by the National Tube Co., presenting the iron-mining operation on the Mesabi range, the transport to the furnace, and production of pig iron, steel and the finished pipe.

The Hoover Steel Ball Co., of Ann Arbor, Mich., has begun the erection of two new buildings, 40x156 ft. and 40x200 ft., which will be devoted to the manufacturo of high-grade balls of steel, brass and bronze, formerly imported largely from Germany and other foreign countries. The daily output of the Hoover plant will be brought up to between six and seven million balls, and ball-bearing manufacturers who have had their supply cut off by the war will be able to obtain their requirements from this source The company uses imported material exclusively, but reports a sufficient stock on hand to last 18 months

Editorial Correspondence

SAN FRANCISCO—Sept. 16

Large Investors in California Mines naturally take exception to a statement in this department Sept. 12 to the effect that such investors have repeatedly declined to make any cash payments. This was an error of omission. This is what the copy said and what should have been printed: "Large investors in new and old mines in California have repeatedly declined to make any cash payments in advance of development."

The Available Supply of Sodium Cyanide for the treatment of ores in California, at the middle of September, is equal to the essential requirements of the larger mines for the remainder of the year 1914. This is the opinion of men qualified to speak intelligently. This available supply includes shipments delayed in Mexico, which it is believed will be safely transported over the Tehuantepec line. It is not probable that any of the mines now operating, with cyanide as an agent in the reduction of ores, will be closed down for lack of cyanide; but as there is likely to be a gradual increase in price there are some properties, prepared to operate with cyanide at the price obtaining at the time of the outbreak of the European war, that could not stand a rise of 4 or 5c. There are perhaps other properties that could stand the rise in price, but new installations at such mines will probably be delayed until there is assurance that the supply will not be long curtailed, or that its manufacture may be early established to provide the requisite supply without further interruption to the industry.

Bureau of Mines Rescue Car Number Five made its first visit in California at Colfax, Placer County, Sept. 9, where it was scheduled to remain until Sept. 19 and whence it was to proceed to the Mother Lode region, visiting Jackson, Angels Camp, Melones, Jamestown. Returning to the Eastern states in November, the car will stop at Kennett, Shasta County. During the entire itinerary in California the car will be moved over Southern Pacific tracks without cost to the Federal or state government. This arrangement was made personally by W. R. Scott, general manager of the Southern Pacific. The work of the car is under the general direction of H. M. Wolflin, mining engineer, in connection with his duties as mine inspector for the California Industrial Accident Commission. Mr. Wolflin has visited all the districts included in the itinerary of the rescue car as well as a number of other districts and found that wherever he introduced the subject of mine rescue work both operators and miners were in accord with the idea of Federal and state coöperation in training men to first-aid work. Many of the larger mines are equipped with modern appliances and have trained men. But they recognize the value of technical instruction and practical demonstration founded upon uniform methods. The equipment of this car includes ten 1910 Draegers, one Fluess "Proto," one Westphalia artificial breathing apparatus, with pump and supplies. There are also supplies of first-aid materials, stretchers, fire hose, hand fire extinguishers, rope, crowbars, and other essentials. The car is a remodeled sleeper, and the upper berths have been retained for the purpose of making practical use of the car as an emergency hospital. In connection with this work Mr. Krogdahl conducted a first-aid field meet at Jackson on Labor Day when a number of teams in the Mother Lode region competed for prizes given by the American Mine Safety Association and mine operators and miners.

BUTTE—Sept. 17

In the Labor Troubles, the past week saw no startling incidents. The preservation of order by military authorities created a feeling of comfort and safety which the citizens appreciate in a high degree. Only praise is heard for the tactful manner in which the militia has conducted the city and county affairs.

Muckie McDonald and Joe Bradley were arrested Sept. 9 in a rooming house in Butte by Major Donahue and Marshal Conley, and without offering resistance were escorted to the county jail to await trial. The prisoners had returned to the city a few days after their flight and were in hiding when apprehended. McDonald declared he had no intention of fleeing and had merely gone on a hunting trip. Hearing he was wanted, he returned with the intention of giving himself up to the civil authorities as soon as the militia had withdrawn. It is said both men will be tried on the charge of openly preaching defiance of authority, of inciting riot and of participating in the deportation of miners.

The question as to whether the military had the right to assume jurisdiction was ventilated in the Federal court before Judge Bourquin. He finally declared he was without jurisdiction since it was shown that the prisoners were being legally detained in accordance with the proclamation of Governor Stewart. An appeal to the Supreme Court resulted in writs of habeas corpus directing the military authorities to produce the bodies of the prisoners, including McDonald and Bradley.

So far the two miners' unions have made no open attempts to interfere with the plans of the companies. Through the daily papers both gave notice to their members that they must desist from all acts of violence and assist the authorities in power to the best of their ability in maintaining order and enforcing the law.

The beneficial effect of closing the saloons is realized by the members of the unions as much as by the citizens, and petitions signed by both unions and by a large number of citizens have been submitted to Major Donohue, expressing emphatic opposition to the opening of the saloons recently granted by the major. Permission was given with the understanding that it would be withdrawn the moment such opening should prove to interfere with the maintaining of order.

By an order of the district court, Mayor Duncan and Sheriff Driscoll were directed to appear Sept. 15 and show cause why they should not be removed from office for failure to enforce the laws and maintain peace and order.

The distribution, Sept. 14 of boycott circulars throughout the city led to the arrest of Robert Noble, a socialist and a member of the old jurisdiction committee of the Butte Mine Workers' Union, who was found to be responsible for their printing and distribution. The latter contained the names of merchants and business men who, some time ago, refused to sign a petition asking that troops be stopped from coming to Butte. It was evident that the circular was aimed as a boycott, and it was undertsood among the members of the new union that the men who did not sign the protest should not be patronized. John Doran, the new president of the union, when interviewed about this matter, promised that all circulars would be called in and that no attempt would be made to print and distribute more of them.

On Sept. 15 Daniel T. O'Regan, attorney for the United States Commission of Industrial Relations, arrived in Butte from Washington, D. C., and reported at the military headquarters where he was assured of every assistance in collecting data on present conditions for a report to be submitted by him to the Washington authorities.

The business men have decided to make Butte in all respects an open town, although action may not be taken until the troops leave the city. This necessity has been brought about by the labor unions themselves. Next to the disrupted miners' unions, the most autocratic of labor organizations has been the plumbers' union. The plumbers established a strictly closed town against all outside plumbers, even if they carried international union cards, and they raised their own wages until now they are getting $12 per day; they established a national boycott against any manufacturer of plumbers' supplies who furnished material to any person in Montana not having the endorsement of their union. This fine piece of work attracted the attention of Washington, and the facts have been investigated with a prospect that criminal action under the interstate commerce law may be brought. The action of the plumbers resulted in a revocation of their charter by the international union, and a new organization was established by the national officers, but other local unions refuse to recognize it. Nearly all other local branches of international unions have recognized and approved the Butte Mine Workers Union, which itself has been repudiated by the American Federation of Labor and the United Mine Workers, so that the action of the local unions has, or will, cut them loose from all international or national affiliation and backing. This gives ample justification on the part of mining companies and employers generally to cut loose from them. The plan is to adjust wages in Butte to conform somewhere nearly with what the miners are paid.

DENVER—Sept. 18

The Colorado Power Co., which owns the extensive hydro-electric generating plant above Glenwood Springs and transmission lines across the state to Denver, finds it has more power on hand than it can market. Through its sales engineer, Harold Frodsham, the company is offering attractive rates to metallurgical concerns with the intention of inducing such companies to introduce electro-chemical and electro-metallurgical processes to supersede those older processes that utilize other forms of power or fuel. Special attention is being given first to the Leadville district. The power company may there equip a complete laboratory in which miners and metallurgists may experiment on their ores with electric methods.

LOS ANGELES—Sept. 16

The Luning Mining District, Mineral County, Nev., embracing Luning and its copper prospects, is continuing to develop in spite of the demoralized copper market. The development is due to the perfecting of the leaching system which will treat the ores of this region by cheap methods. It has been indicated that ore can be treated profitably with copper at 7c. This taken with the fact that the problem of saving the gold and silver has been solved, makes the outlook for the future of the camp a bright one.

The plant for leaching copper ore installed by the Wagner-Azurite company has overcome the neutralization of the acid by the lime content of the ore and is a success. This company is still sinking and is in a high-grade sulphide deposit that will average 4½% copper and is 43 ft. wide.

The Luning Idaho Mining Co. in continuing its working tunnel, has just cut some stringers indicating the proximity of the ore on which the shaft is sunk. Last month this tunnel cut 18 ft. of high-grade copper ore, carrying some silver, probably the best showing in the camp at this depth. This property lies to the south of the Giroux ground where a revival in development has taken place; this means much for the camp, as the company has been reorganized and a large sum of money raised to develop the property.

The Alameda Mines, controlled by Spokane capitalists, is getting ready to begin work on large holdings to the south of Luning. The position of this ground and the large size of the deposits of low-grade copper, with the fact that there is ample water, makes the erection of a leaching plant on this property a possibility in the near future. There is a rumor to the effect that the company is perfecting plans for a plant along the lines of the Nevada Douglas plant at Yerington.

The numerous other properties of this section are all beginning to look up because of the possibilities of leaching. The Luning conditions are particularly adapted to the leaching process, not only for the oxide ores, but for the sulphides; while it should also be possible to save the gold and silver economically. Salt is procured at a moderate figure at Sodaville, 12 miles distant, and for roasting, the coal at Coaldale can be obtained at a low price. From the sulphide ores which would necessarily have to be roasted, undoubtedly sufficient sulphuric acid could be obtained to carry on the leaching. Thus the essentials for this process can be procured economically. Finally there is water in abundance.

SILVER CITY, N. M.—Sept. 16

The Hanover Mining District, in the Santa Rita section of Grant County, will probably double its output during the coming year, the causes being the acquisition of sulphide-zinc claims by the Empire Zinc Co., which should cause the construction of an ore-treatment plant, the blocking out of bodies of carbonate ore in the company's old workings, the demand for the high-grade iron ore from the Brockman, Bessemer and Penrose holdings, and the development of several large copper and zinc properties. The Hanover is the only district in this section that has not been seriously affected by the European conflict. Shipments of zinc and iron ore continue.

JOPLIN—Sept. 18

New Interest in Prospecting has been shown throughout the district following the revival in ore prices. A good deal of activity has developed in the old Belville camp west of Joplin. A company has just completed the sinking of a shaft into ore on the B. M. Robinson land, where at a depth of 110 ft. one of the old-time runs of soft ground ore has been found. The drilling showed ore from 110 to 136 ft. and the shaft is now down into 12 ft. of high-grade blende. On the Crazy Horse lease another good strike of ore has been made but at a much shallower level. Here at a depth of 90 ft. ore of excellent quality was found in soft ground. The shaft is down and drifting is under way. On the Geronimo L. & Z. Mining Co. tract drilling operations have recently developed some good ore from 90 to 135 ft. in soft ground. On a part of the ground still shallower ore was found and this has been leased out to small operators who are now sinking shafts. Here on three tracts in an old camp there are ready for production several leases which will add materially to the output within a very short time.

In the same camp but a considerable distance northward, O. W. Sparks, of Galena has developed a run of ore on what is known as the Locke tract. Out of seven holes put down five showed good ore. An old shaft on the ground was utilized and a drift started out at the proper level to intercept the run. This has been carried far enough to show that the ore is good and another shaft is now being opened up to get ventilation. Preparations are now being made to build a mill on the lease.

Interest is also being taken in the drainage of old tracts, and the working of lower levels, particularly in the old Galena camp where two such ventures are now under way. The old Luscombe Forty just west of the city has been taken over by a company of men which is now pumping out the ground preparatory to handling it at much lower levels than previously. Drilling has shown ore to exist 40 ft. below the floors of the old working level at 100 ft. and with the present price for ore this can be worked profitably. One company on an adjoining tract did this all spring and summer, even with the prevailing low prices paid for concentrates. Still another concern is planning the drainage and working of the New Century tract farther southwest. Both of the old tracts have been heavy producers at the upper level with ores handled by hand jigs or small mills. With larger plants and with much better equipment the new operators feel that there is a chance of profitable operations in the heart of this old camp during the next few years.

There have been renewed rumors of the drainage of the Homestead tract at Carterville, but no definite announcements have as yet been made. This is the tract which F. C. Wallower has tried so long to get under way, without having been able to get the coöperation of adjoining land owners.

In the Miami field activities are noted on every hand. Along Tarr Creek some remarkable strikes have been made and effort is being exerted to get plants upon the new prospects before the winter season sets in. So far only Barnes & McConnell have got their mills done. Frickleton, Marcum & Onstott who have opened up what is acknowledged as the richest deposit in that field are now seeking a mill to move upon their lease. While developing their shaft and doing the preliminary drifting, sufficient ore was placed upon the dumps to mill out 800 tons of clean concentrates, according to the estimates of all those who have examined the property. About half of the ore is lead and the other half blende and both are of high grade. It is estimated that the ore will carry from 25 to 35% lead and zinc. While sinking the shaft and doing the drifting the company has continued its drilling operations. Hole No. 11 has been completed and every hole has shown ore at the 220-ft. level, while seven of them have shown ore at the 125-ft. level which is the one at present being opened up by drifting. The company has a 40-acre lease.

On the Chubb land still farther north Amos Freeman, of Joplin, has developed a property to the point where a mill is required. A plant has just been purchased and will be moved at once. This mill will be located upon what is known as the Tarr Creek group.

Southwest of these leases lies that of Thos. Goodwin who has just completed a milling plant; this is now turning out its first concentrates. This mine is also developing its upper level first. Still farther southwest, almost at the end of the camp, O. W. Sparks, of Galena has brought a mine to the point where a mill is needed and one will be erected within the next 90 days. The mine is well opened up and hand jigs have been used during development work. Besides these properties there are a number of drill rigs at work over the field, especially in the northern end of the camp. Some good strikes have been made and the area of productive territory has been extended about three miles north of the early limits of the Hattenville camp.

TORONTO—Sept. 19

The Report of the Ontario Bureau of Mines for the first six months of the current year shows a falling off in mineral production. The total output was $160,078 less than for the same period of the preceding year, but it is expected that the Porcupine mines will show an increased production in the immediate future. Silver showed a decrease in value of over $600,000, but this was anticipated in view of the reduction at some of the mines and the smaller price received for bullion. While the nickel-copper mines showed an increase for the first six months, the present production is much less than formerly on account of the inaccessibility of the European markets.

The Mining News

ALASKA

THE SEATTLE ASSAY office received $1,509,776 in gold bullion on Sept. 10, $500,000 from southeastern Alaska, $500,000 from Yukon River points, $110,320 from the Iditarod, $45,000 from Fairbanks, $292,856 from Nome and $61,600 from British Columbia.

RUBY CREEK—Union Construction Co., of San Francisco, is contemplating installation of dredge on their property in this district next spring. Walter Johnson making examinations.

MIDAS (Cordova)—Granby company hoped to have mine producing by mid-summer but delays in deliveries and poor metal-market conditions made this impossible. Probable limited operations will begin in late October or November.

CHISANA—Stated gold output for seasons will total $400,000 by H. Waller, U. S. mineral surveyor. Charles Rang credited with taking out about $40,000; Carl Whitham, about $20,000; James Hamshow, about $150,000. Excitement caused by location of good pay on 11 and 12 Upper Bonanza; said to run about $1.50 to the foot.

BROAD PASS—Reports of great strike continue. Several prospectors returned with samples said to assay high as $250 per ton. Trail being constructed by Government engineers from Broad Pass to Susitna, and number of prospectors will go in for winter.

ANDREAFSKI DISTRICT—First gold of season to arrive in Seattle freh here came recently on steamship "Senator" Initial production of this, one of newest gold fields, came in poke containing $8000 of coarse gold. Was mined on Disappointment and Wilson Creeks. Marshall City is shipping point for new diggings, of which little has been heard anthentically as yet, though reports come that outlook for thriving camp is promising.

CALIFORNIA

Amador County

SOUTH EUREKA (Sutter Creek)—Sixty stamps dropping regularly. Reported dividends will be shortly resumed.

SOUTH JACKSON (Jackson)—Prospecting work on 350-ft. level shows encouraging results. Large orebody opened on south drift, value not yet determined.

Butte County

DYER (Chico)—Installation of machinery purchased from a Forbestown mine completed. New Huntington mill nearly ready.

Calaveras County

HEXTER (Mokelumne Hill)—Main tunnel now in 3100 ft. with 100 ft. of channel exposed. Air shaft being constructed to connect present workings with surface. Underground haulage will be electric.

Eldorado County

PACIFIC (Placerville) — Grass fire threatened surface works, extinguished before much damage was done.

TIP TOP (Sunland)—Suit instituted by Reno, Nev., bank to recover $5949 alleged due on promissory note given by mining company.

BIG CAÑON (Shingle Springs)—Operations resumed following temporary shutdown. Mine unwatered, development will proceed.

BUMGARDNER (El Dorado)—Strike reported from this former producer. P. J. Loveless and W. H. James recently purchased mine and started development work. Small mill installed and new pipe line contemplated. Old vein recovered at depth of 150 ft.

Kern County

PARLOW (Loraine)—Last cleanup netted three bricks weighing 113 lb. gold and silver, valued $15,000 to $18,000. Result of 15 days' milling.

Nevada County

FOREST FIRES menaced mining properties at Grass Valley but were checked in time. Mill at Osborn Hill mine partially destroyed. Loss of standing timber heavy.

UNION HILL (Grass Valley)—Work preliminary to reopening mine begun. Reported shaft will be deepened to 1000 feet.

OLD TUNNEL repaired by city of Grass Valley and used as sewer to carry off surface waters, turns out to be property of North Star. City will endeavor to recover costs from mining company.

Placer County

SPRING GARDEN CONSOLIDATED MINING CO. (Forest Hill)—Closed down pending settlement of financial difficulties.

MAGNESITE CLAIMS near Towle will be developed by present owners. Raw material will be shipped for present but expected kiln will later be installed.

SOUTHERN CROSS (Towle)—Reported mine will be reopened. Surface works destroyed by fire several years ago; large outlay will be necessary to resume operations. Extensive surveys of workings completed.

Plumas County

ENGELS (Keddie)—Permission given by California Water Power Commission to develop electric power in Lights Creek for operating mine. Development work curtailed on account of smelting plants closing down. Trucks still hauling ore to Keddie where it is being stored.

San Diego County

OWENS CONSOLIDATED (Julian District)—Shortage of water, which hindered milling operations, now overcome and company expects to resume work. Property equipped with ten-stamp mill.

Shasta County

MANGANESE ORE reported discovered on ranch of T. P. Peterson adjoining property of Noble Electric Steel Co. at Heroult.

GLADSTONE (French Gulch) — Oscar Okerlund, miner, killed by descending skip, while trying to step across hoisting compartment of shaft.

MAMMOTH COPPER CO. (Kennett)—Smelting plant shut down, will make thorough cleanup of buildings and works. Additional cooling pipes to be installed in baghouse system.

Tuolumne County

OMEGA (Jamestown)—Plaintiffs filed paper releasing defendants from judgment deeds and agreements in suit recently decided in favor of plaintiff. Parties are now to assume equally all indebtedness incurred in working property and each to be half owner.

Yuba County

BAC (Brownsville)—Shaft being sunk. New hoisting equipment contemplated.

COLORADO

Boulder County

BLACK CLOUD MILL (Salina)—One unit of remodeled mill in satisfactory operation. Supply of ore sufficient to keep this running day and night. Rest of plant undergoing repairs will be in operation in near future.

Clear Creek County

DORIT (Idaho Springs)—Main adit on Dorit vein advanced 1100 ft., will be continued another 200 ft. to intersect prominent crossvein.

San Juan County

BARSTOW (Red Mt.)—Mill, shut down for past few weeks, has resumed operations.

PRIDE OF THE WEST (Silverton)—Recent developments encouraging; property has commenced to ship high grade to Durango.

MAYFLOWER (Howardsville)—Recent operations in Arastra Gulch encouraging. Some rich ore being produced from development.

BROAD GAUGE MINING & MILLING CO. (Silverton)—Company will resume development work on Broad Gauge, Mayflower and Belle of Shannon properties, located in Burns Gulch. A. A. Halloway, superintendent.

Teller County

GOLD BOND LEASING & DEVELOPMENT CO. (Victor)—Company commenced sinking shaft on property of Gold Bond Con. Mines Co. on Gold Hill. Promising surface discoveries made.

EL ORO MINING & MILLING CO. (Cripple Creek)—Operations resumed at Eclipse shaft. New machinery installed and skip substituted for cage formerly in use. New railroad spur to company's ore house staked out.

LAST DOLLAR (Altman)—Development resumed on this Bull Hill property, now owned by Lews Gold Mining Co. Contract let for 200 ft. of sinking in main shaft and 200 ft. of drifting. Shaft now 1300 ft. deep, with 12 levels. Robert E. Cranston, San Francisco, consulting engineer; J. B. Page, local manager.

ISABELLA (Altman)—Promising orebodies opened on 550-ft. level of Empire State shaft after crosscutting 120 ft in barren ground. At junction of Isabella No. 2 and Maloney veins, 5-ft. vein opened for 25 ft., which yields 4 to 5 oz. gold ore. Exploratory work now being carried on to locate junction of Isabella veins Nos. 2 and 4.

ACACIA GOLD MINING CO. (Victor)—Main shaft on South Burns mine, Bull Hill, will be sunk another 150 ft ; now 1110 ft. deep. Rich ore being developed on 11th level from northern extension of American Eagle's vein. Bottom level of South Burns shaft has been yielding ore said to average $60.

DISTRICT OF COLUMBIA

Washington

BILL FOR LEASING ALASKA COAL LANDS taken up by Senate Sept. 22, to be pressed to passage; provides facilities for conducting leasing by competitive bidding. House also working on bill.

IDAHO

Cœur d'Alenes

PINE CREEK ANTIMONY MINE under lease to A. J. Brainard and associates, began operating this week. Shipped steadily for several years in early '90s, was equipped with smoke process for treatment. Much of crude ore was shipped direct to Germany, while New York markets took balance. Mine will soon be in readiness for active shipments and should quotations be favorable it is thought several other antimony producers will be opened up in the Cœur d'Alenes.

INTERSTATE-CALLAHAN (Wallace)—Persistent rumors company is negotiating for large mill site at Enaville, drawn there by assurance of ample water supply from either North Fork or main Cœur d'Alene River. Possibility of branch railroad up Beaver Creek to the Sunset mines would make this feasible plan, for direct connection could be had from mine to mills and give outlet on main line of O.-W. R. & N. Stated several other Sunset properties have arge tonnage zinc ores available for treatment, and with transportation would join list of shippers. At present Inerstate-Callahan produces more than 300 tons daily without railroad facilities or sufficient water power to meet requirements in mill. Given these accommodations, stated mine could easily produce 1000 tons with sufficient ore blocked out to operate many years.

MICHIGAN

Iron

HIAWATHA (Iron River)—Due to burning slate in underground workings, found necessary to suspend production. Incident is fourth of kind recorded in district within recent years. Fires result from oxidation of pyrite in rock. Trouble at Hiawatha is in worked-out stope between sixth and seventh levels. Friction from slide in hanging held responsible. Work became impossible when gases spread hroughout mine. Operations were suspended and attempt being made to confine trouble by sealing stope off from other workings. Similar fires previously recorded at Fogarty and Youngs mines, Iron River, and at Bristol, Crystal Falls, were not so serious as that at Hiawatha. Menace increases as operations in district attain greater depth.

MONTANA

Granite County

COYLE (Hasmark)—Courtney Bros., leasers, reduced force; directing energies to development work pending return of normal conditions. Curtailment claimed due to uncertain condition of silver market.

Madison County

EASTON (Virginia City)—Forced to shut down. Cyanide supply cut off altogether; unable to secure the material elsewhere; lays off 100 men.

Silver Bow

ANACONDA (Butte)—Dividend cut from 75c. to 25c., payable Oct. 14; 75c. rate had obtained quarterly since October, 912.

BUTTE & SUPERIOR (Butte)—Laying off of about 100 men during last few days explained by Manager Bruce as due to increased output of mine having passed capacity of mill, necessitating temporary curtailment to allow mill to catch up.

PILOT BUTTE (Butte)—Development work on 2400 level progressing steadily; has opened bodies of rich copper ore, which is being shipped at the rate of five to six cars per month. No curtailment of output necessary as yet, and reguar crew of 45 men works seven days per week.

NORTH BUTTE (Butte)—General Manager John D. Pope announced that on Sept. 17 Speculator mine would resume operations after shutdown of nearly a month. Work would be started with about 500 men; more will be put on as soon as conditions improve. [Previous notice of resumpion of operations at 90% capacity denied.—Editor.]

TUOLUMNE (Butte)—Affairs show improvement in last six months. Earnings from regular shipments high-grade ore more than paid for expense of development work on 2600-t. level. From 25 to 40 cars of ore per month go to Washoe, and mine is working seven days per week with force of 115 men. Crosscut on 2600 level now in 100 ft. from station, expected to cut vein by middle of October.

SILVER BOW MINE (Butte)—This property of Anaconda company was to resume operations Sept. 8, after shutdown of several months. Output approximately same as that of Moonlight mine, recently closed on account of damage to hoist. With resumption of operations at Silver Bow, 12 of he 22 operating shafts of Anaconda company will be in commission again. About 30 men will be employed at Silver Bow.

EAST BUTTE (Butte)—Since complete shundown, in compliance with general policy of curtailment, plans perfected for increasing mill and smelting plant capacity, as well as heir efficiency. Of two blast furnaces, each 400-ton daily capacity, one to be enlarged to 800 tons. This, it is said, can be done with little additional expense for heat development, while labor cost for 800-ton furnace will be pracically same as for 400-ton. The larger furnace will be used or regular work; the 400-ton for emergency purposes Enargement of concentrator, present capacity 300 tons per day, will be decided upon when copper market resumes normal conditions and when shipments from independent producers again become more regular. Pittsmont shaft now below 1500 evel being permitted to fill with water to 1200 level, where are large station pumps, and where water will be held pendng resumption of operations.

NEVADA

DEPOSITS OF BARITE known in Clark, Elko, Mineral and Nye Counties. Present decline in imports of mineral may make western deposits valuable.

Clark County

MINING ACTIVITY IN SEARCHLIGHT CAMP confined chiefly to leasing on old mines. Charles W. Lund and Walter Wells have leases on Searchlight M. & M. Co., in northern part of camp, and are operating mill on ore from this mine and rom adjoining Blossom mine, also under lease. On Pompeii, north of Blossom, J. R. Mendenhall has improvised cyanide plant with canvas tanks working on small lot of tailings. The Parallel is leased to B. S. McCready, and ore being milled in Spokane mill. The Cyrus Noble is idle. Duplex is being examined by George Coulton, one of owners, with view to resuming development. Probable some tests of ore for special treatment will be made. Ore above 700 level contains copper silicate ore and lead carbonate with gold and silver. New York Searchlight Co., formerly operated by W. W. Hurt, has ceased operations entirely. The Quartette is developing from East shaft on 600 level. Reported that plans for rebuilding of mill burned last winter are being considered. Property was recently purchased by parties represented by Jones & Miller, of Searchlight. Attempt to recyanide tailings failed owing to presence of copper in them. Charles W. Lund is leasing on the Good Hope, adjoining the Quartette. William Darst interests, of Salt Lake City, have taken working bond on Sam Yet's property on Fourth of July Mountain, east of Searchlight. This is gold prospect. The ten-stamp mill will be rehabilitated for test.

DORAN & ZENZEN (Jean)—Stebbins dry concentrator installed at this large prospect. Ore carries silver and a little lead. Ore mined in development is sorted for high grade; remainder is screened, rich fines going to Stebbins table and coarse to dump.

POTOSI (Goodsprings)—Shipments zinc carbonate ore going forward at rate of 800 tons per month. Empire Zinc Co., now owning property, has begun construction of experimental roasting plant. Expected grade of zinc may be considerably raised and freight rates diminished by roasting.

BOSS (Goodsprings)—Reported ore from this property contains platinum in commercial quantities; assays of 7.32 oz. per ton said to have been obtained. Carload of medium grade shipped to Murray plant of the A. S. & R. during August returned in excess of $4500, with no allowance for platinum. Car ran 8.75 oz. gold and 5.02 oz. silver. Under management of O. J. Fisk, active campaign of development being maintained, and considerable ore now ready for shipment.

Elko County

FLAXIE (Jarbidge)—Mill tests completed and stated mill to cost $35,000 will be built. Power will be generated at Bear Creek.

BLUSTER (Jarbidge)—Test runs being made by General Engineering Co., Salt Lake City, to determine best milling process. Cyanide plant may be built.

Esmeralda County

TALMAGE MINES CO. (Goldfield)—A 2-ft. shoot high-grade gold-silver ore struck in southwest drift from shaft.

YELLOW TIGER (Goldfield)—Shaft unwatered to point below 700-ft. level, and this level cleaned out and repaired. Development work now under way. Compressor and machine drills will be installed at once.

FLORENCE (Goldfield)—Stoping being done above north drift on 150-ft. level in ore assaying $30 to $60 per ton, and in "big stope" on 250-ft. level. Raise being lifted from 350-ft. level to open shoot of good-grade ore which was being mined by underhand stoping. Winze from 280-ft. level in Wheeler lease ground in milling-grade ore and raise will be lifted from 530-ft. level to connect with winze.

JUMBO EXTENSION (Goldfield)—Due to change in character of ore, shipments to Goldfield Consolidated will be reduced from 100 to 45 tons, and shipments to Millers sampler increased from three ears to ten ears per month. Ore assaying over $20 gold and less than 1% copper will be smelted, and that under $20 gold and over 1% copper, concentrated.

Humboldt County

RECENT GOLD PLACER DISCOVERIES made on Leonard and Teppee Creeks in northern part of county. Gold-bearing veins also discovered near Leonard and Cove Creeks.

MOONLIGHT MINE (Unionville)—This old silver property will be reopened and development work started at once; not worked since early '70s.

BUCKSKIN NATIONAL (National)—Shoot of good-grade ore opened in development work. Hatch lease, on portion of company ground, will drive 700-ft. tunnel.

ROCHESTER-LINCOLN CONSOLIDATED MINES CO. (Rochester)—Flunkey No. 2 claim purchased for $37,000, according to report. Extensive development work on both properties will be done.

NATIONAL (National)—New machinery installed, improvements and increase in capacity of milling plant being made, new two-compartment shaft being sunk on high-grade ore-shoot recently discovered in north-south vein.

SEVEN TROUGHS COALITION (Seven Troughs)—New electric pump installed and giving satisfaction; 6-ft. exhaust fan will also be installed, bad ventilation having necessitated discontinuation of stoping. Sinking of winze being continued.

GREEN ANTIMONY MINE (Mill City)—Stated mine and furnace in Bloody Cañon will be operated again, owing to rise in price of antimony. Considerable quantity of antimony has been held in stock.

ROCHESTER MINES CO. (Rochester)—Excavating for foundations of new custom mill half completed and work on retaining walls started. Thought mill will be completed by Jan. 1, 1914. Estimated 100,000 tons milling-grade ore developed in district; Codd lease credited with 50,000 tons, assaying $10 to $20; Four J lease with 20,000 tons, assaying $15 per ton, and mine dumps with 20,000 tons.

Lander County

RUBY SILVER MINE (Battle Mountain)—Concentrating plant in Lewis Cañon finished and in operation. Crew of 20 men employed.

Lincoln County

PRINCE CONSOLIDATED (Pioche)—Option obtained on 35% of stock of Virginia Louise. Company already holds 20[illegible] of this stock. Virginia Louise adjoins end line of Prince Consolidated, and 465-ft. shaft, recently sunk, opened two [illegible] shoots thought to be continuation of tha worked on Pr[illegible] Consolidated.

GOLD CHIEF MINING CO. (Caliente)—Mill runn[illegible] steadily; 150 tons of $5 gold ore treated daily Mine wor[illegible] through 450-ft. incline shaft. Large tonnage low-grade gold ore developed and considerable work under way on 200- and 300-ft. levels. Crosscut on 200-ft. level opened oreshoot 10 ft. wide, assaying about $5.

Lyon County

BLUE JAY (Yerington)—Good-grade ore stoped on 100-ft. level and shipments being made. Whip used to hoist; automobile replacing customary horse.

Mineral County

WHEELER MINE (Pine Grove)—Lesseees treating old tailings in concentrating plant at Pioneer mill site; good recovery made.

AURORA CONSOLIDATED (Aurora) — Mill treating 200 tons per day, will be operating to capacity within 60 days, it is stated. Construction work being hastened and all building will be finished before heavy snowfall. Crew of 150 men employed.

Nye County

ANTIMONY NORTH OF TYBO, in Hot Creek district discovered, it is stated.

OFFICE OF "TONOPAH BONANZA" BLOWN UP Sept. 22; three sticks of powder under job printing plant. Corner of building blown off; adjoining garage wrecked; windows block away broken. Bonanza took active part in labor trouble, favoring Federation against I. W. W.

MERCURY MINES CO. (Ione)—Shipment made of 42 flasks of quicksilver from final cleanup. Plant will be operated again in six weeks, it is stated.

MONITOR BELMONT MINING CO. (Belmont)—Control of principal mines of district obtained and corporation formed. Mill being built and power line of Nevada-California Power Co. will be extended from Manhattan. Belmont was prominent silver camp 1864-5, credited with production of $15,000,000. Had one time 10,000 population.

Storey County

CROWN POINT-BELCHER (Virginia City)—Hoisting of ore at Jacket incline delayed on account of breaking of cable; new cable being installed. Milling plant operating steadily.

SOUTH DAKOTA

Lawrence County

TITANIC (Carbonate)—Shaft work suspended, announcement made company will drive long adit from westward to open and drain entire territory of company.

TROJAN (Trojan)—Company engaged in building small town. Among improvements under way are commodious hotel and number of small dwellings, all for employees. Work hastened in effort to complete before winter.

WASP NO. 2 (Flatiron)—An 18-ton locomotive and equipment of dump cars purchased from U. S. reclamation service, having formerly been used on Belle Fourche irrigation project, will be employed in hauling débris away from steam shovel used in stripping ore.

BRANCH MINT (Galena)—J. D. Hardin, in circuit court at Deadwood, given verdict of $3500 against McKay & Graham for malicious destruction of personal property. This regarded as opening round of litigation in which Hardin is suing to secure title to property under his lien of $440,000, which he claims should be satisfied before bondholders be allowed to foreclose on mortgage bonds. Other suits pending will be heard this month.

BISMARCK (Flatiron)—Operations suspended at mine and mill after operating 18 months. In statement at recent meeting of stockholders manager F. B. Hitchings said 79,036 tons of ore mined during year ended July 31 averaged $1.453 per ton; for 7 months ended July 31 average was better, or $1.52 per ton; 42,880 tons were treated in that period for recovery of $55,113.40, or average of $1.285 per ton. Costs for entire year averaged 69.4c. for milling and 55.9c. for mining, total of $1.253. From January to July mine was operated at profit; for rest of year loss was sustained. For these reasons, and because exploration did not hold out encouragement for higher-grade, work was stopped. Stated that company sustained net loss on operations, of $150,000.

UTAH

Juab County

GOLD CHAIN (Mammoth)—Operations will be resumed shortly.

MAMMOTH (Mammoth)—Ore carrying bismuth, gold, silver, and copper opened lately in drift on 600-ft. level, and is being developed.

YANKEE CONSOLIDATED (Eureka)—Zinc ore being mined on upper levels by lessees. Work on company account being done on 200- and 1700-ft. levels.

COLORADO (Silver City)—August royalties amounting to about $2000 received from lessees. Beck Tunnel adjoining also being worked under leasing system.

IRON BLOSSOM (Silver City)—In August some reduction made in copper-ore shipments. Earnings said to be sufficient to meet dividend requirements. Twelve cars shipped week ended Sept. 11.

CENTENNIAL EUREKA (Eureka)—Reported 12 men imprisoned by cave on 1600-ft. level. Hope of rescue early given up but latest news stated tapping was heard and extraordinary efforts were being made to reach victims.

EAGLE & BLUE BELL (Eureka)—Shaft sinking from 1550 to 1700 level in progress, expected work will be completed by end of October. Shipments for week ended Sept. 11 were reduced to four cars, owing to trouble with cable.

CHIEF CONSOLIDATED (Eureka)—New ore carrying silver with some gold recently opened on 1000- and 1600-ft. levels. Strike on 1600 of especial interest, being several hundred feet away from other known orebodies and on main oreshoot. Zinc ore being mined in several places in neighborhood of lead stopes.

Piute County

HOMESTAKE (Marysvale)—Good milling ore opened, carrying silver and copper, with a little lead and gold. High-grade streak 10 in. wide. Tunnel is in 300 ft. N. M. Nielson, of Richfield, manager.

BULLY BOY & WEBSTER (Marysvale)—One hundred-ton concentrating mill in Bullion Cañon recently destroyed by fire. Some insurance, not enough to cover loss. Mill worked on a small scale by lessees, treating gold-silver ore from property.

Salt Lake County

NATIVE COPPER (Alta)—Two feet silver-lead ore cut recently in 400-ft. tunnel. Property in Peruvian Gulch southwest of South Hecla.

OHIO COPPER (Bingham)—Fields flotation process to be tried in mill at Lark. Equipment to treat 50 tons per day expected to be in operation soon.

CARDIFF (Brighton)—Lower tunnel now in 2350 ft. following limestone-quartzite contact. Will unwater winze sunk in ore from upper workings. During August progress of 85 ft. was made.

WASATCH MINES (Alta)—The 150-ton mill and transformer plant destroyed by fire Sept. 7. Orebins and other buildings not damaged. Origin of the fire uncertain, but believed to have been caused by wearing off of insulation from one of power wires. Five cars of ore shipped recently. Development being done on ore opened short time ago on tunnel level near No. 3 shaft, and in Garfield workings.

SOUTH HECLA (Alta)—At annual meeting reports on financial and physical condition of the property were read. Showed company shipping 50 to 100 tons daily during summer months, while curtailment going into effect Aug. 1 resulted in reduction to about 30 tons. Development opened much ore. Summer operations successful, and cash balance sufficient to carry company through winter months. Some shipments will be made during winter. There is eight-mile haul to loading station. Following directors were elected: G. H. Watson, H. C. Edwards, Herman Bamberger, V. Burman, T. Coughlin, E. Storer, D. W. Harcrow. G. H. Watson is manager and in charge of operations.

WASHINGTON

Ferry County

REPUBLIC CONSOLIDATED MINES CORPORATION (Republic)—Properties consisting of the Lone Pine, Pearl and Surprise mines, recently acquired under bond from defunct Republic Mines Corporation have passed into control of new company being organized by West Virginia capitalists, J. L. Harper and local associates; holdings taken over under three-year bond for $200,000, initial payment of $10,000 already made. New company also will take over cyanide mill and reduction works of the San Poil Consolidated, and transfer will be made immediately, consideration, $185,000, bond to run for four years; Spokane & Eastern Trust Co. has been made trustee of money derived from the royalty and bond payments, and will disburse it pro rata to creditors of the San Poil until outstanding indebtedness is liquidated. In addition the new syndicate is negotiating for Last Chance and several other properties at Republic.

WISCONSIN

Lead and Zinc

McMILLAN MINING CO. (Milwaukee)—Incorporated for $100,000 to operate in Hazel Green district.

FIELDS MINING CO. (New Diggings)—Company equipping new property with 600-ton plant; orebody known to be large, as much as 60 ft. thick.

WILKINSON (Burton)—Mine has been shipping 300 to 400 tons of pyrite weekly to acid works, is showing extensive zinc ore in lower workings.

ALDERSON (Platteville)—Shaft sunk by Chas. Kistler penetrated 8 ft. of rich sheet ground that will make 50% concentrate, it is believed. St. Rose mill being wrecked for removal.

CANADA

Ontario

McKANE (Swastika)—Claims optioned to Harry Cecil, of London.

COBALT LAKE (Cobalt)—Work of draining Cobalt Lake will proceed at once.

KERR LAKE (Cobalt)—Operations resumed Sept. 7 with practically full staff of employees.

HOLLINGER (Porcupine)—Directors voted $10,000 to the patriotic fund for relief of soldiers' families.

McINTYRE (Schumacher)—Additional unit of mill gone into operation bringing capacity up to 300 tons.

NIPISSING (Cobalt)—Hydraulicking operations for past season uncovered several new veins of value uncertain up to this date.

LITTLE PET (Porcupine)—Mine opened short shoot of remarkably rich ore on 50-ft. level. Company producing approximately $6000 per month.

CASEY COBALT (Cobalt)—After curtailing production at outbreak of war, mine is resuming with two-thirds force, operating 10 drills in place of 15.

BAILEY (Cobalt)—Protective committee organized to safeguard interests of shareholders are opposing proposed sale for debt on ground that it is move to wipe out stockholders' interests.

TECK-HUGHES (Kirkland Lake)—Harry Keys in charge of operations under Nipissing option. Another vein found running parallel to main vein, 60 or 80 ft. to south. Crosscut being driven to it on 75-ft. level.

The Market Report

METAL MARKETS

NEW YORK—Sept. 23

The features of the week have been further steps toward the restoration of conditions of equilibrium in the copper market, a breaking of the deadlock in spelter and a further softening in the tone of the lead market.

The committee of the London Metal Exchange has fixed the following prices for August, upon which average contracts may be based in the absence of the usual quotation: Lead, £20 9s. 9d.; spelter, £29; electrolytic copper, £62 10s., per long ton.

Copper, Tin, Lead and Zinc

Copper—A noteworthy exportation of copper continues. This is partly due to copper going out on old contracts and partly to copper that is being shipped abroad on consignment. However, there is developing some new demand from England and Italy. The French demand is stagnant. Germany would buy a good deal of copper if it could be delivered to her, but there is a serious hitch about that. In the meanwhile, American mills are taking a good deal of copper, although there is considerable difference of opinion as to their present manufacturing rate. Some estimates are 70% of normal; others only 40%. There is also a great difference among producers in their ability to dispose of their production. Some report deliveries approximating their present production, but most report deliveries short thereof. We summarize all reports in the judgment that the deliveries are still far below the production at the curtailed rate, and that while the trade is working toward the condition of approximate equilibrium, we are still materially distant therefrom. With the increasing volume of business, conditions are very erratic and uncertain. Some sales of round lots have been effected during the week at 12c., delivered, usual terms.

The American Smelting & Refining Co. is making final settlement at 12.34c. per lb. for the copper in ore, matte, etc., that it received in August, upon which it advanced 10c. per lb. pending final settlement.

Exports of copper from New York for the week were 4548 long tons. Our special correspondent gives the exports from Baltimore at 847 tons copper.

Base price of copper sheets is 17½c. per lb. for hot rolled and 18½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 13¾@14c. per lb. for carload lots at mill.

Tin—There has been a considerable demand from consumers, but relatively little business has been done. It is hard to do business, owing to the reluctance of sellers to contract for future deliveries owing to the dangers of transportation in the Indian Ocean, where a German cruiser has been capturing British ships. The conditions have produced a firmness in the tin market here.

Lead—A good deal of nervousness has been exhibited in this market, and there has been a distinctly softer tone. As well as we can determine the facts, real consumption continues good and the bulk of the demand being supplied on contracts, there is no strong motive for reducing prices. On the other hand, the relatively small competitive market seems to be oversupplied and some producers have been more anxious to have money than lead. The offering of some lead for resale by previous buyers has also been disturbing. In St. Louis, transactions have been made during the week at 3.65c. In New York, the A. S. & R. Co.'s price has remained unchanged at 3.90c., but outsiders have offered freely at 3.85c., and there have been distinct intimations about possibility of doing business at 3.80c., which of course would be the St. Louis parity.

Spelter—The expectations of a renewal of demand from England, which we indicated last week, failed to be realized. The fact is that English buyers obtained a supply that had been in stock at Rotterdam, which became available at about £23½@24, or 5.10@5.20c. Cut off from immediate possibility of selling for export, several producers began to feel vigorously for the market among domestic consumers, who for several weeks had been conspicuous by their absence. As the offerings approached 5c., they became interested, and at 5c. a business of some thousands of tons was done, both for early and for distant shipments.

DAILY PRICES OF METALS

NEW YORK

Aug. Sept	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
17	4.9575	52¾	*	†31¼	3.80 @3.90	3.65	5.25 @5.35	5.10 @5.20
18	4.9300	51¾	*	†31¾	3.80 @3.90	3.65	5.20 @5.30	5.05 @5.15
19	4.9525	51⅞	*	†31¾	3.80 @3.90	3.65	5.15 @5.25	5.00 @5.10
21	4.9375	51½	*	†31¾	3.80 @3.90	3.65	5.15	5.00
22	4.9525	52⅝	*	†31¾	3.80 @3.90	3.65	5.15	5.00
23	4.9550	53	*	†31¾	3.80 @3.90	3.65	5.15	5.00

*No quotations. †Nominal.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts: and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

Other Metals

Aluminum—A quiet market continues and quotations are unchanged at 20@20½c. per lb. for No. 1 ingots, New York.

Antimony—The market has been dead for the past week, with no sales reported. Prices are purely nominal, somewhere around 10c. per lb. being asked for ordinary brands. Stocks are reported low, and any revival of demand would probably cause a reaction upward.

Quicksilver—Business has been rather slow, and prices are unchanged at $75@80 per flask of 75 lb., New York. Stocks here are low. There is no London quotation.

Gold, Silver and Platinum

Silver—The market has been very erratic, owing to the irregularity of the orders. It is reported that some small buying for India has taken place this week, which has accounted for the rise to 24¼d. in London.

Official prices of silver in London for the week were: Sept. 17, 24d., Sept. 18, 23⅞d.; Sept. 19, 23[illegible]d.; Sept. 21, 23⅝d., Sept. 22, 24½d., Sept. 23, 24¼d. per oz. sterling silver.

Platinum—There is no change to report. The market is absolutely quiet, with very little business doing. Dealers appraise values at about $50 per oz. for refined platinum and $57@58 per oz. for hard metal.

Zinc and Lead Ore Markets

JOPLIN, MO.—Sept. 19

The letter of Sept. 12, delayed in transmission, shows high price of blende, $48, assay base, $44@46, metal base, $43@44; calamine, $25@26; average all grades, $43.08; lead base, $46; average all grades, $47.90. Shipments, 7,962,680 lb. blende, 748,810 lb. calamine, 1,727,850 lb. lead ore.

PLATTEVILLE, WIS.—Sept. 19

Letter of Sept. [illegible] delayed in transmission shows base price of zinc ore [illegible] 46; lead ore, $45. Shipments were 3,628,740 lb. zinc ore, [illegible]41,000 lb. lead ore, and 257,700 lb. sulphur ore. Deliveries to separating plants, 3,496,080 lb. [illegible] ore.

IRON TRADE REVIEW

NEW YORK—Sept. 23

The markets are still quiet. There is a general expectation that a demand upon us will be the ultimate result of the great war, but the time has not come yet.

Domestic business is still in suspense on account of the unsettled state of the financial markets. Matters are gradually getting into shape, but the process is slow. Meantime buyers are cautious, and do not want to be committed far ahead.

PITTSBURGH—Sept. 22

There has been a further decrease in steel and pig-iron buying and the market is more stagnant than at any time for years. Steel men are not prepared to make any prediction as to when a turn for the better is likely to occur. The average rate of steel production is now but little over 50% of capacity.

England has placed an embargo upon galvanized sheet exports, for reasons not stated and not easily guessed. It seems doubtful therefore whether there will be much buying against inquiries recently made by English sheet mills for 125,000 tons of sheet bars. On the other hand the sheet export market may be stimulated. On the whole the iron and steel export market is not opening up to any extent.

The Carnegie Steel Co. is this week operating at 62% of capacity, but this is a better showing than is being made by the majority of mills, since some of them are not operating at over 50%. The Republic bessemer plant is reported down this week, after having operated full last week.

Strictly new buying in steel products is extremely light, and specifications against old contracts have been decreasing, so that current bookings are less than shipments.

The large steel mills at least are holding prices very firmly. In several instances they have passed dividends, to husband cash resources, and they are likely to pursue an equally conservative course as to sales, avoiding any business that does not assure at least a slight profit. Bars, plates and shapes are generally held at 1.20c. Sheets are a shade weaker, some mills selling at 1.90c. and 2.90c. for black and galvanized respectively. Tinplate is back to the old level of $3.40, after the pig tin scare.

Pig Iron—The market is altogether stagnant, and shipments on regular contracts are lighter. Prices seem to be well maintained so far as can be ascertained at former levels: Bessemer, $14; basic, $13; malleable and No. 2 foundry, $13@13.25; forge, $12.50@12.75, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market seems to show a slight declining tendency, as while English makers still quote $85, Baltimore, for forward deliveries there is re-sale material offered sometimes at $75. The Carnegie Steel Co. states that it is not offering ferromanganese, but will sell at a fair figure to any mill that would otherwise have to stop production.

Steel—A sale of 1000 tons of sheet bars has been made within the past two weeks at $21, maker's mill. but another sale of a larger tonnage went through lately at $22. The large mills state that their minimum prices are $21 for billets and $22 for sheet bars. Rods are $26, Pittsburgh.

COKE

The New Jersey Zinc Co. has closed a contract with W. Harry Brown, operating the Alicia plant, for coke requirements of its two spiegel stacks at Palmerton, Penn., the full requirements being 10,000 tons monthly; but only one of the stacks is now in operation. The contract is for two years, the price to be determined monthly on a ratio with the current price of pig iron. The market is quotable as follows: Prompt furnace, $1.65@1.70; contract furnace, $1.75@1.85; prompt foundry, standard brands, $2.25@2.35; ordinary 72-hour coke for prompt shipment, $2@2,25; standard foundry coke on contract, $2.35@2.50, per net ton at ovens.

CHEMICALS

NEW YORK—Sept. 23

The general market is still much disturbed and unsettled by the war conditions and interference with foreign trade.

Arsenic—The market is quiet, with little business. Quotations are nominal at $4.50@5 per 100 lb. for both spot and futures.

Copper Sulphate—Domestic orders are fair, but nothing is doing for export. Prices are unchanged at $4.50 per 100 lb for carload lots, and $4.75 for smaller parcels.

Nitrate of Soda—Business is very dull and prices remain nominal at 1.95@2c. per lb. for both spot and futures.

Pyrites—Imports at Baltimore for the week included 711 tons pyrites from Huelva, Spain.

PETROLEUM

Exports of mineral oils from the United States in August were 63,606,427 gal. For the eight months ended Aug. 31, the total exports were 1,314,449,269 gal. in 1913, and 1,493,731,331 gal. in 1914; an increase of 179,282,062 gal., or 13.6%, this year.

Shipments of crude oil from Tampico, Mexico, to the United States during June, 1914, totaled 1,062,062 bbl., or 86,156 bbl. less than in June of last year. The decline is the result of disturbed political conditions.

NEW CALEDONIA ORES

Exports of ores from New Calendonia for the six months ended June 30 are given by the "Bulletin du Commerce" of Noumea at 41,396 tons nickel ore, 920 tons cobalt ore and 39,789 tons chrome ore. Exports of metals were 1849 tons nickel matte.

COPPER SMELTERS' REPORT

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	April	May	June	July	August
Alaska shipments	1,279,537	585,387	1,114,758	2,879,396	3,122,75
Anaconda	22,900,000	23,500,000	23,800,000	. .	. . .
Arizona, Ltd.	3,570,000	3,092,000	3,742,000	3,300,000	. .
Copper Queen	7,562,723	8,388,203	7,613,719	7,817,318	. .
Calumet & Ariz.	5,450,000	5,495,000	4,630,000	5,940,000	. .
Chino	5,926,591	5,496,875	5,486,419	. .	3,045,04
Detroit	1,790,926	2,105,034	2,129,100	1,966,526	. . .
East Butte	1,178,000	1,179,762	1,215,323	. . . .	. . . .
Giroux	45,948	429,553	425,000	. . . .	. . . .
Mason Valley	862,000	916,000	950,000	. . . .	.
Mammoth	1,850,000	1,750,000	1,725,000	1,950,000	1,975,00
Nevada Con.	4,880,043	4,959,589	4,483,175	. . . .	. . . . .
Ohio	610,518	625,000	605,000	. . . .	. . . . . .
Old Dominion	2,779,000	3,302,000	2,937,000	2,962,000	.
Ray	6,089,362	6,300,847	5,941,567	. .	3,200,00
Shannon	1,012,000	1,056,000	1,049,227	1,084,000	960,00
South Utah	247,641	55,394	62,990	.	.
Tennessee	1,370,800	1,336,950	*710,800	.	. .
United Verde*	3,000,000	3,100,000	2,900,000	. . .	. . .
Utah Copper Co.	12,739,757	13,208,483	12,870,063	.	7,978,25
Lake Superior*	13,000,000	12,500,000	16,000,000	. . .	. . . . .
Non-rep. mines*	8,000,000	8,200,000	8,000,000	. . .	. . . . .
Scrap, etc.	2,500,000	2,500,000	2,500,000		. . . .
Total prod.	108,644,846	110,082,077	110,891,141		.
Imp., bars, etc.	17,043,191	19,081,487	23,885,521		
Total blister	125,688,037	129,163,564	134,776,662		.
Imp. ore & matte.	10,400,122	10,586,506	9,157,540		
Total Amer.	136,088,159	139,750,070	143,934,202	. . . . .	.
Arrivals–Europe†	17,299,520	13,558,720	19,040,000	. . . .	. . . .

* Shut down 10 days for repairs.

† Does not include the arrivals from the United States.

Assessments

Company	Delinq.	Sale	Amt.
Argenta, Ida	Sept. 1	Oct. 3	$0.0005
Best & Belcher, Nev. (post.)	Sept. 25	Oct. 16	0.05
Black Bear, Ida. (post.)	Oct. 1	Nov. 1	0.01
Carney Copper, Ida	Sept. 21	Oct. 21	0.0022
Cedar Creek, Ida.	Sept. 10	Oct. 10	0.003
Chalonn, Nev	Oct. 3	Oct. 21	0.0025
Columbine, Colo.	Sept. 15	Oct. 20	0.02
Copper Plate, Ida	Aug 29	Oct. 3	0.002
Davis-Daly, Mont.	Oct. 15	....	0.25
Duluth, Ida	Sept. 5	Oct. 3	0.001
Emerald, Utah	Sept. 15	Oct. 10	0.0033
Honolulu, Ida	Sept. 15	Oct. 12	0.0025
Idaho-Nevada, Ida.	Sept. 7	Oct 1	0.001
Lead King, Ida	Oct. 1	Oct 16	0.0005
Liquidator, Ida	Sept. 12	Oct 12	0.002
Lucky Swede, Ida	Sept. 19	Oct. 19	0.001
Monarch-Pittsburgh, Nev. (post.)	Sept. 14	Oct. 19	0.01
Orange-Manhattan, Nev	Sept. 12	Oct. 10	0.01
Reindeer-Queen, Ida	Sept. 21	Oct. 21	0.002
Rescue Eula, Nev	Sept. 10	Oct. 15	0.01
Royal Copper, Ida	Sept 3	Oct. 3	0.001
Royal Mining, Ida	Sept. 23	Oct. 19	0.0015
Saltese, Ida.	Sept 1	Oct. 1	0.002
Silver Pick, Nev.	Sept. 14	Oct. 19	0.01
Snowshoe, Ida.	Sept. 19	Oct. 19	0.005
Snowstorm, Ida	Sept. 12	Oct. 3	0.003
Tar Baby, Utah	Sept. 3	Oct. 5	0.005
Tonopah Gipsy Queen, Nev	Sept. 2	Oct. 17	0.01
Treasure Vault, Ida	Sept. 15	Oct. 12	0.02
Tuscumbia, Ida. (post.)	Aug 20	Oct 1	0.002
Umatilla, Nev	Sept. 3	Oct. 8	0.01
Utah Metal, Utah.	.	Oct 1	0.05
Valentine, Ida	Sept. 12	Oct 12	0.001

The Engineering and Mining Journal

VOLUME 98 OCTOBER 3, 1914 NUMBER 14

Operation of the Pittsburg-Silver Peak Mill

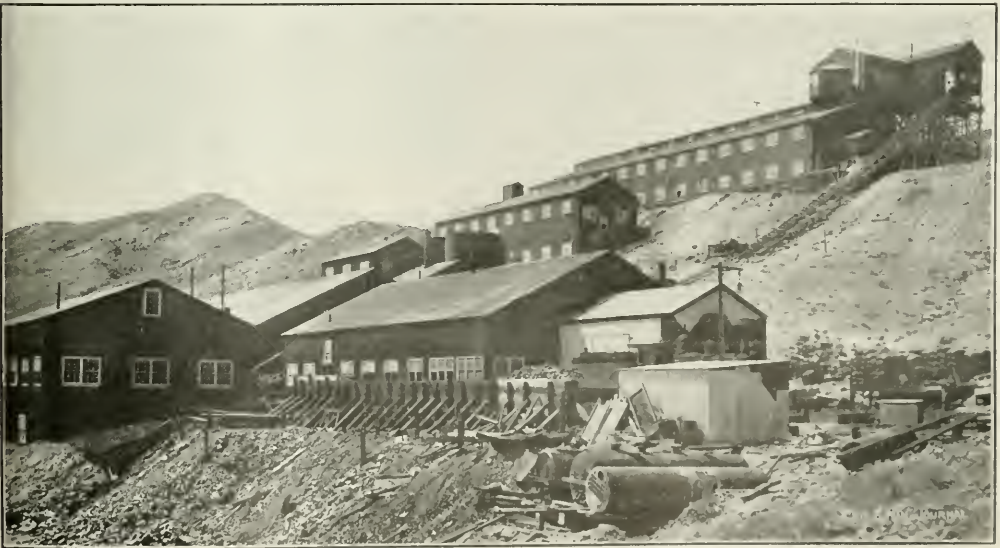
By Lyon Smith*

SYNOPSIS—The ore, a hard quartz, averages $5 gold per ton, and is delivered to the treatment plant by an aërial tramway, 14,000 ft. in length. The process involves crushing to 35 mesh with 120 stamps, followed by plate amalgamation and regrinding of the coarser sands. Classification is effected by settling and sizing cones. The sand is leached and the slimes treated directly in Merrill slimes presses. Zinc-dust precipitation is used. Mill operation costs $1.21 per ton treated.

* * *

The 120-stamp mill and cyanide plant of this company is situated at Blair, Esmeralda County, Nev. The Silver Peak railroad, 17½ miles long, owned and operated by the mining company, connects the camp with Blair Junction on the Tonopah & Goldfield R.R., 30 miles west of Tonopah. The plant was completed in the latter part of 1907 and since then has been in continuous operation.

The ore treated averages $5 per ton in gold, and is for the most part a hard, white, crystalline quartz. A large proportion of the gold is finely disseminated and in a free state, although it is also contained in scattered pyrite, and rarely, galena, which occurs sparsely through the quartz. Silver is present in part of the ore in a ratio of about 1 to 100, as compared with the gold. The quartz occurs in the form of overlapping lenses, intrusive into thin-bedded metamorphosed limestones, and frequently associated with similar lenses of alaskite. The general dip of the lenses and the lens zones is 30 degrees.



General View of Pittsburg-Silver Peak Mill, Blair, Nev.

Mill buildings, situated 2.7 miles from the main tunnel portal, are of modern construction with concrete foundations and steel superstructure, and occupy a gravity site contiguous to the railroad. All machinery is electrically driven from power furnished by the Nevada-California Power Co. The water supply is developed at

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*Metallurgist, Blair, Nevada.

Silver Peak and is pumped to the mill through 17,000 ft. of standard 6-in. pipe against a head of 550 ft.

Ore from the various mine workings is trammed to underground loading stations, from which it is hauled through a 5800-ft. main tunnel to the crusher building and upper terminal station of the aërial tramway. Electric locomotives are used, each hauling a 10-car train. Cars are of the rigid frame, single side-dumping type and have a capacity of 2½ tons each.

Crusher Building and Tramway

After weighing, the ore is dumped into a small reserve bin by an automatic side-dumping tipple, electrically actuated. Two men load, operate and discharge a 10-car train. The ore is drawn from the reserve bin as required to a No. 6 McCully gyratory crusher, the 3½-in. product from this machine gravitating to two No. 3 McCully gyratories with crushing heads set at 2½ in. The drive is from a 100-hp. Bullock motor, through line shafting, and the three crushers are brought to speed by a heavy friction clutch. The No. 6 machine has a maximum capacity of 50 tons an hour. The final product is elevated and passes the automatic sampler, while the reject goes by gravity to the 400-ton tramway storage bin.

The tramway, 11,000 ft. long, was built by the A. Leschen & Sons Rope Co. The fall from mine to mill is approximately 1600 ft., an Ingersoll-Sergeant two-stage, 10-drill compressor, connected to the main sheave through bevel gears, shaft and belt acting as a brake on the traction rope. The air developed is used in controlling the ore-bin gates and supplements the general supply furnished by the mine compressor.

As carriers there are 121 sheet-iron buckets supported from a two-wheel trolley by the typical triangular bucket hanger. Positive grips, placed 204 ft. apart, secure the hangers to the traction rope. The tramway is of straight-line type with no angle stations and passes one high ridge and several minor divides. Tension stations and intermediate towers are of wooden construction. The traction rope is a 1-in. special Hercules brand, and the track cables, 1⅜ and 1 in. diameter, for the loaded and empty buckets, respectively.

Buckets are automatically loaded and discharged by the Leschen patented system. Special basket carriers are used for transporting supplies of all kinds. These are loaded on a stub track and shunted by hand to the main tramway line.

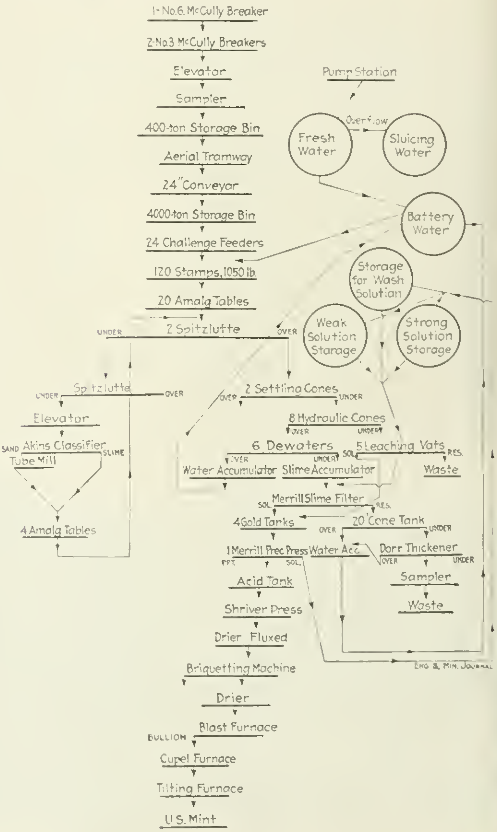
The normal capacity is 500 tons per 16 hr. This is equivalent to loading 74 buckets an hour, spaced at 48 sec., the line traveling at a rate of 250 ft. a minute. This ore weighs 91 lb. per cu.ft. and is free running. The bucket load is approximately 840 lb. and combined with the weight of the bucket and hanger complete averages a 1650-lb. unit.

Ore is dumped from the tramway buckets through a 1x3-ft. chute into a wooden container, which is provided with a feeder and discharges upon a 24-in. conveyor belt, running the entire length of the storage-bin building. An automatic double side-discharge traction dumper distributes the ore equally along the length of the bin. The bin is flat-bottomed and placed directly back of the stamps. It is 227 ft. long and has a capacity of 4000 tons.

Stamp Mill

From the bin the ore gravitates to 24 suspended Challenge feeders, which supply the 120 stamps. These weigh 1150 lb. each and drop 94 times per minute through 7 in. The weight is divided as follows: Stem, 191 lb.; boss-head, 300; shoe, 200; tappet, 157; total, 1148 lb. The working weight is about 1050 lb. The mortars, furnished by the Power & Mining Machinery Co., are of the narrow, rapid-discharge pattern. The battery frames are the usual three-post wooden construction.

The one-piece concrete battery block is surmounted by a 6-in. maple coping laid in tar, upon which is a single thickness of ¼-in. rubber belting. The mortars are held in place by eight anchor bolts, 2¼ in. in diameter. The bottoms of these bolts are enlarged and provided with a ½-in. keyway, which receives the gib key engaging the foundation washer.



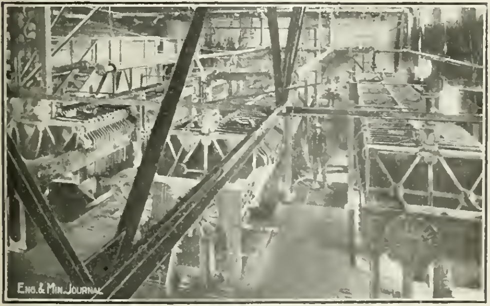
Flow Sheet of Pittsburg-Silver Peak Mill

Crushing is carried on in from 5 to 6 parts of water using a 5-in. discharge, which is kept constant by means of chuck blocks. The battery screens in present use are of two sizes, namely, 5x19-mesh Ton-Cap, No. 22 wire, with width of aperture 0.024 in.; and a similar Ton-Cap screen having a 0.021-in. width aperture. The stamp duty is 4.1 tons.

The stamps are driven in units of 20 by 50-hp. Bullock-type motors, placed beneath the ore bin and back of the stamps. A countershaft underneath the floor transmits motion to the two bull-wheels, which are controlled by rack-and-pinion belt tighteners. The camshafts are of mild steel and no trouble is experienced from breakage. The wearing parts are Adamantine chrome steel and cams are of the Canda self-locking type.

This unit of the plant was originally built as a 100-stamp mill. Two batteries of 10 stamps each, 5 right and 5 left, to correspond with the initial construction, were added later and a second set of amalgamation tables installed. The primary installation have the tables placed directly in front of the mortars and are used in conjunction with an 8-in. lip plate. Those installed later are placed 35 ft. from the mortars and on the next gravity plane of the mill, the pulp from the batteries being laundered to box distributors at the head of the tables.

The regular stamp-mill operating crew consists of six men, a batteryman and an amalgamator on each of the three shifts. In addition to this two men on day shift make all necessary repairs, and a plate man, assisted by the amalgamator, does all work pertaining to amalgamation. Simple repairs, such as putting on shoes, bossheads, turning of stems, etc., are done on shift by the amalgamator and batteryman, the more extended repairs being left for the day repair crew.



Merrill Filters at the Pittsburg-Silver Peak Mill

The accompanying table gives the wear and cost of battery steel:

CONSUMPTION OF BATTERY STEEL

	Make	In.	Lb.	Days Wear	Cost per Lb.	Cost per Ton Milled
Shoe	Chrome	10½	200	87	$0.04895	$0.0274
Die	Chrome	8½	156	104	0.04895	0.0179

Amalgamation and Classification

Outside amalgamation is practiced. Each table is composed of four copper sheets with a total area of 68 sq.ft., set on a grade of 1¼ in. to the foot. From the lip plate, 8x18 in., the pulp falls 2 in. to the head apron plate, the drop between the four table plates being ¾ in. Narrow splash boards are used at the head of each plate to retard the flow and give a longer contact with the amalgamated surface.

The plates are dressed once a shift and the head apron plates cleaned up each morning. On account of the low grade of the ore, it is not practical to keep the plates "close," and a light dressing with a whisk broom every eight hours keeps them in better condition than would a removal of amalgam. The lip plates are scraped close every 10 days or two weeks while the 3-ft. plates are allowed to build up until a part of the amalgam may be removed without leaving the surface in a hard and glassy condition.

Extending across the foot of each table are sand boxes, 8 in. wide and 10 in. deep, from which the sands are removed each week. These sands are treated in a 5-ft. pan, together with the material periodically cleaned up from the amalgamation traps below the sand boxes. After cleaning and air pressing, a 38% gold amalgam is delivered to the refinery. The recovery by amalgamation ranges from 55 to 60%.

From the stamp mill the pulp is conveyed to the cone department in two wooden launders, 12 in. wide and 8 in. deep, set on a grade of 1⅛ in. to 1 ft. The launder bottoms are lined with ¼-in. steel plate and are provided at the discharge end with screen boxes. A circular sump, 3 ft. in diameter by 4 ft. deep, provided with a baffle board and adjustable gates, equalizes the feed to two dewatering cones, 8 ft. in diameter at point of overflow with sides sloping at 50°.

The spigot discharge is delivered to a battery of eight hydraulic cone classifiers, the combined overflow from both sets of cones passing to a distributing sump and thence to a series of six cone-bottomed dewatering tanks. The underflow from the hydraulic classifiers, which forms the leachable portion of the pulp, passes by launder to the sand plant. The overflow from the cones is treated in Merrill automatic-sluicing slime presses. Separate treatment of the sand and slime is later described.

Regrinding

The regrinding plant was installed in June, 1912. Prior to this time the material remaining on 80-mesh, amounting to from 52 to 60% of the whole, contained 85 to 90% of the total value in the sand residue from the leaching plant.

SCREEN ANALYSIS OF SANDS RESIDUE

Mesh	Per Cent.	Value
On 40	22.82	$1.83
60	29.32	1.00
80	10.05	0.80
100	10.47	0.70
150	7.75	0.28
200	10.72	0.18
200	8.87	Tr.

At present three classifiers of modified spitzlutte type remove from the stamp-mill pulp about 50 tons a day of the coarsest sand. This is returned by means of a 40-ft. bucket elevator, using 6x10-in. buckets to a 13-ft. Akins classifier, which feeds a 5x18-ft. Allis-Chalmers chain-driven tube mill. The slime product from the Akins classifier and the discharge from the tube mill undergoes amalgamation before being returned to the classifying cones. To increase the efficiency of regrinding, one battery discharges directly to the Akins classifier through a 4-mesh screen.

The tube mill, when installed, was lined with 4-in. silex blocks. This lining was short-lived, considering the duty of the mill. More recently the Komata lining has been adopted, and the No. 5 Danish flints, formerly used as grinders, replaced with selected mine quartz. Comparative figures as to consumed horsepower of the mill, and life and efficiency of the two types of liners cannot be definitely given. The silex with which the mill was first lined was of poor quality, and this largely accounts for its short life. Since the Komata lining has been in use, the mill, by a better regulated system of classification, has handled from 10 to 15% greater tonnage. Thus the conditions under which the two types of liners operated have been so different that it is impossible to determine their relative efficiency. Screen analysis of the mill discharge is practically the same under both conditions.

The total saving by regrinding the coarser sand amounts to from $1200 to $1600 a month, the additional cost being 3.9c. per ton of ore milled, distributed into labor, 0.4c.; supplies, 1.5c.; power, 2c.; total, 3.9c.

Sands Treatment

The launder which conveys the sands from the cone department discharges to a series of 5 leaching vats, provided with annular launders, each 36 ft. in diameter by 11½ ft. deep. A tipple box diverts the flow to the particular vat which is filling with sands, where it is received by a distributor of the Butters type. Four pounds of lime to one ton of sand are added at the cone department. Until recently this lime has been crushed wet in a one-stamp battery through an 8-mesh screen. The method of crushing, however, proved unsatisfactory. In was found that the sand charges in the leaching vats gave up their alkalinity in a comparatively short time. Several methods of adding the lime were tried out and the various results noted. At present the lime, in units of 150 lb., is spread evenly over the bottom of a lime box, provided at one end with an 8-mesh screen. A light spray of water is given and the lime allowed to stand for about 30 min. It is then turned several times with a shovel and gradually worked through the screen, 50 lb. an hour being the normal rate of addition. Pieces of lime rock and other portions of the lime that will not break up and partially slack by this method are removed and added to a pan grinder, which is used to deliver an emulsion of lime to the slimes.

The sand charges hold their alkalinity better under the present system of adding lime. The stamp delivered a certain amount of fine material, which could not be eliminated and which gave up its alkaline properties too quickly to be of much benefit in subsequent treatment. This fact was evidenced by the alkalinity of the displaced overflow from the vats during the filling period. Titrations have indicated a marked decrease in the protective alkalinity of the overflow water, while examination of the sands shows that the alkalinity is retained to a greater degree throughout the treatment period.

Treatment details present few departures from the usual practice. The sands, in charges of 480 tons each, is at first given 50 hours' contact with a 3-lb. cyanide solution. This is known locally as "strong solution." A 12-hour, combined air-and-drain period follows, at the expiration of which a 1.5-lb. solution (weak solution) is applied for 25 hours. The charges are washed with a barren low-strength solution for from 40 to 60 hours, and are "finaled" when the effluent assays from 12 to 10c. a ton in value. The treated charge is then sluiced out through one center and four side gates. Two men, using 3-in. hoses having 1½-in. nozzles, remove the charge in from 2½ to 3 hr., one ton of water to one of sands being used for this purpose.

Solution Changes

During the last 12 hours of strong- and the first 12 hours of the weak-solution periods, the effluent is air-lifted. In the first case the solution is returned to the top of the charge, in the latter, the strong solution displaced by the ongoing weak is transferred to the vat in which the sand is undergoing strong-solution treatment. This proceedure has materially decreased the tonnage of pregnant solution pumped to the precipitation press, and has appreciably cut down the consumption of cyanide, lime and zinc dust. No effect upon the extraction has been noted.

The vat and filter-press effluent flows to 4 iron tanks, each 26x10 ft. Two of these tanks receive all solution titrating above 0.8 lb. per ton in cyanide, the rest of the effluent passing to the other tanks. This latter solution is used, after being precipitated, as a wash on the sand charges, any excess in the amount required for this purpose being delivered to the sluicing water system. About 80% extraction is obtained in the sands plant.

Slimes Treatment

As previously noted, the combined overflow from the settling and sizing cones flows to a series of 6 cone-bottomed settlers or dewatering tanks, each 26 ft. in diameter and 24 ft. deep. The tanks are provided with annular launders for receiving the clear-water overflow, which is returned to battery storage tank by a 9x10-in. Aldrich triplex pump. The thickened slimes (sp.gr. 1.22 to 1.25) is drawn continuously from the apexes of the settling tanks and passes to a 20x16-ft. iron accumulator from which it is drawn off, as required, to the Merrill filters.

The three Merrill automatic sluicing pressure slimes filters are of the partial-filling type. Each press contains 86 frames, 4 in. deep and with a cross-sectional area of 25 sq.ft. Originally each press contained 64 frames, but at the time the regrinding apparatus was installed, the filtration plant was enlarged to its present size. The presses are filled from a 6-in. pipe line under a gravity pressure of 25 lb. The clear water issuing during the filling is returned by a 4-in. centrifugal pump to the water accumulator in the cone department and thence to the battery storage tank.

Filling is completed in from 20 to 25 minutes, depending upon the specific gravity of the entering slimes. The filtering medium is a light twill over which is placed a single thickness of No. 6 army-weave duck, which weighs from 22 to 24 oz. a sq.yd. The press schedule, as given herewith, is changed slightly from time to time, but is representative of normal operation.

CYCLE OF FILTERING OPERATIONS

Period	Time, Min.	Tons Solids	Tons Washwater
Filling	20 to 25		
Weak solution to waste (KCn 1.7, protective alkalinity 0.7)	20	4.2	
Weak solution to weak effluent gold tank	20	4.2	
Weak solution to weak pregnant gold tank	60	12.6	
Wash water to weak pregnant gold tank	30		10.9
Wash water to weak effluent gold tank	20		7.3
Sluicing	60 to 80		
Total	Cir 4 hr.	21.00	18.2

Charge tonnage, average 10 to 12 tons dry slime.
Per cent. extraction, average 92.

A description of the mechanical details of the Merrill press is not necessary. The distinguishing feature is the automatic discharging device, by means of which the cake, after treatment, is removed from the press. Water for this purpose is introduced under a pressure of 60 lb. per sq.in., the discharged residue approximating eight parts of water to one of solid. A large part of this water is recovered by settling in a cone-bottomed tank, 24 ft.

high and 20 ft. in diameter, the thickened product from which is fed to a 20-ft. Dorr thickener for further dewatering. This water is returned to the sluicing-water tank by an Aldrich triplex pump. Costs are as shown in the accompanying table:

COST OF FILTERING

	Per Ton Ore	Per Ton Slime
Labor, pressmen, $4.50 a shift..	$0.030	$0.077
Supplies	0.057	0.148
Power	0.012	0.032
Totals	$0.099	$0.257

The item of power includes the operating cost of the following machines: Press solution pump, ⅔ return sluicing-water pump, ⅓ pregnant-solution pumps, 40% compressors and Dorr thickener.

PRECIPITATION

All solution from both sand and slime plants is precipitated by zinc dust in one Merrill, 30-frame, 52-in. precipitation press. The zinc dust is first fed to a small tube mill by a 12-in. belt, operated by floats and counterweights. The tube mill discharges to the suction pipes of two 5x7-in. Aldrich triplex pumps, which deliver the solution to the precipitation press through 125 ft. of 6-in. pipe. The press has a filtering area of 420 sq.ft. and storage capacity of 35 cu.ft. The filtering medium is a 10-oz. twill.

Before precipitation, all solution is clarified in a Kelly filter press, which is fed by one 2-in. centrifugal pump. This press was not purchased for clarifying purposes, but being available, was installed as an experiment and has been an aid to more efficient precipitation.

Little trouble is experienced from incomplete precipitation. From 0.2 to 0.3 lb. of zinc dust per ton of solution is used, depending upon the condition of the press. Immediately after cleaning, and until the filter cloths become coated with a slight excess of zinc dust, 0.3 lb. is used. This amount is lowered to 0.15 lb., after 500 tons of solution have been pumped.

Refining the precipitate at this mill has already been described at length[1], and will not be repeated here.

COSTS

The consumption and cost of the three principal chemicals used are as follows:

	Coosumption per Ton Ore Milled, Lb.	Cost per Ton Ore Milled
Sodium cyanide	0.49	$0.11106
Lime	4.1	0.04202
Zinc dust	0.33	0.02496
Total		$0.17804

The mill requires 412 hp. for its operation, its cost being $7.35 per hp. per month.

The total operating cost for 12 consecutive months, during which time 172,482 tons of ore were milled, was as is shown in the accompanying table.

OPERATING COSTS AT PITTSBURG SILVER PEAK MILL

	Labor	Supplies	Power	Total
Stamping	$0.067	$0.092	$0.155	$0.314
Amalgamating	0.039	0.004	0.001	0.044
Tube milling	0.001	0.013	0.012	0.026
Neutralizing and settling	0.028	0.053	0.062	0.083
Leaching and sluicing	0.017	0.079	0.011	0.110
Filter-pressiog	0.035	0.061	0.017	0.114
Precipitating	0.004	0.036	0.001	0.011
Refining	0.018	0.028	0.001	0.017
Assaying	0.016	0.012	0.003	0.031
Water service	0.024	0.016	0.027	0.067
Heating		0.003		0.003
Superintendents and foremen	0.067			
Total direct operating	$0.346	$0.397	$0.231	$0.977
Pro-rata of general expense	0.034	0.060		0.094
Suspense account		0.050		0.050
Total operating	$0.380	$0.507	$0.234	$1.121

The operation of the Pittsburg-Silver Peak Gold Mining Co. is under the direction of William A. Bradley, general manager, to whom I am indebted for reviewing this manuscript. Charles A. Barr is mill superintendent.

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Smelting at Lubumbashi

In a recent speech by Jean Jadot, chairman, at the meeting of the Union Minière du Haut Katanga, the following statistics were given out concerning smelting at Lubumbashi:

> Production of copper from Jan. 1 to June 30, 1914: 42 days' work with one furnace; 122 days' work with two furnaces; 3 days' work with three furnaces, which corresponds to 295 days' work with one furnace; was 4520 tons of bar, containing from 96 to 97% of copper, and 100 tons of matte, containing 65%. The average production per day furnace was 15½ tons. [Since that date (June 30) the three furnaces have been working well and uninterruptedly.] The average cost of production in 1913 of one ton of copper on truck at the works was 800 f. The average cost for the first six months of 1914 was 778 f. This price was found to obtain during a period when work was comparatively reduced, if it be compared with that registered since three furnaces have been working. We had anticipated an average cost of 700 f. a ton. This cost will certainly not be exceeded by the average cost for the financial year 1914 now in progress, because during the second six months the production will be higher than that of the first six months, and will be recorded under more economical conditions. The probable production for 1914—we say probable, because we must always take into account occurrences of every kind—will be from 10,000 to 12,000 tons of copper instead of the 7000 tons in 1913. To the abovementioned cost of production calculated on truck at the works must be added the cost of transport from Elizabethville to Antwerp, cost of handling sale, etc., which gives as the probable cost of production at Antwerp for 1914 in round figures about £40 a ton. Please note that this price does not include general European expenses carried to the profit and loss account, which amounted in 1913 to £18,000. We are engaged in realizing a vast program of enlargement of our metallurgical works at Lubumbashi, especially by the addition to the three existing furnaces of four new furnaces, which we hope to see working about June or July, 1915. If this hope be realized, our production for 1915 may be from 20,000 to 24,000 tons of copper. Naturally, this increase in production will have a very favorable effect upon the cost of production; the more the production increases the more the cost of production diminishes. The question which is of equal importance to us is the question of fuel. We have not ceased to give it our attention. The two batteries, each of 22 coke ovens, were fired, the first in December, 1913, and the second in March, 1914. Their capacity for production is 3000 tons per month. They insure the working of two furnaces, and fulfill our expectations. With a view to obtaining all the coke required to supply the new plant, we have entered into a very satisfactory agreement with the Wankie colliery. We have obtained a notable reduction on the transport rates for fuel on the Rhodesia railways. The question appears, therefore, to be settled on excellent terms.

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The South African Gold Fields and Cyanide

Authoritative estimates which are now available place the amount of cyanide on hand at Johannesburg as being sufficient to meet the requirements for about two or three months, says the *Chemical Trade Journal.* During 1913 the quantity of cyanide purchased by the Transvaal gold mines amounted to 11,096,812 lb., valued at £163,561, about 75% of this being supplied by Germany. In the past the cheapness of the German product has discouraged British gas companies from making cyanide, it being more economical to market their hydrocyanic acid as prussiates. Now, however, that the supplies from Germany are cut off, the production of cyanide by British gas companies will be commercially possible, and all reasonable demands will be easily met.

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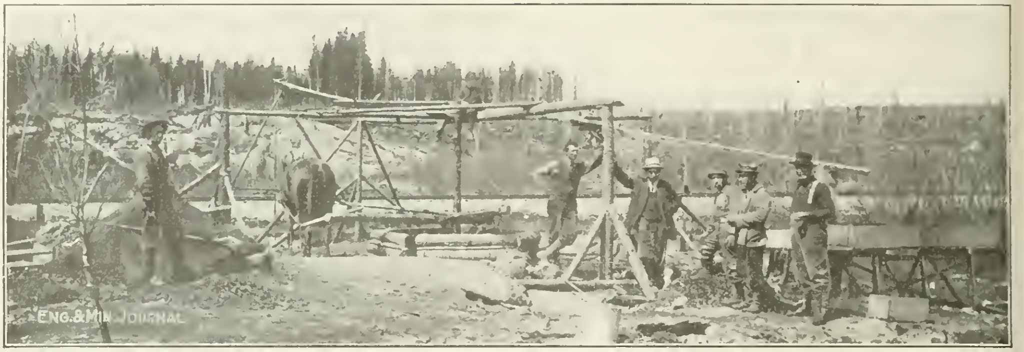
[1] Refining at Silver Peak Mill, Lyon Smith, "Eng. and Min. Journ.," Mar. 22, 1913.

Gold at Sesekinika, Ontario

By J. T. Kerr*

Sesekinika Lake lies 400 miles north of Toronto and 60 miles southeast of Porcupine. It was the scene of a gold rush in June. The discovery claim has been staked and restaked many times in the last nine years; trenches had been cut and veins stripped for hundreds of feet yet no pay ore was found. During the Wolf Lake excitement N. N. Maloof staked the claim but did not start to work it until last February when he took a notion to put in a shot at a certain place where there was no vein and no mineral showing on the surface, merely country rock. After the blast, to his surprise, he found under a foot of capping decomposed rock, much of it like dark brown sand, in which were specks of gold.



Washing Lode Quartz for Gold at Sesekinika, Ont.

Close View of Arrastre

Pit from Which Gold Is Taken

As soon as the snow disappeared from the ground, an arrastre, similar to those used in Mexico, was built, and by means of this the separation of the gold from the rock and sand was commenced. The accompanying illustrations show the nature of the work and the arrastre.

After the results of Maloof's discovery became known all the ground for many miles around was staked by those in the vicinity so that when men from the outside came in there was no chance for them to get ground near the discovery. So far little is known of the Sesekinika veins, too little to prophesy as to the immediate future of the region.

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*Sesekinika Lake, Ontario.

Increase in Borax Production

In 1913 the production of crude borate materials in the United States was 58,051 short tons, valued at $1,491,-530, compared with 42,315 tons in 1912, according to the U. S. Geological Survey. All the borax in the United States is produced from ores derived from California, and mainly from a few mines in Inyo and Los Angeles counties, although a small quantity was produced in Ventura County.

Thus far there has been no output of borax from the potash property in the Searles Lake region, where the owners expect to obtain borax as a byproduct of the potash operations.

Cathode Potential in Copper Refining

By Kenneth S. Guiterman*

SYNOPSIS—An investigation was carried out which had for its object the exact determination of the cathode potential which obtained under various conditions of temperature, current density and purity of the electrolyte. By means of such measurements, it is possible to obtain a precise knowledge of the electrolyte reactions which take place at the cathode. Changes in the current efficiency are accompanied by concurrent changes in the cathode potential.

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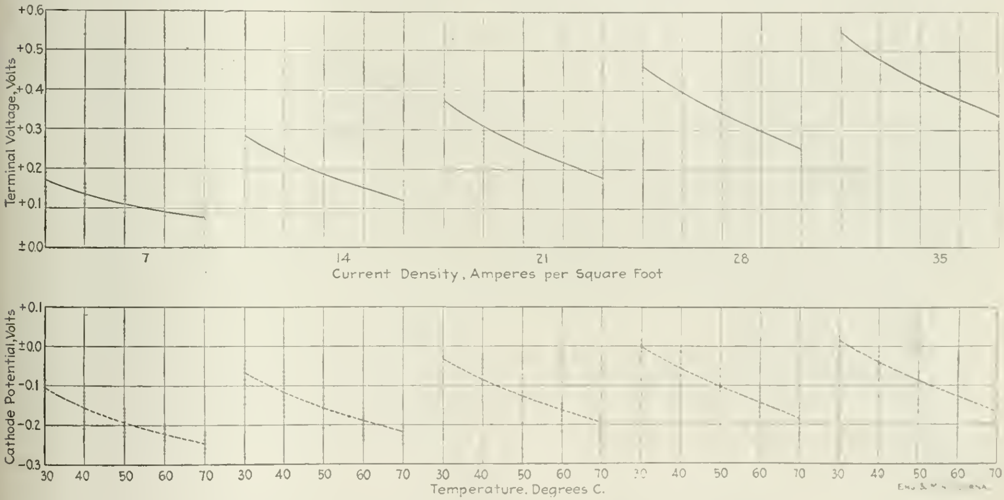
When any metal is precipitated by the electric current, it is necessary to employ such a terminal voltage which will insure the requisite potential at the cathode. It is also true in general that a loss in current efficiency is accompanied by a decrease in the cathode potential from the normal value.

The following experiments were carried out: (1) In every experiment the apparatus consisted of an electrolytic cell, containing an electrolyte of copper sulphate, to which some free sulphuric acid was added. The electrodes consisted of pure wire-bar copper at all times. (2) The electrolyte was kept in agitation by means of a rotating arm. The cathode potential was measured by comparison with a Weston element of constant voltage, in conjunction with a normal electrode composed of mercury-mercurous sulphate in a saturated water solution. (4) The Weston element maintained a constant potential of 1.019 volts. (5) The normal electrode had a potential of — 0.616 volt, as compared to that of a hydrogen electrode. (6) The temperature of the electrolyte in each experiment was varied as follows: 30° C.; 40° C.; 50° C.; 60° C.; 70° C. This variation occurred in successive stages, the cathode potential being measured at each temperature. (7) In each experiment and at each of the above temperatures, the current density of the cathode was varied successively as follows: 7; 14; 21; 28; 35 amp. per sq.ft. (8) In so far as it was possible, the composition of the electrolyte in regard to copper and free-acid content was maintained constant at approximately the following figures:

Cu—3.5%, equivalent to about 4 grams per 100 cc.
Free acid—11%, equivalent to about 12.5 grams per 100 cc.

In all experiments the contents of the electrolyte was recorded in terms of grams per 100 c.c. The volume of the electrolyte employed was uniformly 900 c.c. In all experiments which were made, there was used the pure electrolyte with the subsequent addition of certain impurities as follows: Glue, 0.005, 0.010, 0.020, 0.030 and 0.040 gram per 900 c.c. These amounts are the equivalent of ¼, ½, 1, 1½ and 2 times the amount of glue per cubic foot per day in practice. Salt, 0.005, 0.010, 0.020, 0.030 and 0.040 gram per 900 c.c., being the equivalent of ¼, ½, 1, 1½ and 2 times the weight of salt added per day per cubic foot under practical operating conditions. Arsenic, 4.5, 9.0, 13.5, 18.0 and 22.5 grams per 900 c.c. These amounts are the equivalent of approximately the following percentages in the electrolyte: 0.39%, 0.87%, 1.3%, 1.75% and 2.17%. Iron, ferrous, 4.5, 9.0, 13.5, 18.0 and 22.5 grams per 900 c.c., being equivalent approximately to the same above percentages as for the arsenic. Iron, ferric, 4.5, 9.0, 13.5, 18.0 and 22.5 grams per 900 c.c., equivalent to the same above approximate percentages in the electrolyte. Nickel, 4.5, 9.0, 13.5 and 18.0



Results of Tests for Determination of Cathode Potential grams per 900 c.c., being the approximate equivalent of 0.39%, 0.87%, 1.3% and 1.75% nickel content in the electrolyte.

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*Chief Chemist, Research Laboratory, Perth Amboy, N. J.

EXPERIMENTAL

A total of 26 experiments was made in accordance with the plan above outlined. The results of these experiments are plotted upon the accompanying curve sheet, which needs little explanation for its interpretation. Voltage changes are plotted as ordinates, which are indicated at the left of the sheet. Temperature changes are represented by the abscissas, as are also shown. The curves in the upper part of the drawing represent the mean or average terminal voltages under the various conditions of temperature and current density. Those in the lower half of the drawing represent the mean average cathode potentials concurrent with the above terminal voltages. The former are absolute voltages, while the latter are relative potentials, as compared to the equilibrium potential of hydrogen, which is taken as equal to zero. In all of the experiments, the total cathode area was 0.094 sq.ft., and the distance between the electrodes was 1 in., surface to surface.

The results of these experiments are of the highest importance, inasmuch as they serve to confirm the truth of the figures, which are obtained upon the larger scale in the experiments in the tanks (cf. ENG. AND MIN. JOURN., Aug. 22, 1914, p. 338). The curves illustrate this in most excellent manner.

In order that full importance may be attached to these curves and their significance clearly understood, it may be advisable here to explain briefly the meaning of the cathode potential. There exists for every element a certain minimum potential, which is required if it is to be precipitated or evolved at the electrode during the passage of the electric current. Under ordinary experimental conditions and for the sake of simplicity, it is customary to take the potential of hydrogen as zero (0.0). This basis has been assumed in the present experimentation and the equilibrium potentials of the other metals have been referred to this standard.

Those elements whose potentials lie below that of hydrogen are, therefore, negative, while those requiring a greater potential than hydrogen for their deposition are correspondingly positive. Lying in the first class with negative potentials are copper, silver, gold, etc.; the potential of copper being $-e_h : -0.308$. In the second class lie iron ($e_h : +0.66$), nickel ($eh : +0.60$), etc.

In a consideration, therefore, of the question of the variation of current or ampere efficiency, the question naturally arises: What causes are likely to occasion such changes? The answer to this question is extremely simple. Variations in current efficiency can be caused by one of two things; that is, either by causing the cathode potential to rise so high as to produce an evolution of hydrogen at the cathode, or by occasioning the potential to fall so low that the equilibrium potential required for the deposition of copper is not exceeded. In the latter case the current efficiency would be zero as far as the deposition of copper is concerned and this condition is therefore of little interest in the present discussion. The problem thus resolves itself into a determination of the conditions under which the relative cathode potential may change from a negative to a positive value.

In this consideration there is still one other factor which is of the greatest importance, namely, the one which is known as the overpressure of hydrogen. This is of moment only in so far as it permits or causes the evolution of hydrogen when its equilibrium potential is exceeded. As a consequence of this factor alone, it becomes possible to precipitate such metals as cobalt, nickel and zinc from acid solutions.

With this brief explanation, the interpretation of the curves shown becomes an easy matter. The important points determined may be summed up as follows:

With pure electrolyte it has been shown that under none of the conditions either of current density or temperature, was the equilibrium potential of hydrogen exceeded. In other words, under none of the above conditions did the cathode potential change from negative to positive.

The addition of glue in the proportions commonly used in practice (12 to 14 lb. per day per each 170,000 cu.ft. of electrolyte), caused the cathode potential to rise somewhat. An increase in the temperature of the electrolyte offsets this rise to a large extent. The equilibrium potential of hydrogen was exceeded, however, only at high current densities and with a cold electrolyte. Still further increases in the additions of glue are accompanied by continued small increases in the cathode potential.

Salt added to the electrolyte appeared to be without appreciable influence upon the cathode potential.

Additions of arsenic and ferrous iron to the electrolyte showed but a slight effect in causing the cathode potential to rise. This was expected from theoretical considerations alone. The addition of ferric iron to the electrolyte caused an immediate fall in the cathode potential, which was accompanied by a reduction of the iron to the ferrous state. Concurrent with the reduction of the iron, the cathode potential gradually resumed its normal value.

Under no conditions would it be possible for the iron to be alternately reduced and then reoxidized, for the reason that under ordinary practical copper-refining conditions the cathode polarization is always greater than that of the anode.

The addition of a strong cathode depolarizer, such as potassium permanganate, caused a drop in the potential equal to that caused by the ferric iron, thereby confirming the preceding statements.

The addition of nickel to the electrolyte was without appreciable effect upon the cathode potential.

RECAPITULATION

The average current efficiency obtaining in pure electrolytes is 95%. The average current efficiency with impure electrolytes containing approximately 2% arsenic and 1% iron in solution is also 95%. In other words, the presence of glue, salt, arsenic and iron in the electrolyte is without effect upon the current efficiency. The average current efficiency with impure electrolytes containing ferric iron is still 95%.

The presence of impurities in the electrolyte causes a slight increase in the cathode potential. The presence of a cathode depolarizer, such as a ferric salt or the permangante of potash, causes a momentary decrease in the cathode potential. At no time and under no conditions does the cathode potential fall below that value required for the deposition of copper. Only under extreme conditions of both high current density and low temperature of an electrolyte does the cathode potential rise above the value required for the evolution of hydrogen (0.0) at the cathode.

Conclusions

In view of these positive results which have been obtained and which support in detail all theory on the subject, the following conclusions are reached: Under practical operating conditions obtaining in copper refineries, a maximum of about 95% current or ampere efficiency, as measured against the best grade of electrical galvanometer, may be obtained. Impurities in the amounts commonly met with in copper electrolytes, such as iron and arsenic, have absolutely no effect upon this efficiency, notwithstanding assertions to the contrary. An element capable of existing in two states of oxidation, for example, ferrous and ferric iron, does not follow a cycle of oxidation at the anode with alternate reduction at the cathode whereby current is consumed which would otherwise be of value in depositing our copper. The state of oxidation in which the iron exists is purely dependent upon the relative values of the cathodic and anodic polarizations.

Under the usual conditions obtaining in copper refining, the cathodic polarization predominates, which causes the iron to remain in the reduced ferrous condition at all times.

While the quality of the deposited copper, its electrical conductivity and its physical character may be affected by certain impurities in the electrolyte, the current efficiency is not altered at all. A loss in current efficiency in copper refining is a reflex solely of mechanical short-circuits both in and out of the electrolytic tanks themselves.

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The White Pine Development

Houghton Correspondence

The White Pine mine, in Ontonagon County, Michigan, being opened by the Calumet & Hecla interests, continues to create astonishment in the nature of its development. Two weeks ago a most important discovery of an entirely new lode was made. This has not yet been explored, but the initial diamond-drill core showed a formation as rich in copper as that upon which the development work, to date, has been done. The lode was found 150 ft. back of the footwall and was discovered by purest chance. The drill core showed a wider formation than the original and its placement is contrary to all rules of geological conditions in the copper district. This fact is not of particular interest, in view of the fact that the White Pine mine itself is opened on a lode which is so different from anything previously discovered.

The White Pine mine now has over a mile of openings on good copper rock of a commercial quality. The narrow width of the lode, 18 in. to 5 or 6 ft., resulted in difficulty at the beginning of the work. This and continued faulting created some scepticism at first. But further development gave the miners a fairly accurate knowledge of how to find the lode when it "broke."

There never has been any milling problem of serious moment, general opinion to the contrary notwithstanding. The rock is a comparatively soft sandstone and the Calumet & Hecla, by experimenting at its plant at Lake Linden, demonstrated that it could recover 80% of the contents with ordinary milling machinery. The tables save most of the copper. The mill which the company now has in the course of erection undoubtedly will do better than 80%, possibly as high as 90%.

Underground work continues and by the time the mill is ready for operation the mine will be ready to furnish rock to its complete capacity. No. 3 shaft now has attained a depth of 1200 ft. and No. 4, 900 ft. A new boiler plant to furnish steam for hoisting at both of these permanent shafts is nearing completion.

To fully appreciate the possibilities of the White Pine property, it must be understood that the sandstone formation shows copper returns of close to 100 lb. per ton. This is five times better than the average secured from the rock of the Lake Superior copper mines today.

Every mining man who visits the White Pine is impressed with the absence of rich rock sticking out in bunches as in every rich mine opened on the conglomerate or amygdaloid lodes, and with the uniform content.

If the White Pine does what its most ardent admirers predict, it will show a copper output about half that of the Calumet & Hecla on a tonnage of 1000 daily. No official of the Calumet & Hecla can be induced to make any such predictions. In fact, the best they say is that their hopes are for a successful commercial proposition in the White Pine.

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Magnetic Surveying on the Cuyuna

By J. E. Rotthaus*

On the Cuyuna range over an area of 50 miles long and of a width varying up to several miles, probably 3000 drill holes have thus far been put down. In the entire district there is not one surface indication of iron ore or of the associated rocks, the surface everywhere being covered with sand and drift. The presence of iron-bearing formation was discovered through the use of the dip-needle, and magnetic surveying, or "dip-needling" as it is usually called, rendered material aid in the early stages of exploration in the district. As the district has now been more or less thoroughly explored and mapped magnetically, not much of this work is now going on.

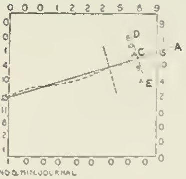
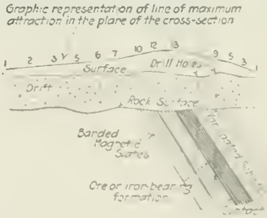


Fig. 1. A Forty Outlined by a Magnetic Survey



Graphic representation of line of maximum attraction in the plane of the cross-section
Surface
Drill Holes
Drift
Rock Surface
Banded Magnetic Slates
Ore or iron-bearing formation

Fig. 2. Vertical Cross-Section at Right Angles to the Base Line

Such surveying work is carried on crudely in the Cuyuna district, as compared with Swedish practice where great refinement is attained. In Sweden the ore is magnetite and the inclosing rock is absolutely nonmagnetic, while on the Cuyuna the conditions are somewhat reversed: the hematite is practically nonmagnetic, w the accompanying slates carry magnetite and attract the needle. Magnetic surveying is carried on in the Cuyuna field with but one object in view, i.e., to ascertain the absence or presence of the magnetic slates which prevailingly accompany the iron-bearing formation. This relationship is generally true on the South Range, but the absence of such magnetic slates on the richest known areas of the North Range left those deposits to be discovered by other methods.

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*Brainerd, Minn.

There are a number of reasons why more delicate use of the magnetic-surveying instruments is impracticable in this district. The iron formation sometimes contains sufficient magnetic material to show a few degrees of attraction. The hematite and the slates are frequently interbedded, and are often buckled severely. Volcanic dikes sometimes bisect the formation, and these dikes usually contain a small amount of magnetite. The overlying drift may contain pieces of magnetic float of sufficient size to deflect the needle. These facts and their interpretation may mislead even the experienced dipneedlers; in fact, in many instances, any interpretation must be largely a guess.

The amateur is confronted with additional difficulties, such as deflections caused by electrical and magnetic storms, dulling of the bearing points, the partial loss of the magnetism of the needle, the presence of pipe lines or small quantities of scrap iron concealed in dumps, etc.; these errors, experience alone will enable him to interpret correctly and to avoid.

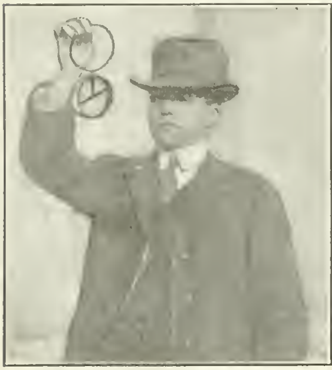

Fig. 3. Unsatisfactory Method of Holding

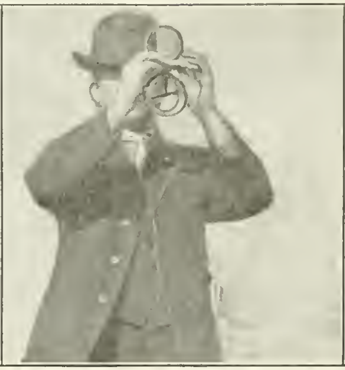

Fig. 4. Satisfactory Method

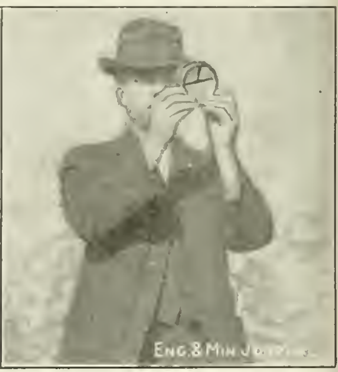

Fig. 5. Best Method

The use of magnetic-surveying instruments in the Cuyuna field has led to several refinements in practice. The Gurley "Miner's Dip Compass No. 341" seems to be the instrument most desired. Cuyuna field men first suggested the use of a bubble to insure perpendicularity of the compass when held in the hand. The instrument is first held horizontally, to determine the horizontal direction of the magnetic attraction. It is then held vertically in the plane of attraction and coincident therewith to ascertain the intensity of magnetic attraction. Fig. 3 shows the method of holding the instrument for the final reading, as the same is prescribed in many technical instrument catalogs and in some textbooks. Figs. 4 and 5 show the methods which Cuyuna range usage has shown to give the most accurate results; Fig. 5 is preferable. When holding the instrument as shown in Fig. 3, the slightest breeze may move the compass out of the perpendicular plane, while with the firm grasp shown in Fig. 5, the elbows being tightly pressed against the body, the likelihood of this is diminished. In Fig. 5 the bail or ring encircles the compass. This is left loose and free to swing and therefore acts as a plumb-bob in respect to one plane, while the bubble-tube is used to keep the instrument plumb as regards the other plane. Using the method of Fig. 3, these precautions are not properly observed.

Given, say, a 40-acre tract to work on, the engineer first takes readings at certain stated intervals, usually 100 paces (264 ft.) around the boundary. An idealized plat of the results would be as shown in Fig. 1. This shows the points of maximum magnetic attraction on the boundaries of the property to be at points *A* and *B*. Then, as a basis for drilling operations, a base line from *A* to *B* is staked off in 100- or 200-ft. intervals, and by taking readings perpendicular to this line, such as *C-D*, *C-E*, the sinuosities in the line of maximum attraction are accurately platted. This line then indicates, more or less closely, the location and trend of the magnetic slates which accompany the iron-bearing formation. In many instances, however, the iron content of the latter may be too low to make it commercial iron ore.

For drilling the tract, the base line is taken as a general guide. Cross-section lines are laid off at regular intervals, usually 300 ft., along this line. The drilling is started at a distance of probably 100 ft. from the base line on the hanging-wall side, which is usually the southeast, about as shown in Fig. 2, a cross-section. The questions of the location of drill holes, distance between cross-sections and the type of drilling, i.e., whether with angle or with vertical holes, are beyond the scope of this article. Many factors with which the dip-needler has no concern influence drilling operations.

Magnetic readings in the district run between 0° and 35° or 40°, and in rare instances run as high as 70°. It is difficult to state in a general way what readings might be considered favorable, except to say that exceedingly high readings are not especially so, since they generally indicate the presence of highly magnetic slates and are not an index to the value of the ore deposits, if there be any.

Mine Stores and What Mines Use--I

SYNOPSIS—The mine store is a department which has generally received little attention. A system of accounting and recording is given here, making a separate business of it, which should point toward a successful establishment. Lists of materials used in well known mines are given.

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The first function of a mine store is to furnish the mine with a convenient source of regular supplies used at the mines, and the second, which grows in importance with the scale of operations, is to purchase and secure the delivery of supplies at the least cost. This is true because larger quantities of supplies may be bought or contracted for at one time, thereby securing more favorable terms. The location of a mine store must be central to all departments to insure a minimum cost of delivery from the store to the works. It is equally important that it be situated on a railroad spur so that all shipments of supplies may be received directly from the cars and stored without extra haulage. Undoubtedly, the best design for a mine store and warehouse is on the order of the long railroad freight sheds with a platform on all sides and doors spaced so that cars may be spotted at any particular part of the building. This arrangement will also permit delivery wagons and trucks to be backed up to any part of the building from which it is to get its load. This design not only gives the highest labor efficiency in handling supplies but also allows the storing of stocks in the most accessible manner. For fire-protection, the timber yards should be at some distance from the store and the oil-storage and powder magazine should be placed well away from other buildings.

Store as an Independent Department

The store should be run as independent department; in fact, it should be treated as a separate business altogether. It should have complete charge of everything pertaining to the buying, receiving, and local delivery of supplies. Timber framing is usually considered a separate department but it is a supply-distributing department and should be under the store management. The responsibility of delivering supplies and teaming should rest solely with the storehouse so it follows that it should have charge of stables and auto trucks used for general haulage. We then have in addition to the original of cost materials bought and freight thereon the following: cost of maintenance and repairs to store buildings and yards; insurance on buildings and stock; running expense of purchasing department; storehouse management, clerks and laborers; timber-framing mill operations; stable and auto-truck expense, including drivers and laborers. These charges must be added to the bills for supplies issued from the mine storehouse before we get the actual cost of supplies. It is indisputable that no mine is getting its actual cost of supplies when it does not include these

It is quite a problem with some to know just how to make an accounting of these extra charges to supplies but they may be handled in a very simple way. To explain this method it is necessary, in a general way, to explain the bookkeeping system that must be employed at the mine's general operating office. Those who have had to wrestle with mine accounts and costs, not from the bookkeeper's point of view but to get the meat out of the figures, must agree that the main office is not the place to keep detailed costs. It is proper that it should have a file of all detailed cost sheets and reports but they should not originate there. It should attempt nothing more than a general accounting of funds passing through its hands. The division of accounts are subject to the operating units set apart by the management, but let us assume that the manager has divided his operations under the following heads; each with its own superintendent, organization and system of accounting:

Main accounts:
  1—Mining, including accounts for separate mines.
  2—Milling.
  3—Selling.
  4—Management and general operating office.
Sub-accounts:
  A—Storehouse, including framing mill and stable.
  B—Power plant and compressors.
  C—Electrical department.
  D—Mechanical department.
  E—Railroad department.
  F—General surface department.
  G—Hospital department.

Accounts 1 to 4 inclusive make up the total cost of production after all monthly charges from the sub-accounts have been added. In paying vouchers the main office charges all payroll payments direct to the main accounts or sub-accounts as the case may be, but all payments for supplies, machinery and freights are charged to the storehouse. Power, of course, is charged to sub-account B. It is not the object of this article to discuss the details of the whole system of accounting so no reference will be made to these accounts only as they relate to the storehouse and distribution of supplies. The bills of the storehouse to the other departments must include the original cost of the material plus its freight charge, payrolls, its own department supplies, framing-mill expense, and stable expense. This additional expense for supplies must be distributed fairly to the various departments so that at the end of the month when the main operating office credits the storehouse with its bills to other departments the balance remaining will represent as closely as possible the actual cost of supplies in stock.

It is obvious at first glance that these additional charges cannot be accurately distributed to each department so that the total will check with actual expenditures without a great deal of work. It is also certain that anything like an equitable distribution must be based on the amount of supplies bought from the store. A little careful figuring will soon establish the ratio of these expenses to the original supply cost and a per cent. factor taken which if added to each bill will about balance these charges. A comparison of the inventory of stocks on hand with the balance standing on the books against the storehouse will serve as a way to regulate this per cent. factor. However, it is not necessary that all these additional charges should be cared for in this manner. The expense of the framing mill is added to the cost of framed timber and the charges for general hauling and teaming is billed out at an hour rate which represents the actual cost of teams and labor plus the per cent. factor. These adjustments and charges are looked after by the store manager.

It is very well on small operations to burden the storehouse department with making a detailed distribution of supplies among the working accounts of other departments. But in conducting operations on a large scale it is better to let these distributions be made by the clerks of the various departments. In this case, the storehouse would only bill out goods to the accounts on the main operating books as stated. The authority for issuing supplies to and charging other departments should be in the form of a requisition signed by someone of authority in the department making the purchase. It is usually necessary, however, for such departments as the electrical, mechanical, and general surface department to purchase supplies which they will use for other departments. In this case, it is a great saving of time and bookkeeping to allow these departments to have such purchases charged direct to the department where the work is being done. For example; the electrical department purchases some electrical fixtures which it intends to use in the mill, it has the store charge it direct to the mill. the store requires it to "OK" the bill and designate where the fixtures were used in the mill. In this way the mill clerk will be able to make a proper distribution of the bill in his cost records. By following this practice, the bills rendered by the subdepartments to the other departments represent only their labor and necessary supplies for their own maintenance. This is best cared for at a shop-hour rate.

Under this system of organization the clerk of the mine department would receive a requisition from one of the foremen for a bill of supplies on which would also be stated the distribution. The clerk would in turn draw a regular storehouse distribution and to his copy of this attach the foreman's order. Upon delivery of the order by the storehouse, it sends a bill on which is given the requisition number. By referring to this number in his carbon copies, the clerk readily obtains the correct distribution of the supplies billed. It is a very simple matter then for the mine clerk to enter these bills under their proper headings on the monthly mine-supply sheet. At the end of each month he is furnished with a statement by the storehouse which should check with the total on his distribution sheet. The itemized supply distributions are handled by other department clerks in a similar manner. It might be well to mention here that the final mine and mill cost sheets containing labor, supplies, power, and department charges are not closed until a final check on department charges has been made through the main operating office. Copies of these sheets are then filed with the main office, thereby supplying more detail than would be possible under any other system.

PERSONNEL OF STORE ORGANIZATION

The personnel of a mine-store organization under a system of this kind would consist of a purchasing agent, storehouse manager, book-keeper and billing clerk, stock clerk, stable foreman, framing-mill foreman, and laborers. It is needless to say that the purchasing agent should be a good business man and familiar with the mining business. Few who have been connected with operations have not been caused more or less annoyance on account of the purchasing agent's unfamiliarity with the materials he was expected to purchase. Few orders originate with him but he is entrusted with the buying and delivery and final settlement of supply accounts. But in the purchase of staple supplies such as timber, explosives, fuels, oils, iron, steel, piping, cyanide, etc., he has a wide field to show his ability to save money, usually has the authority to purchase these in large amounts if he deems it necessary. The store manager should be a hustler who is familiar with the supply needs of all departments. He should make it a point to know the amount of stock he should carry. He should be the chief adviser of the purchasing agent in regard to regular stocks and above all know how to prevent delay in getting orders filled. He should have full authority over his department and subject only to the purchasing agent's orders, yet he should realize that the store is only run for the accommodation of other departments. All orders shoud go to the purchasing agent through the storehouse and all bills have the storehouse "OK" before final settlement, or return to the purchasing agent.

It should be the duty of the stock clerk to keep a daily record of stock on hand so that an inventory may be had at any time. One of the most convenient systems of the kind is a card system consisting of about 10x12-in. cards printed on two different colored boards. One color used for stock on hand and the other for deliveries. A card of each color is used for each separate item of stock. New stock received is promptly entered on the "stock on hand card" and all deliveries are entered daily on the "delivery cards." With this system, an ocasional checking with the stock in the storeroom will give a very accurate inventory at all times. The purchasing agent and store manager should make a regular study of these delivery cards to ascertain just what amounts of regular supplies are consumed. These records will guide them in making or contracting for the purchase of large stocks of staples in order to obtain the lowest cost. Buying in small lots means paying higher prices and freight charges. A study of these cards will undoubtedly show that some supplies are slow moving if not almost dead stock. To purchase them in lots to obtain anything better than the retail price would mean tying up money for an unreasonable time. In this case, the final cost would probably amount to double the retail price at a local store. If the mine is situated within easy reach of local stores the question of stocking the mine store with supplies other than those used in fair-sized quantities should be carefully considered. It has been thought that actual examples might be the best illustration, so the following lists of supplies, and other lists to be published in future issues of the JOURNAL, will give in detail all the supplies used at the Nevada Consolidated during a 10-mo. period, Miami Copper Co. during a 6-mo. period, New Jersey Zinc Co. during a 6-mo. period, and at the Hollinger Gold Mines during a 12-mo. period.

NEVADA CONSOLIDATED COPPER CO.

Mine Supplies for 10 Months in Steam-Shovel Mining; 2,376,966 Dry Tons Ore and 2,480,962 Cu.Yd. of Waste Mined

Fuel and Power	Tons	Lumber	Feet
Blacksmith coal......	119	Rough fir lumber.....	282,638
Coal	35,000	Flooring, ceiling, etc.	39,625
Coke	13	Ami wood............	47,148
		Molding, quarter round, etc..........	16,336

Explosives

Dynamite, 40%, lb..	1,667,050	Fuse, ft...............	207,198
Grant ammonia powder, lb.............	38,900	Blasting caps, No. 7..	93,520
Black powder, cans..	17,623	Electric exploders, 35 to 100 ft............	25,251
Praeposit powder, cans	4,966	Blasting machines....	4

Dynamite consumption about 0.71 lb. per ton of ore. Black powder consumption about one can for every 105 tons of ore produced.

Oils, Greases, Etc.

Cylinder oil, gal......	4487	Candles, boxes.......	15
Summer and winter lubrication, gal.....	3857	Gasoline, gal.........	3446
Signal oil, gal.... ...	264	Alcohol, gal..........	49
Red engine oil, gal...	181	Turpentine, gal.......	60
Compressor oil, gal...	40	Linseed oil, gal.......	115
Black chain oil, gal..	7191	Whale oil, gal........	5
Thread-cutting oil, gal.	90	Cup grease, lb........	3342
Crude oil, gal........	186	Gordon's gear shield, lb.	1262
Kerosene, gal........	1843	Mica axle grease, lb..	25
		Graphite, lb..........	321

Consumption of lubricating oils approximately 1 gal. for every 147 tons of ore; of lubricating greases, about 1 lb. for every 458 tons of ore.

Iron, Steel and Castings

	Lb.		Lb.
Bar steel	224,832	Iron castings	111,290
Sheet steel	25,492	Brass castings	25,649
Bar iron	88,965		

Consumption of iron, steel and castings about 1 lb. for five (5) tons of ore.

Pipe and Fittings

Pipe, ¼ to 6-in., ft.	18,600	Ball joints, 2- to 4½-in.	12
Copper tubing, 1¼-in., ft.	40	Stop and waste cocks	10
Galvanized pipe, 10-in., ft.	30	Bib cocks	240
Valves, ¼-in. up	1169	Bib cock repairs, pc.	325
Bushings, ⅛- to 2-in.	1045	Cylinder cocks	18
Nipples, ⅛- to 2-in.	2037	Lock nuts	24
Unions, ⅛- to 3-in.	1260	Valve leathers, sets	10
Couplings, ⅛- to 4-in.	1402	Valve washers	2
Reducers, ⅛- to 4-in.	454	Valve nut and seat	1
Ells, ⅛- to 3-in.	742	Safety pop valves, 2-in.	6
Street ells, ⅛- to 3-in.	1161	Three-way hydrants	3
Pipe plugs, ⅛- to 3-in.	514	Expansion joint, 3-in.	1
Pipe caps, ⅛- to 3-in.	208	Faucet washers	300
Tees, ⅛- to 2½-in.	451	Faucet balls	404
Crosses, ¾- to 2-in.	11	Return bends, 1½-in.	4
Flange unions, 1½- to 3-in.	40	Water valve covers	6

Tools

Picks	131	Pick handles	564
Hammers, 928 lb.	131	18- and 36-in. hammer handles	1072
Ball pein hammers	76	Ax handles	41
Scoop shovels	77	Adze handles	18
Round point shovels	686	Shovel handles	292
C. S. saws	6	Saw handles	14
Crosscut saws	2	File handles	9
Axes	29	Track-jack handles	85
Foot adze	1	Screwdriver	1
Plow points	12	Hammer, farrier's	1
Monkey wrenches	97	Knives, farrier's	7
Trimo wrenches	53	Jaws, farrier's	1
Trimo wrench parts, pc.	916	Draw knives	2
Trimo movable jaws	52	Hacksaw blades	1879
Trimo springs	72	Hacksaw frames	7
Drop-forged wrenches	133	Water pails	6
Hand saws	5	Squares	2
Grading plow	1	Rules, 2-ft.	6
Track jack	1	Steel tape line	1
Jack-lever socket	1	Engineers' torch	36
Champion jacks	2	Torch burners	72
24-ton base ratchet jacks	2	Gasoline burners	3
Tackle blocks, 4-in.	4	Lanterns	149
Track-jack repairs, pc.	390	Lantern globes	1128
Road grader	1	Lantern burners	177
Timber carrying hooks	4	Acetylene burners	576
Chain hoist	6	Acetylene-lamp parts	106
Little giant air drill	1	Acetylene lanterns	16
Crankshaft power drill	1	Tinners' mallets	5
Ratchet bit braces	2	Galvanized tubs	38
Drill chucks	5	Tube cleaners	3
Drill-chuck keys	5	Shear block blades	14
Twist drills	668	Emery wheels	20
Shank drills	12	Plier pockets	2
Drill bits	18	Wheel-scraper boxes	4
Ship-auger bits	24	Loco. replacers, pr.	12
Extension bits	3	Counter brushes	9
Planer gear and pinion	1	Wheelbarrows	6
Steel balls	1700	Meat-saw blades	9
Vises	3	Glass cutters	6
Vise jaws	1	Mattocks	8
Faceplate	1	Manure forks	10
Rail clamps	4	Little Giant drill repairs	20
Brooms	198	Repairs for shop, pc.	383
Pliers, pairs	9	Rivet sets	2
Whisk brooms	14	Pipe dies	106
Scrapers	6	Pipe taps	117
Rail benders	3	Shearing machine	1
Asphalt rake	1	Valve grinders	2
Wire stable brush	1	Flue welder and dies	1
Worm gears, rail bender	4	Saw-sharpening machine	1
Feather duster	1	Dust pans and brushes	2
Carpenters' chalk	576	Metal-workers' crayons	688
Paint brushes	115	Steel step ladder, 6-ft.	1

NEVADA CONSOLIDATED COPPER CO.

Supplies Used in Underground Mining at the Veteran Mine, 10 Months, Jan. 1 to Oct. 31, 1913; 216,794 Dry Tons of Ore Mined

Fuel and Power

Coal	1065 tons	Power	120 hp. per 24 hr.

Lumber

Round mine stulls, lin.ft.	210,070	Flooring, ft. b.m.	1,048
Round mine lagging, lin.ft.	34,092	Oak, ft. b.m.	73
Common lumber, ft. b.m.	443,202	Quarter round, door stop, etc., lin.ft.	2,009
		Shaft guides, lin.ft.	1,000

Consumption of mine timber about 1.13 lin.ft. per ton of ore; of common lumber, about 2.05 b.ft. per ton of ore.

Explosives

Hercules 40% dynamite, lb.	130,750	Caps	168,750
		Fuse, ft.	505,700

Consumption of dynamite about 0.60 lb. per ton of ore; of fuse, about 3.9 ft. per pound of dynamite

Oils, Greases, Etc.

Gear grease, lb.	1527	Renown engine oil, gal.	577
Cup grease, lb.	1584	Capital cylinder oil, gal.	206
Axle grease, lb.	25	Atlantic red oil, gal.	45
Graphite, lb.	10	Ario compressor oil, gal.	230
Candles, cases	1125	Transformer oil, gal.	15
Kerosene, gal.	228	Signal oil, gal.	18
Lard oil, gal.	12		
Linseed oil, gal.	19		
Black car oil, gal.	1568		

Consumption of lubricating oils about 1 gal. for 82.7 tons of ore; of lubricating greases about 1 lb. for 69 tons of ore.

Iron and Steel

Bar iron, lb.	9201	Pick steel, lb.	313
Tool steel, lb.	51	Forged steel, lb.	125
Ribbed steel, lb.	172	Cruciform steel, lb.	700
Drill steel, lb.	1829	⅞-in. drill steel, sets	12

Consumption of iron and steel about 1 lb. for 17.4 of ore

Pipe and Fittings

Galvanized 8-in. pipe, ft.	2000	Reducers, ⅜x1 to 3x4 in.	29
Black iron pipe, ½- to 4-in., ft.	2585	Valves, ¾ to 1¼ in. (gate)	84
Nipples, ¼- to 4-in.	844	Valves, globes, ¼- to 2-in.	92
Couplings, ½- to 3-in.	278	Valves, 8-in. galvanized gates	7
Ells, ¼- to 4-in.	441	Valves, check, ½- to 3-in.	14
Ells, galvanized, 8-in.	40	Air cocks, ⅛- to ¾-in.	5
Unions, ¼- to 2-in.	267	Expansion joints, 3- and 4-in.	7
Plugs, ¼- to 4-in.	170	Composition bibbs	12
Tees, ¼- to 4-in.	114	45° ells	9
Tees, 8-in. galvanized	38		
Angle cocks, ⅜-in.	6		
Waste cocks	20		
Bushings, ¼x⅜ to ¾x1 in.	238		

Tools

Claw hammers	5	Steel figures, sets	1
4-lb. hammers	27	18-in. hammer handles	256
8-lb. hammers	6	36-in. hammer handles	67
Machine hammers	2	Drifting pick handles	207
Sledges, 10- and 12-lb.	2	Track-jack handle	1
Scoop shovels	14	Peavy handles	2
L. H. R. P. shovels	724	File handle	1
Hand saws	21	Ax handles	12
Pick eyes	24	Hacksaw blades	221
Rake	1	Hacksaw frames	2
Axes, handled	80	Peavies	2
Files	183	50-ft. tapes	3
Trimo wrenches	15	Lanterns	8
Monkey wrenches	15	Lantern globes	1
Trimo wrench frames	6	Ore buckets	8
Baxter wrenches	3	5-gal. buckets	37
"Always ready" wrenches	3	Oilers	16
Brooms	30	Emery wheels	8
Trimming shears, pair	1	Miner's hand lamps	45
Jacks	2	Nut augers	2
Calipers, pair	2	Plug taps	12
Dividers	1	Tinners' shears, pair	1
Thickness, gage	1	Pliers, pairs	3
Flue cleaner	1	Wheelbarrows	4
Mops	2	Saw-tooth holders	12
Wash tubs	6	Saw teeth	156
Carpenter's chalk, gross	½	Rubber brushes	3
Keyseat clamps, pair	1	No. 1 Milburn light	1
Rubber hand pumps	3	Pocket scriber	1
Chain block, 1-ton	1	Machinists' plumb level	1
Calcimining brushes	5	File guards	3
Breast drill	1	Emery-wheel dresser	1
Screw plate	1	7⅝ drill bit	1
Expansion bits	2	Pipe cutters	6
Combination reversible ratchet	1	Drill bits	6
Machinist's hand taps, sets	9	Twist drills	30
		Wood augers	2

MIAMI COPPER CO.

Mine Supplies Jan. 1 to July 1, 1913, Underground Mining 489,627 Tons of Ore and 32,668 Tons of Waste Mined

Fuels

Coal:		Coke:	
3-in. lump, tons	537	Furnace, tons	136
Blacksmith, tons	65	Oil:	
		Fuel oil, bbl.	52,748

3200 b.hp. used.

Lumber

Mine timbers, ft.	3,347,712	Mine stulls, pc.	11,780
Mine lagging, ft.	1,268,739	Mine wedges, pc.	154,340
Building lumber, ft.	161,916		

Explosives

Dynamite:		Powder:	
1⅛-in. 30% gelatin, lb.	31,750	Judson powder, lb.	50
1⅛-in. 40% gelatin lb.	2,150,550	Fuse	
1⅛-in. 70% gelatin, lb.	50	Comet fuse, ft.	715,100
		Caps	
		Electric exploders	500
		6X caps	123,400

Oils, Grease, Etc.

Oils:		Oils:	
Kellogg a.c cylinder oil, gal.	5374	Fish oil (for paints), gal.	[illegible]
Cap. cylinder oil, gal.	3647	Linseed oil (for paints), gal.	[illegible]
Renown engine oil gal.	2710	Turpentine (for paints), gal.	[illegible]
No. 1, heavy concentrator oil, gal.	3888	Wood alcohol (for for paints), gal.	[illegible]
Arlo compressor oil, gal.	3545	Grease:	
Dark summer oil, gal.	1457	Arctic cup grease, lb.	[illegible]
Gasoline, gal.	2223	Mica axle grease, lb.	[illegible]
Kerosene	1024	Candles	
		Candles, cases	1,326

Iron and Steel

Bar iron and steel, lb.	100,293	Castings, lb.	164,350
Steel plates, lb.	77,713	Drill steel, lb.	30,318

Pipe and Fittings

½-in. up to and including 1-in. pipe, ft.	34,907	Above 2-in. and including 4-in. pipe, ft.	1,304
Above 1-in. and including 2-in. pipe, ft.	27,100	14-in. welded steel pipe	54
		6¼-in. casing for drill holes, ft.	209

Pipe fittings cost $1910 or 18.5% of total pipe cost.

Tools

No. 6 picks	702	Mill brooms	175
Pick handles No. 34	1543	10-in. bits	2
Shovels	1078	Stucco brushes	97
Axes	73	Grindstone	1
Ax handles	222	No. 4 trucks	3
Cant-saw files	396	Machinists' vises	2
Hacksaw blades	3047	Chain hoist, ½ ton	1
Drill-hammer handles, etc.	587	Car movers	4
		Rail benders	3
Pipe wrenches, 14-in.	210	Stock for Toledo pipe dies	1
Saw, crosscut and band	49	Wall brushes	6
Wheelbarrows	171	Rivet buster	1
Little Giant electric drills	3	1-ton Peerless hoist	1

NEW JERSEY ZINC CO.

Mine Supplies used in Six Months. Ore Broken, 216,650 Tons; Waste Broken, 97,770 Tons; Total Tons Broken, 359,420 Tons

Fuels and Power (Not All Used for Mining)

Tons coal	10,177	Average hp. 6 months	7532.98

Lumber

Mine timber, ft.	138,864	Spruce, chestnut, pine, ft.	819
Mine lagging, 4-in., ft.	262,811		
Mine plank, ft.	49,810		

Explosives

Gelatin powder, lb.	145,250	Delay act. fuses, ft.	7,200
Caps	207,610	Fuse, ft.	586,450
Victor fuses, ft.	39,328	Fuse cutter	1

Consumption of powder about 0.556 lb. per ton of ore; of fuel, about 3.16 ft. per lb. of powder.

Oils, Greases, Etc.

Alcohol, pt.	1	Black oil, gal.	195
Gasoline, gal.	6	Kearsage oil, gal.	107
Turpentine, pt.	1	Hydraulic oil, gal.	7
Grease, lb.	769	Kerosene, gal.	114

Consumption of lubricating oils about 1 gal. for 850 tons ore; of lubricating greases, about 1 lb. for 342 tons of ore.

Iron and Steel

Channel iron, lb.	317	Stub steel, lb.	10
Round iron, lb.	5501	Round soft steel, lb.	1498
Angle iron, lb.	8465	Square soft steel, lb.	103
Flat iron, lb.	5911	Nickel steel, lb.	1535
Tool steel, lb.	245	Sheet steel, lb.	73
Flat steel, lb.	300	Spring steel, lb.	42
Shafting, lb.	183	Bar steel, lb.	304
Drill steel, lb.	24,977		

Consumption of iron and steel about 1 lb. for 5.4 tons of ore.

Pipe and Fittings

½- to ¾-in. pipe, inclusive, ft.	290	4-in. couplings, pr.	2
		2-in. flanges, pr.	40
1-in. pipe, ft	1249	4- and 5-in. flanges, pr.	8
3- and 5-in. pipes, ft.	34		
Crosses	1	Unions	57
Reducers	9	Bushings less than 2-in.	621
Valves	4		
Ells less than 2 in.	99	Tees less than 2-in.	78
Plugs less than 2-in.	320	Cocks	52
2- and 4-in. couplings, pr.	16		

Tools

Adzes	4	Steel-wire brushes	4
Axes	24	Tar brush	1
Crosscut saws	7	Paint brushes	5
Draw knife	1	Crayons	18
Carpenter's square	4	Chalk line	1
Wood bits	5	Chalks	12
12-lb. sledges	9	Sledge-hammer handles	275
6-lb. hammers	5		
Picks	44	Adze handles	4
Shovels	101	Shovel handles	6
Universal ratchet	1	Pick handles	255
Rules	2	Hammer handles	154
Screwdrivers	5	Machine-hammer handles	10
Wrenches	89		
Stilson-wrench frames	3	Ax handles	55
50-ft. tapes	3	Saw handles, pairs	6
24-in. level	1	Pipe taps	3
T-shank drills	45	¼-in. taps, set	1
Angle divider	1	Thread thimbles	32
Hacksaw frame	1	Files	95
Emery wheel	1	Grindstones	2
Timber cranes	24	Water pails	4
Hacksaw blades	569	Wrench nuts	3
Cutter wheels	3	Wrench jaws	5
Brooms	3		

HOLLINGER GOLD MINES

Supplies for One Year (Part Used in Construction); 140,131 Tons of Ore and 11,544 Tons of Waste Mined

Fuel and Power

Coal:		Wood:	
Steam coal, etc., tons	2252	Wood for fuel, cords	3136
Blacksmith coal, tons	109	Oil.	
		Fuel oil, bbl.	571
Coke:		Electric current, hp. year	1313
Hard Coke, tons	93		

Lumber

Rough lumber, ft.	298,124	Shiplap, ft.	63,966
Dressed lumber, ft.	242,873	Mine timber wedges, pc.	13,500
Square timber, ft.	99,893		
Lagging, ft.	31,835	Base mold, board, window stop, etc., ft.	10,632
Flooring, ft.	53,025		

Explosives

Dynamite:		Lead wire, ft.	9,000
7830 cases, lb.	391,500	Connecting wire, lb	140
Fuse, etc.:		Detonators, boxes	1047
Fuse, ft.	1,128,000	Cap and fuse crimpers	27
Electric and time fuses, boxes	91	Electric blasting batteries	5

Consumption of dynamite about 3.8 lb. per ton of ore.

Oils, Greases, Etc.

Oils, lubricating:		Oils, miscellaneous:	
Dynamo oil, bbl.	13	Wood alcohol, gal.	10
Compressor oil, bbl.	18	Turpentine, gal.	27
Cylinder oil, bbl.	28	Greases:	
Crusher oil, bbl.	7	Arctic cup grease, lb.	3450
Transit oil, bbl.	1		
Oils, miscellaneous:		Special gear grease, lb.	890
Gasoline, bbl.	11		
Kerosene, bbl.	33	Mica axle grease	1184
Polarine oil, bbl.	2	Galypsol grease, lb.	1233
Linseed oil, bbl.	4	Camshaft grease, lb.	678
Mineral seal oil, drums	3	Flake graphite, lb.	310
		Cable dressing, lb.	667
Floor oil, bbl.	½	Belt dressing, lb.	113
Electrolite, bbl.	⅓	Candles, cases	1130

Consumption of lubricating greases about 1 lb. for 18 tons of ore.

Iron and Steel

Bar iron and steel, lb.	72,124	Cold-rolled shafting, 1 in. to 3⅛ in., lengths	89
Sheet steel, lb.	23,215		
Drill steel, lb.	67,755		

Consumption of iron and steel, not including shafting, about 1 lb. for 0.86 tons of ore.

Pipe and Fittings

Pipe:		Unions, ¼ to 8-in.	8,010
Black iron, ¼-in. to 8-in., ft.	36,371	Plugs, ¼- to 8-in.	2,125
		Caps, ½- to 4-in.	847
Spiral riveted, 6-in., ft.	750	Couplings, ½- to 3-in	1,314
		Bushings, ⅜- to 8-in.	11,118
Valves:		Reducing couplings, ½- to 6-in.	1,489
Brass globe, ¼- to 2¼-in.	512	Crosses, ½- to 2-in.	504
Angle valves, ½- to 1-in.	145	Tees, ⅛- to 8-in.	2,413
		Reducing tees	43
All iron gate, 1- to 8-in.	113	Return Y's, 2- and 3-in	162
Sundry valves	199	Return bends, 1- to 2-in.	211
Nipples, ⅛- to 8-in.	23,592	Brass and iron stop cocks	2,084
Elbows, ⅛- to 8-in.	11,761		
Street elbows, ½- to 1-in.	860	Valve seats, ½- to 2-in.	214
45° elbows, ½- to 3-in	815		

Tools

Sledge hammers	34	Chain blocks, 1- and 10-ton	2
16-lb. rock hammers	32		
Striking hammers	42	Pulley blocks	8
Claw hammers	180	Crayons, gross	4
Machinists' hammers	132	Files	1644
Riveting hammers	3	Hacksaw blades	1920
Axes	384	Hacksaw frames	16
Fireman's axes	4	Hand saws	48
Shovels	759	Crosscut saws	2304
Spades	44	Twist drills	185
Coal scoops	14	Ship augers	28
Hammer handles	1272	Braces	3
Pick handles	524	Bits	19
Ax handles	276	Taps and threads	45
Peavie handles	36	Sets stocks and dies	2
File handles	180	Pliers	9
Awl hafts	43	Screwdrivers	42
		Garden rakes	12
Stilson wrenches, 6- to 48-in.	631	Plasterers' hoes	6
Stilson-wrench nuts	168	Mason's lines	216
Stilson-wrench jaws	124	Soapstone crayons	864
Stilson-wrench frames	87	Collets and dies	19
		Vises	8
Monkey wrenches, 8- to 15-in.	474	Tube expanders	5
Drift picks	492		
Rock picks	168	Eberhardt turning tools	7
Chain tongs	7		
Armstrong boring tool	1	Cutters for keyseater, set	1
Farrier's knives	3		
		Cutters for emery-wheel dressers, sets	6
Racks for bolt threader	2	Trimo cutters	2
Chisels	4	Paint brushes	84
Steel brooms	168		
Galvanized-iron pails	11	Corn and stable brooms	480
Flue cleaners	6	Tinsmith snips	4
Cant hooks	48	Emery wheels	2
Tackle blocks	58		

(To be continued)

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Recent Dividend Actions

The New York *Evening Post* sums up recent actions of mining companies listed on the Exchange as follows:

Butte & Superior, unchanged at 75c.; Utah Copper unchanged at 75c.; Guggenheim Exploration, unchanged at 87½c.; Chino Copper, reduced from 75c. to 50c.; Anaconda, reduced from 75c. to 25c.; Ray Consolidated and Nevada Consolidated dividend action deferred. These dividend actions were for the current quarter.

Details of Practical Mining

Open Screened Dormitory in Southwest

By A. L. Flagg*

The dormitory shown in the accompanying photograph was recently built by the Kelvin-Sultana Copper Co., at Kelvin, Ariz., for the accommodation of its miners. The building is inexpensive, comfortable and sanitary, well adapted to use in localities where the climate is exceedingly warm in summer and the winters not cold. The normal capacity is 24 men, though, with crowding, it will accommodate nearly twice that number. During the warmest days, interior temperatures were from 4° to 11° lower than out of doors in the shade, depending on the direction of the wind.

The dormitory proper, 14x26x8 ft., is a galvanized stamped-steel building, in sections, of the "Pruden System" all-metal, portable type. Around this, on all four sides, a porch 8 ft. wide was built. This is boarded up to a height of 3 ft. Above the boards and extending to within a foot of the eaves is a screened opening 40 in. wide, covered with ordinary galvanized screen cloth. A continuous roof covers both the steel structure and the screen porch, an air space of 2 ft. being left over the roof of the steel building. The inner building is provided with four windows on the sides and a door at one end. At the front end and in one corner is a lavatory with running water and a drain. The building is lighted by electricity. Twelve double steel bunks with good springs and mattresses are provided.

Kelvin-Sultana Dormitory with Screened Porch

[We incline to the opinion that the miners inhabiting this outdoor sleeping porch are in luck.—Editor.]

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*Mining engineer, Kelvin, Ariz.

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Determination of Dip of Beds from Drill Cores

In E. E. White's article, published in the Journal of Sept. 19, there occurred the statement, "Consider *r* as equal to unity." As a matter of fact, the distance from the point *a* on the drill hole to the intersection of the drill hole with the bedding is considered as unity in deriving the formulas. Mr. White's manuscript was correct, the error having been made in editing.

Unusual Problem in Openpit Mining*

The ore deposit at the Virginia mine varies in chemical composition almost beyond belief, comprising almost every oxide, hydroxide and carbonate of iron. Some of the ore is magnetic—in fact, the best of it is. In part of it there is a large percentage of carbonate; in some of it a great deal of pyrite; there is some oxide of manganese—these in addition to every form of hematite. The variation occurs both vertically and horizontally. For example, a 65-ft. vertical bank in the pit has 16 layers, each a different kind of ore. The adjacent layers vary widely in composition; thus a 4-ft. streak running 59% iron, 0.045% phosphorus and 0.070% manganese is followed by a 5-ft. layer running 50% iron, 0.136% phosphorus and 3.35% manganese. The range of the iron in the bank is from 63 to 43%; of the phosphorus, from 0.02 to 0.25%, and of the manganese, from 0.30 to 5.20%. The variation horizontally is equally great; thus frequently bank samples on 10-ft. banks run 59% of iron and 0.03% phosphorus, while the cars loaded from these banks run any other analysis that the wildest imagination can invent. Imagine the disappointment when a bank like the above gives in the car sample 48% iron, 0.136% phosphorus and 3.25% manganese.

In appearance there is nothing to indicate the kind of ore present. There are soft ores and hard ores, sandy ores, steel ores, and ores blue, red, black, yellow or gray. Visitors to the pit used to wonder why we were loading a gray-looking rock, refusing to believe that it was ore until they had an analysis of a sample taken personally. A representative of the fee owners ordered thrown out of a car a lot of stuff which he thought was rock, which upon analysis proved to carry 66% iron and 0.044% phosphorus, the highest grade of ore ever found in the pit.

So when orders came at the opening of the season of 1911 to ship but one grade and that a high-grade bessemer, there had to be found ways and means to do it. The guarantee was 57% iron, 0.36% phosphorus and 0.76% manganese—you can imagine the prospects as to an output.

A laboratory was built at the mouth of the pit and a high-speed chemist and two swift and accurate samplers put to work. Four dumps were started, one for high-phosphorus ore, one for low-iron, one for high-manganese, and one for waste. Two steam shovels were kept under steam constantly and handled by one crew alternately as the nature of the ore required; this frequently meant several changes a day from one shovel to the other.

The ore was sampled in one-car lots and analyzed for iron, phosphorus and manganese separately. From these one-car samples, five-car samples of grade ore were built up. The sampling was done in the pit. The chemist's return on one element was out in 35 minutes after the ore was loaded. If a car was too high in phosphorus or manganese or too low in iron to be combined with what was expected from the other shovel, it was sent to one of the dumps The analyses determined in which dump it belonged; they also determined how soon ore that could be used would be reached. Frequently the cars had to be held for the chemist's complete returns before they could be dumped. Low-iron and high-manganese were not wanted on the non-bessemer dump, nor high-iron on the low-grade dump, and above every thing else, not one pound of ore was to be wasted that could be used in a mixture to produce guarantee ore.

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*An abstract of an article by John H. Eby, superintendent of the Virginia mine, Virginia, Minn., appearing in the Michigan College of Mines' "Alumnus," April, 1914.

In addition to these difficulties, the ore was generally hard and broke in large pieces. These pieces had to be broken with hammers to a maximum size of 6 in.; 16% of the total working time was spent at this work, the shovels having to wait while the men broke the ore. Frequently not over 50 tons per hour was loaded.

In making up the grades of the samples a system of records and orders was established. The first record was the analysis sheet kept by the chemist, Table I, containing analyses of the separate cars. From this sheet the superintendent would, whenever possible, build up a five-car lot and issue an order, Table II, to the chemist, to make up the five-car sample for it. The number of this five-car sample was placed opposite the car numbers on the analysis sheet. Three copies of this order were made; one went to the chemist, one to the analysis clerk and one was filed on record. Another order, Table III, was made up instructing the yardmaster and shipping clerk to have the five cars switched out and shipped.

TABLE I—ANALYSIS SHEET

Sheet No. 35

Car No.	Iron	Phos.	Mang.	5-Car Sam. No.
9,654	59.37	0.056	0.50	757
10,237	50.21	0.020	3.21	758
8,464	49.36	0.018	1.75	757
10,786	57.32	0.055	0.60	756
11,114	63.10	0.055	0.75	758
10,176	55.14	0.020	0.50	757
6,742	63.10	0.042	0.20	756
8,513	51.20	0.015	1.10	756
9,120	54.15	0.018	1.30	758
11,013	58.25	0.045	0.43	756
5,437	56.12	0.026	0.70	758

TABLE II—CHEMIST'S ORDER

June 25, 1911.

Virginia Mining Co.,
Virginia Mine.

Chemist please make up and run the following sample No. 756:

Car No.	Iron	Phos.	Mang.
6,742	63.10	0.042	0.20
10,786	57.32	0.055	0.60
11,013	58.25	0.045	0.43
8,513	51.20	0.015	1.10
3,762	52.11	0.017	1.20
	281.98	0.174	3.53
	56.40	0.035	0.70

....
Supt.

TABLE III—YARDMASTER'S ORDER

June 25, 1911.

Virginia Mining Co.,
Virginia Mine.

Yardmaster make up and shipping clerk bill out samples Nos.:

756	757	758
6,742	9,654	10,237
10,786	8,464	11,114
8,513	10,176	9,120
3,762	10,345	5,437
11,013	7,538	6,378

....
Supt.

Frequently three or four days would pass during which no grade samples could be built up and the ore had to be carried until some different ore was loaded. At such times as many as 90 cars would accumulate in the yard; and then the shovel would get into the right kind of ore and there would be a cleanup and in 24 hr. there would not be a loaded car in the yard. The switching out of the samples was difficult, for the cars had to be picked out from all over the yard. This took 25% of the working time of the engine crews.

There was no system of mining; it was dig where you could get the ore and dodge what you could not use; and there was always the chance of getting completely tied up. Many a time nothing but vigorous and drastic measures systematically carried out saved the closing down of the mine. On two different occasions cargoes were within 800 tons of finished, yet it was not possible to finish the cargo until 5000 tons of ore were sent to the dumps and four days spent in getting the small amount required. The records for the season of 1911 show that to obtain the 97,000 tons of grade bessemer ore, 60,000 tons of off-grade and waste had to be moved. The handling of this occupied 28% of the total working time of the shovels. The changes of shovels were frequent, and a great deal of track-shifting was required.

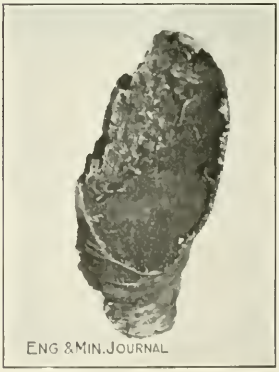
I think that this record challenges comparison for production of a high-grade ore out of a low-grade deposit; for the average of the 60,000 tons off-grade did not exceed 52% iron.

*

Diamond-Drilling through Steel

By Wallace G. Imhoff*

In the Iron River district, Michigan, there is a heavy overburden of sand and gravel. On a certain job churn drilling had been conducted for a week or so; the surface was extremely hard to get through and blasting was necessary in a number of cases. At a depth of 146 ft., ledge was reported encountered and accordingly the diamond drill was connected up. From the start extremely hard drilling was reported with little or no progress; the diamond setter was sent for and given charge of the drilling.



Casing Core Taken by Diamond Drill

For six hours diamond drilling continued with but slight progress. At length the drill rods suddenly sank, drilling became easy and sand and gravel issued from the wash water. The drill was immediately stopped and the rods drawn. Upon examining for core the piece of steel pipe, shown in the illustration, was found. The diamonds had cut a section through the 3-in. casing. Only those familiar with diamond drilling can fully appreciate the skill of the setter who accomplished this feat with no broken diamonds or even the loss of $^1/_{64}$ carat.

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*Consulting engineer, Pittsburgh, Penn.

The trouble was caused by blasting without pulling the casing high enough; when the blast exploded it tore and feathered the casing, closing up the end of the pipe in such a manner as to give those in charge of the drilling the impression that rock ledge had been encountered.

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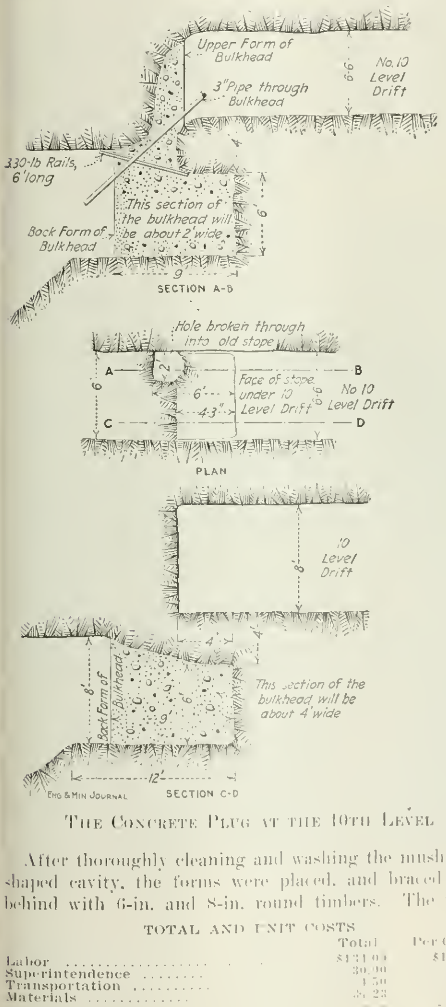
Concrete Bulkhead of Irregular Shape*

The accompanying drawing represents a concrete bulkhead of irregular shape installed to resist a water pressure of 50 lb. per sq.in. between the old and new workings of the Hibernia magnetite mine, in New Jersey.



The Concrete Plug at the 10th Level

After thoroughly cleaning and washing the mushroom-shaped cavity, the forms were placed, and braced from behind with 6-in. and 8-in. round timbers. The inside of the forms was covered with tar paper, and a 3-in. drain pipe, for possible future use, was run through the forms. This pipe was fitted with a gate valve on the working side. Two-thirds of a cubic yard comprised a batch of concrete, which was mixed rather wet, so that after a batch had been placed, water rose slightly above the level mass. Three iron rails were placed across the mouth of the cavity for reinforcement. The 12 yd. of concrete was placed in 10½ hr. The accompanying table give the costs.

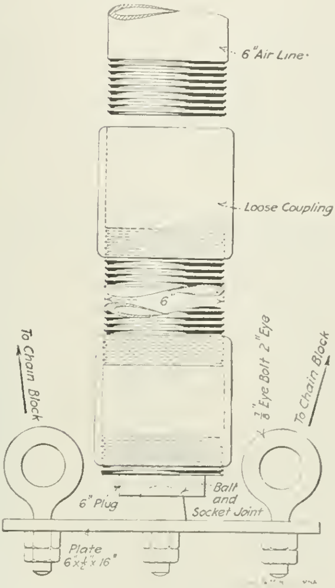
TOTAL AND UNIT COSTS

	Total	Per Cu. Yd.
Labor	$134.00	$11.15
Superintendence	30.00	2.50
Transportation	4.50	0.37
Materials	37.23	3.10
Total	$205.73	$17.12

⁂

Air-Pipe Connection in Sinking*

In sinking the Palms shaft of the Newport Mining Co., a 6-in. pipe line was used for the compressed air. The accompanying illustration shows the bottom connection. The method of adding a new section was as follows: To the top end of the new section at the surface a coupling was fastened closely by a few threads, and at the bottom end there was attached a temporary coupling with the socket of a ball-and-socket joint. The pipe was lowered underneath the bucket with a ½-in. chain, a clamp keeping it from slipping. The plate of the ball-and-socket joint was supported underneath the air line by two chain blocks. The lower end of the section of pipe was swung over upon the plate by hand. Then the section was raised by the chain blocks up to the end of the air line, and a few quick turns of the loose coupling made the connection. The coupling was then tightened with chain tongs.



Ball-and-Socket Support for New Section of Pipe

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Blasting-Machine Rheostat Tester

The September *du Pont Magazine* strongly advises the use of the rheostat for testing a blasting machine before use. By introducing as many units of resistance into the circuit as there will be detonators in the blast and firing one detonator for a test, the blaster is assured that the machine will fire the whole blast and will fire it for him. The latter point is important as there is a certain knack in getting the utmost out of a blasting machine and an expert operator can often fire more holes than another perhaps stronger man. Furthermore, this testing builds up the machine and restores any residual magnetism lost by disuse or by jolting.

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*From the A. I. M. E. "Bulletin," August, 1914.

*An excerpt from an article presented before the [illegible] meeting of the Lake Superior Mining Institute, Aug. [illegible], 1914.

The six-post rheostat is so designed that all resistances from 0 to 100 units can be had in steps of five. The unit is equal to the resistance of one detonator.

While this rheostat tester is simple and substantial, without moving parts, it is necessary to follow directions and use sense in making connections. Instances are known where connections were so made that no resistance was introduced and a defective machine was indicated to be in shape.

In testing, precautions must be taken to avoid being hit with flying pieces of copper. The cap should be buried in sand 6 to 8 in., or put behind a good healthy rock or tree.

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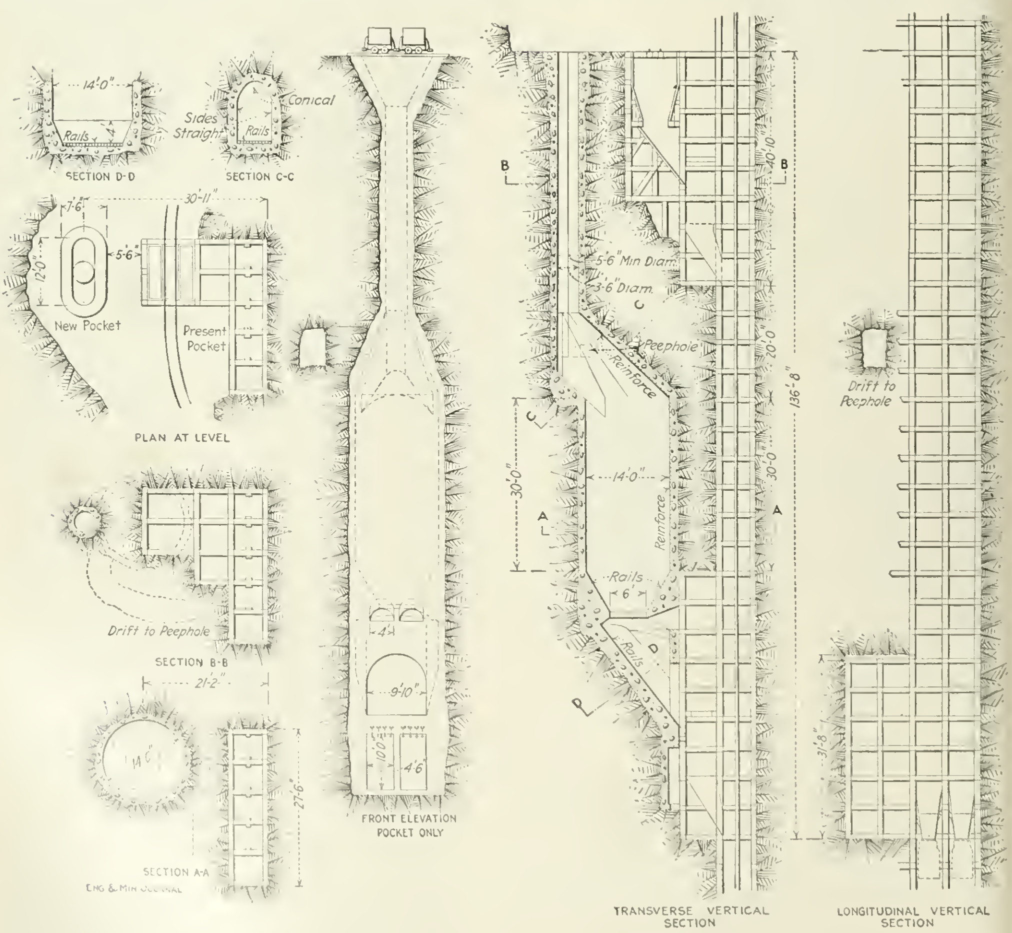
Concrete Hoisting Pockets

The accompanying drawings reproduced from the August, 1914, *Bulletin* of the A. I. M. E. represent a concrete-lined storage and loading pocket of the Sacramento shaft, the principal hoisting shaft of the Copper Queen company. It is believed that the elimination of upkeep cost on the concrete lining will more than compensate for its increased first cost over a wood lining. Furthermore, the shape of the pocket and the smooth surface make the lining particularly adaptable for handling the wet sticky aluminous ores, for which purpose it was installed.

The pocket starts with an elliptical bell-mouth and tapers to a 3½-ft. cylindrical chimney. This enlarges to a circular pocket 14 ft. in diameter and about 30 ft. high. The capacity of this, the pocket proper, is 52,000 cu.ft. or 260 tons. It has a conical bottom with a 6-ft. opening which feeds to a small pocket, which in turn supplies the measuring pocket.

From one of the shaft compartments a drift runs around to a peep-hole into the pocket where the cylindrical chute widens to the pocket proper. The slanting bottoms at various points in the pocket are covered with rails where they are subject to the impact of falling ore. The concrete lining is reinforced in some places.

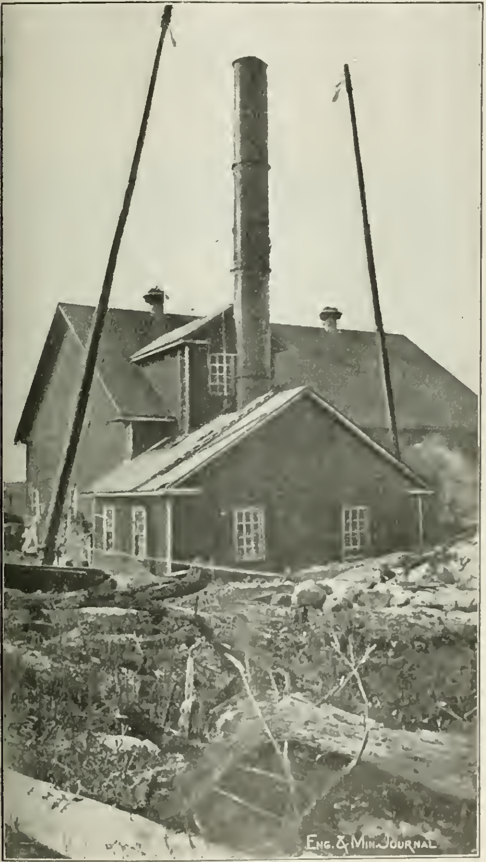


SECTIONS OF NEW CONCRETE-LINED SKIP POCKET AND OLD TIMBERED POCKET

Details of Milling and Smelting

Rig for Lifting Stack

The accompanying illustration shows the rigging that was used to lift a sheet-metal stack from the ground and drop it into a hole in the roof of a boiler house. The stack was in one piece and lay on the ground by the side of the boiler house, which was completed, except for erecting the stack, a hole having been left in the roof for the latter. The guy pole, at the left in the picture, was tipped a little back from the vertical, and a rope from it was attached to the stack, which lay on the ground beneath the pole. With this pole, the stack was then raised sufficiently to clear the roof, and the guy lines from this pole were then pulled over to swing the pole around until the stack was over the roof. A line from the guy pole at the right of the picture was then attached to the stack, to which was also fastened a fag line. The stack was then raised to a vertical position, shifted over the hole and dropped into the latter. In this way the possibility of damaging the roof was avoided.



Rig for Lifting Stack at Balkan Mine, Alpha, Mich.

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Smelting Furnace for Cyanide Precipitate*

By P. S. Anderson†

The following notes are submitted in the belief that they may interest operators of small cyanide plants, where the installation of an expensive tilting furnace is not practical.

The furnace I am about to describe is well adapted to the Taverner lead-smelting process which I have used for years with good results. My last furnace was used for nearly four years and was built in a 24x42-in. carbody. Brickwork had to be replaced about every 12 months.

To provide for the tilting feature, I placed two 12x12-in. timbers, 4 ft. long, parallel with and ½ in. away from each side of carbody, then across these timbers, and 2 in. from back end of carbody, I placed a piece of 16-lb. T-rail 48 in. long, for back end of furnace to rest on.

Then by running a piece of ⅞-in. drill steel through lugs on the bottom of the carbody, I had the tilting feature. For the furnace proper, I placed two solid tiers of firebrick in the bottom, then one tier around, so as to leave inside dimensions 14x27 in., building flush with front end of the carbody. This made room for cupel or test, which was made concave and slightly lower at back end, thus allowing closer tapping of slag before the final pour. The next tier of brick was left with an opening 2¼x4½ in. (space of ½ brick) in the center of front end. This made the tap hole, which was filled up before starting the furnace with a mixture of fireclay and sand. Two more tiers of brick brought the furnace up to the burner opening at front end.

The burner opening was made so as to throw flame on the charge at angle of 45°. Over the furnace, for 18 in. from front end, I placed a low arch of firebrick. For the charging door, which also made balance of furnace top, three firebricks, held together with an iron band, were used, having a hook to which a chain was attached and run over a pulley, for lowering and raising door.

At the back end the last or top tier had an opening 2¼x4½ in., into the dust chamber, made by bricking in the rest of the length of the carbody and covering it over, leaving an opening on top to let the gases escape into the hood. Tilting was done with a lever attached to the dumping handle of the car. After filling around with sand and drawing the sides together with a rod passed through the door lugs (door being removed), the furnace was ready.

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*A paper read before the Columbia Section, A. I. M. E.

†Baker, Ore.

A Case 2½-in. burner was used. When I wished to smelt, the cupel was tamped in, and a slow wood fire started in the evening, which was allowed to cool down by morning. The furnace was charged with about 100 lb. of precipitate, litharge and flux, about 70 lb. of damp precipitate being used, and the furnace was started. As this melted down, more was added with a scoop shovel until there was about 7 in. of molten material in furnace. After stirring, and when the slag was fluid, the first tapping of slag was taken off if necessary, otherwise scrap material was fed in, such as old cupels, speiss, etc., and the fusion completed.

In tapping, about two-thirds of the slag was taken off into a mold, and the balance of the charge heated until the cupel, on testing with rod, felt smooth, when all the remaining charge was poured into another mold by tilting the furnace. After cooling, slag and speiss were removed and the lead bar placed in the furnace for cupellation. To start, charcoal was placed on the lead bar and the burner turned on. After it opens, fireclay is removed from the front opening of the furnace and temperature is regulated with the burner. After the bar solidifies, it is removed and cut up, resmelting in two No. 8 graphite crucibles.

Although the lead was allowed to go to waste, I found it paid on account of getting cleaner slag and bullion. Very little gold was found in the flue dust, although there was considerable silver. Samples gave average results of 12.10 oz. gold and 1110 oz. silver per ton. The slags averaged 2c. per lb., gold and silver, or $40 per ton. Gasoline consumption averaged, including cupellation and resmelting, 1 gal. per 18 lb. of precipitate.

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Composition of Lead Slags

The chemical composition of the slags produced in lead smelting has always had important consideration. In recent years, however, the views of metallurgists have been considerably modified, says Irving A. Palmer.[1] Experience has shown that many of the irregularities in the furnace work, formerly thought to be due to the composition of the slag, are the result of other causes. Laboratory experiments throw some light upon the constitution of lead slag. It is now known that these slags, instead of being definite chemical compounds, are in reality mixtures of a number of compounds and oxides; these probably exist in a different state of combination while in a molten condition than when solidified. These compounds can exist in a great variety of proportions without materially changing the fusibility or fluidity of the slag. It is recognized also that certain oxides, such as those of aluminum and zinc, may not be combined with silica at all, but may be an igneous solution in the slag.

With larger furnaces and the improved methods of preparing the charge now in use, hotter slags are produced than formerly. This has led to the employment of slags heretofore considered to be too refractory for lead-furnace work. The slags still conform generally to the singulo-silicate type, but often there is a considerable portion of bisilicate. In localities where there is a surplus of siliceous ores, the metallurgist will make a slag high in silica, so as to smelt more of the ore that is most abundant. So also he will generally use as much lime as possible, because it is a cheaper flux than iron. Of course, it is generally held also that high-lime slags are beneficial metallurgically. In this connection it may be said that high-lime slags are more in use than they were in times past. The old idea that the lime and iron oxides should exist in the slag in certain definite molecular proportions has been discarded by most metallurgists. This so called "type" theory was supported for a long time and was considered by some to be extremely essential. Theory and practice have combined, however, to indicate that the things to be considered in adding lime to a charge are the question of cost and the percentages of silica, alumina, zinc and magnesia present, rather than the ratio of the lime to the iron. Lead slags are now regularly made containing from 35 to 37% of silica, and from 24 to 26% of lime, including magnesium and barium oxides, figured as lime. In these slags the zinc and alumina are generally low.

High-silica slags are usually considered as being liable to contain a rather high percentage of lead. To some extent this is true, but such a slag runs well, chills slowly, and keeps the furnace in good condition. Furnace accretions are always basic; high-silica charges inhibit their formation and are conducive to long campaigns.

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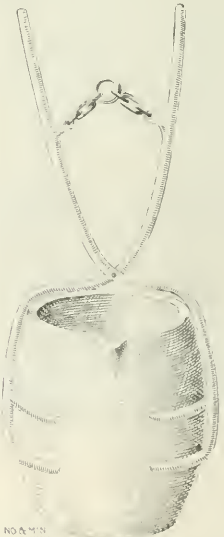
The Use and Care of Crucibles

Most crucible users are careful to store their crucibles in a warm place, and to anneal carefully before using them, according to a recent bulletin of the Bureau of Mines ("Brass Furnace Practice in the United States") but are not careful enough as to the fit of the tongs. If possible, a grab type of tongs should be used, such as is shown in the illustration, intended for use with a mechanical hoist. The tongs are hooked into the hoist, lowered into place, the tongs being spread, and gently seated. The hoist then is gently started and the crucible is held by its own weight.



Grab Crucible Tongs

Foundries using this type report that they can handl up to 650 lb. of metal this way, and the excessive pinching of crucibles is avoided with a much longer resultant life. A crucible grows slightly smaller with use owing to oxidation and wear One foundry that reports ar exceptional crucible life has three sets of tongs, differing slightly in size, which ar selected according to the ag of the pot. An easy way to keep tongs of proper siz is to have a cast-iron form the size of the crucible used When the tongs get slightly out of shape, put them o this form and pound them back.

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[1] "Smelting Lead Ores in the Blast Furnace." Bull. A. I. M. E., July, 1914.

Thomas Johnston Grier

Thomas Johnston Grier, superintendent of the Homestake Mining Co., died at his winter home at Los Angeles, Calif., Sept. 22, of heart failure, his sudden demise coming as a surprise to his many friends. Several years ago, Mr. Grier suffered from a severe attack of acute indigestion and was constantly under the care of a physician. He went East about 18 months ago and consulted some leading physicians. Upon his return to Lead after this trip he was greatly improved and continued apparently in the best of health until his death, active to the last in the administration of the affairs of the company he served.

Thomas Johnston Grier was born in Pakenham, Ont., May 18, 1850. James Grier, his father, was a native of Ireland, and Eliza Patterson Grier, his mother, was born in Canada. He was the fourth of a family of 10 children. With his parents he lived at Iroquois, Ont., where he graduated from high school and later learned telegraphy. At the age of 17, he entered a telegraph office in Montreal, and four years later, on reaching his majority, removed to Corinne, Utah. After two years there he spent four years in Salt Lake City, becoming chief operator. It was while in this position that he became acquainted with George Hearst, one of the original owners of the Homestake, who induced him to go to Lead to become book-keeper and telegrapher for the new company.

Thomas Johnston Grier

He arrived in Lead in 1878 and immediately entered the employ of the Homestake Mining Co., then but recently organized, and remained with the company until his death. At the time Mr. Grier went to the Homestake, Samuel McMaster was superintendent and Mr. Grier became his trusted lieutenant, taking full charge during the absences of Mr. McMaster in the later years of his life. He filled the position so creditably and acceptably that upon the death of Mr. McMaster in 1884, Mr. Grier was selected superintendent, and has held the position ever since, a period of 30 years.

His marked ability as an organizer and his earnest adherence to high business ideals enabled him to develop a mining institution known the world over as one of the greatest low-grade gold mines. Under his management, the company became a steady dividend payer, omitting its disbursements only on two occasions, the last of which was after the great fire in the mine. Besides the dividends, many millions of dollars from the earnings were spent in improvements, all made with a view of adding efficiency to the plants of the company. The capacity was increased until today the daily output of this company has reached nearly 4500 tons. Under his direction were built the water system which not only supplies the works but the city of Lead and several surrounding towns, with water; the hydro-electric plant at Spearfish; the Ellison hoist; the viaduct connecting the mills with the railway system of the company. The Star and Amicus mills, were also completed during his term of office. Besides this, a high degree of efficiency was maintained in all departments of the large enterprise. At his direction the present work of installing one of the larger hoists in the country and the building of a steam auxiliary power plant was commenced.

The Homestake company with 2500 employees and a payroll of $225,000 per month, was under the sole direction of Mr. Grier and policies outlined by him were carried out; the entire management being left to his sound judgment and business ability. In connection with his duties as superintendent and general manager of the mine, he was also president of the First National Bank of Lead, vice-president of the First National Bank of Deadwood, vice-president and director of the Wasp No. 2 Mining Co. and president of the Hearst Mercantile Co. He had been a member of the American Institute of Mining Engineers since 1892. He was also a member of several Masonic orders, and life member of the Benevolent and Protective Order of Elks of Lead. His membership in the Homestake Veterans' Association dates from the time of the organization of that society. He was a member of the Episcopal Church and a loyal friend to all other religious denominations. He knew personally nearly every man in the different departments. He was always looking to the welfare of his fellowmen and there was no grievance so small that he would not give audience to it. It is said of him that no man no matter of what station in life ever approached him and failed to receive a respectful hearing, sympathy and sound advice. At his direction, a bonus of 7% of their yearly earnings has been given to the employees of the company for the last two years, as a Christmas gift.

The Homestake company has always cared for the welfare of its employees. For over 35 years it has provided a completely equipped hospital, which for the past four years has been absolutely free to the operatives and those dependent upon them for support. An Aid Fund, administered by the company, supported by contributions from each employee of $1 and the company $1000 monthly, pays sick, accident and death benefits. The Hearst free library, maintained by Mrs. Hearst, one of the largest stockholders, is now housed in Recreation Hall. Mrs. Hearst also supports a free kindergarten. Recreation Hall, just completed, adequate in size for present needs, elegantly furnished, superbly appointed, which affords a lounging and amusement place for employees when off duty and also includes a beautiful theater, was erected at a cost of $300,000. In all these things, Mr. Grier took an active part, initiating and guiding as circumstances have required. In it all, he proved himself a man of strong intellectuality, broad human sympathies, fine sensibilities and clearly defined principles.

He was married in 1886 to Mary Jane Palethrope, of Glasgow, Scotland. She survives him, with a daughter and three sons.

At the close of the sessions of the Federal Commission on Industrial Relations, held at Deadwood in August, Professor Commons, the chairman, made the following statement, referring especially to Mr. Grier's testimony before the commission:

> I would like, on this question of the underlying causes that you have brought out, I would like for my personal use, not as stating any idea of my colleagues, to state to you what seems to me to be our purpose and line of suggestions which, from my standpoint, would be of use in the work that we have to do. As I stated at the beginning, we are required by Congress to investigate the underlying causes of industrial unrest, and to make recommendations for legislation to Congress and, naturally, to the states. If we find unrest, what are its causes and what legislation we should recommend as a remedy.
>
> Now, I might state what seems to me to be the summing up of this testimony, that is, the way it strikes me from my own point of view, not representing either the employer or the employee, but simply as a looker-on, you might say: You have here the most remarkable business organization that I have come across in the country. You have developed welfare features which are beyond anything that I know of, and they are given with a liberal hand.
>
> You have a high scale of wages, reasonable hours—very fair hours. There has been evidently great progress made in taking care of the employees in the hospital service, and you have taken care of the cost of living, have kept it down below what employees in other communities have been forced to pay. You have practically been able by your great strength here as a huge corporation, dominating the whole community, to look out for the welfare of your employees, and to bring in an admirable class of citizens. It seems also that you are influential in politics, that you secure a good class of officials, and that you have secured the enforcement of law, the reduction of immorality. It seems also that you make an effort to build up the religious life of the community and that your policy is broad and liberal in all respects. I take it also, that this policy depends solely upon your personality. Such inquiries as I have made here, indicate that in all cases the stockholders leave all these matters to you personally, and that this broad policy has been carried out by you on your own initiative, and that you have felt that it was necessary, for the good of the community, the securing a fine class of labor here, which you have undoubtedly done, that you should hold the reins pretty tight on this community.

Adding that he had visited business men and talked with individuals in the camp, the chairman stated that from all he could see or hear the Homestake management had wielded its power with the utmost fairness, had encouraged the religious life and educational life of the community and asked suggestions from Mr. Grier as to recommendations to be made Congress as a basis for legislation, pointing out in the course of his remarks the fact that another man in Mr. Grier's place might not exercise his power with the same fairness, justice and generosity that have characterized Mr. Grier's administration. Mr. Grier did not offer the suggestions asked but, responding to the chairman's question as to whether he would recommend that superintendents be prohibited from becoming stockholders in the company they represent, said that he should and declared that the reason he had never owned any Homestake stock or Hearst Mercantile stock was that he felt it placed him in a better and fairer light before employees and toward the property to have no personal interest in dividends.

This declaration accorded with his whole course of action as manager and with his habits of mind. While deeply interested in the property under his charge, he never sought for individual profit from its management.

The Alaska Coal Bill Passed

Washington Correspondence

The leasing bill for Alaska's coal lands was passed by the Senate in form somewhat changed from the bill passed by the House. The bill provides the government shall reserve 5120 acres of coal-bearing land in the Bering River field and 7580 acres in the Matanuska for government mining, product to be used on Government railroads, in the navy.

Other lands are to be leased for not more than 50 years in 40-acre blocks, maximum tract 2560 acres; royalty to be 2c. to 5c. per ton and rental 25c. per acre for first year, increasing to fixed charge of $1 after five years, rentals to be credited against royalty. Leases for local needs are to be made in tracts of 10 acres maximum without royalty or rental. Attempts at monopolization are to be punished by forfeiture and an 8-hr. day underground is prescribed as maximum.

Recent Developments on the Comstock

Special Correspondence

The new discovery recently reported in the Belcher has excited a good deal of interest. The water formerly stood in the Belcher mine a little below the 1100 level. Since the water has been lowered, the Sturges management has driven one crosscut on the 1500 level, and another on the 1600. In each case a width of 60 to 70 ft. of ore that will assay between $8 and $15 per ton has been exposed. Its average is probably nearer to the lower figure.

This ore is the so called white rock or "gold ore" of Gold Hill. Large quantities of it were milled at the close of the bonanza period, and after the lower levels in Gold Hill were flooded. The water came up slowly, and did not reach the 1100 level until the pumps in the Combination shaft, in Virginia City, were shut down in 1886. During the time when the gold Hill mines were flooded in 1881, and the time when the water reached the 1100, the Sutro Tunnel level, a large quantity of this low-grade ore was taken out from the Yellow Jacket, Crown Point and Belcher mines. The ore occurs in lenses, parallel with the old bonanza stopes and to the west of them, toward the foot wall.

No considerable quantity of the new ore in the Belcher has yet been blocked out. However, the manager is quoted as saying that he is now able to make expenses out of the production, and that as soon as a direct connection with one of the shafts is made, he will be able to increase largely the production and earn considerable profit. The ore is very soft, crushing almost to a powder, and therefore mines and mills very easily. The gold rock in Gold Hill has a reputation of concentrating about 100 : 1. The pyrites crystals in the ore are so small and fine as to be scarcely visible to the naked eye. In $15 rock not more than 50c. will be in silver.

Nobody can say as yet how much ore is likely to be developed in the Belcher, or how much profit the company is likely to earn. Such things depend largely upon the management. The present management is economical, but its efficiency is now to be demonstrated. The prospect in the mine, now that they are below the water level, and below the ground which has been mined over and raked back and forth a dozen times, appears to be favorable for further development. Anyway, the new Belcher discovery is very promising and many a mine operator would like to have one that looks as good.

In regard to the Comstock in general, it is considerably upset along with the rest of the world. The fight between Whitman Symmes and the San Francisco brokers was finally adjusted out of court. Symmes himself was anxious to see the thing through, but there were all kinds of opinions, and when one man is fighting an entrenched organization, with its many ramifications, there are many things to be considered. Some of the stockholders and directors of the Mexican thought that the fight ought to be settled, as it appeared that that could be done, and get back to work again. This was finally done by Mexican paying the attorney's fees of everybody concerned.

The Mexican and Union companies began work at opening up another level, the 2650, without waiting for action by the pumping association, which was holding the water a little below the 2500 level. Just as it was getting started, the European war broke out and the stock exchange was closed, with the consequences that assessments were not collectible. Mexican and Union were able to continue work, and did so, but the other three North End companies did nothing. The pumping association, however, has been keeping the pumps running. Con. Virginia is doing a little work, but Ophir and Sierra Nevada are doing nothing. Union is crosscutting on the 2650 level, and Mexican is beginning to cut for the 2650 station, and soon will be driving a crosscut there.

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Mineral Resources of Morocco

A report from the United States Consul-General at Tangier, says that the mineral resources of Morocco are as yet but imperfectly known. The country is believed to contain various valuable ores, such as copper, silver, gold and iron, especially in the Sus provinces, while there are widely distributed indications of the presence of oil in more accessible regions, all of which during the last few years have attracted attention commensurate with surface prospects. It will require, however, more than the superficial prospecting that has so far been undertaken to demonstrate whether the deposits are such as would justify exploitation.

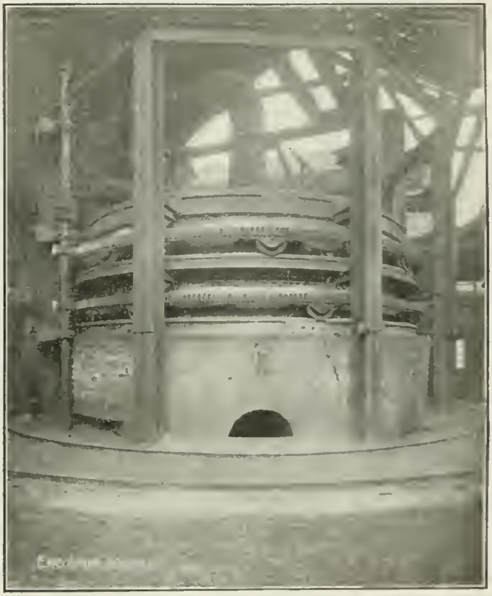
As far as Moroccan mining interests are concerned, attention for the moment is centered in Paris, where an international arbitral commission is sitting with the object of adjudicating the various denouncements that have been filed at various times by those who carried out prospecting operations prior to the recent promulgation of the mining code for Morocco.

Furthermore, owing to the fact that the foreigner is still insecure in the particular regions alleged to contain the most promising deposits, and owing to the remoteness of these districts from the coast, and in view of a lack of all facilities of transportation, it is not anticipated that the mining interests in Morocco are likely to undergo any sudden or immediate development.

*

The Spirlet Roasting Furnace

A new mechanical roasting furnace that has attracted a good deal of attention among zinc smelters during the last year or two, is the Spirlet, which is exploited by the Erzröst Gesellschaft, of Cologne, Germany. The American agent for the furnace is Beer, Sondheimer & Co., 42 Broadway, New York. The general features of this furnace are shown in the accompanying engraving.



VIEW OF THE SPIRLET ROASTING FURNACE

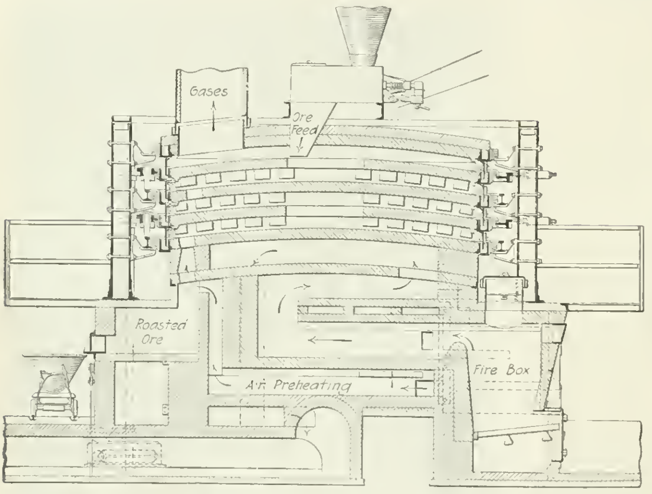
Note the method of supporting the revolving hearths, and at the left of the photograph note one of the vertical shafts for turning them.

The furnace consists of three circular hearths which revolve around a central axis, which is, however, purely geometric, there being no interior working parts in this furnace; a fourth and lowest hearth is stationary, as is also the roof of the furnace.

The furnace structure is built up within six vertical columns, to which are fastened annular rails for supporting the movable hearths. The movable hearths are constructed within an engirdling spur gear, shown clearly in one of the accompanying engravings, and are supported on wheels which run on annular rails, carried by the exterior framework. The spur gears mesh with small pinions attached to vertical shafts, which are connected with the source of power and constitute the driving mechanism, turning the alternate hearths in opposite directions.

The hearths are slightly arched. They are constructed of special refractory tiling. On the under side the stirring rabbles, made of the same refractory material as the hearth itself, are dovetailed in. These rabbles are so arranged that with the rotation of the hearth the ore is moved, on one hearth outwardly from the center, and on the next hearth inwardly toward the center. Each hearth thus bears on its upper side the ore to be roasted, while on its under side are the rabbles which stir the ore upon the next hearth below.

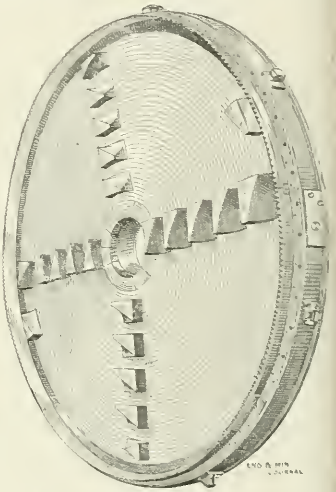
At the periphery, the roasting compartments are hermetically sealed by annular rings, which dip into the channel of the ring next below, made tight with a seal of sand or fine ore. The lowest hearth, which is stationary, is muffled, and is heated from a fire box. There are arrangements for preheating the air which enters the roasting chambers.



VERTICAL SECTION THROUGH THE SPIRLET ROASTING FURNACE

The advantages claimed for this furnace are that there are no working parts of iron within the furnace itself, and by virtue of their absence it was possible to make the distance between the several hearths very small, this being economical from thermal considerations. By avoiding iron stirrers, the cooling of any iron part is unnecessary, wherefore no heat is carried away from the furnace by cooling air or water. The cost of repairs is small, being confined substantially to the maintenance of the arches. The first furnace was in operation more than a year without any one of the stirring rabbles becoming broken. The several hearths can be easily removed, one after another, by simply lifting them out by means of a movable crane, it being unnecessary to detach a single screw or bolt. It is claimed that the quantity of flue dust produced in roasting in this furnace is very small, especially because the drop from one hearth to another is so small.

The average capacity of the Spirlet furnace is about 5000 kg. per 24 hr., with a power consumption of less than 1 hp. The labor attention is probably similar to what is required with furnaces of the McDongal type. It is claimed that the fuel consumption is less than 10% of the quantity of ore charged. With certain ores, it has been possible to make a commercially complete desulphurization without the use of any fuel. The sulphurous gas is strong, being 5 to 7% SO_2 by volume. Australian blendes have been burned down to less than 1% sulphur, Algerian blendes to below 2%, and Carthaginian blendes to 3¼%. The Spirlet furnace is in use at certain of the works of the Vieille Montagne company in Belgium, and at the smelteries at Overpelt and Engis, in Belgium, and at Stolberg, in Rhineland. The Grasselli Chemical Co. is now installing one at one of its works in West Virginia. The parts for this last furnace were wholly imported from Europe, no arrangement having yet been made for their construction in this country. As compared with the Hegeler furnace, which is in general use in the United States for blende roasting and sulphuric acid manufacture, the Spirlet furnace probably offers no advantage in first cost per unit of capacity, but in operating cost it ought to be superior. Anyway, it is a very original and ingenious design of roasting furnace.



VIEW OF ONE OF THE HEARTHS OF THE SPIRLET FURNACE

This view is looking toward the underside of the hearth, which is turned up on edge for the purpose of the draftsman and shows the stirring rabbles which are set in the masonry of the hearth.

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Magnesite in 1913

There was a decrease in the output of magnesite in the United States from 10,512 short tons in 1912, to 9632 tons in 1913, according to the U. S. Geological Survey. The only production in this country was in California, as heretofore.

With the cutting off of the foreign supplies, due to the European war, however, the demand for the domestic product ought to increase, especially in view of the new and shorter water route by way of the Panama Canal to the Eastern United States. It is to be hoped that the sudden stimulus thus given to the domestic mining industry will build up a trade that will withstand the competition that must undoubtedly ensue when normal trade conditions are again established.

The demand for the domestic product is restricted to the Pacific Coast and Rocky Mountain region, as it has been impossible at the present railroad freight rates to ship to the points of largest consumption in the East.

*

Kirkland Lake District, Ontario, Canada

By H. W. Hardinge*

The Kirkland Lake district of Ontario is situated in Teck and Lebel Townships, about seven miles northeast of the Swastika station on the Timiskaming & Northern Ontario Ry. This section is practically intermediate between the Cobalt silver and the Porcupine gold districts.

The gold-bearing, as also the barren, veins appear as fractures mainly in a conglomerate formation, along which are intrusions of a reddish feldspathic-porphyry. These veins, after formation and secondary movement, have evidently been the courses of siliceous gold-bearing solutions. The conglomerate formation is not materially different from that of the silver-bearing district of Cobalt; the genesis, however, of both the gold and silver in these districts, as well as that of Porcupine, are, in my opinion, similar, i.e., the result of intrusive solutions acted upon by great pressure and heat, independent of character of country rock. This opinion may be subject to criticism by local authorities, still I am firmly of the belief that the mineralization in either gold or silver, and in fact all the mineral contents of the veins, is not the result of segregation or mineralization from the country rock. Local opinion in the Cobalt district appears to credit the silver contents of the veins to the diabase as the generic matrix.

When I made my report on the Nipissing mine about eight years ago, I met with considerable opposition in view of the positiveness with which I asserted that the silver, together with its calcite matrix and other associated minerals in the silver-bearing veins, were the result of a deep-seated aquo-thermic action, and in view of this fact the mineralization of the veins would penetrate to considerable depths, at least up to the point of decreased pressure and heat commensurate with precipitation. The matter of depth (over 800 ft.) has now been proven. I refer to this in view of the positive statement I am about to make relative to my opinion of the permanency of the Kirkland Lake district, which is, that the gold-bearing ores will penetrate at least as deep as they are traceable upon the surface. My theory is that these veins are sections of a plane cut through a lens-formed fracture, which has been sheared across by glacial action and into which the solutions had previously penetrated. Not all the solutions carried gold—hence, the barren veins.

The gold in the Kirkland Lake veins not only shows in the parent vein of quartz along the strike of the porphyry intrusion, but is also associated with the veinlets of quartz which intrude into cracks, due to the shrinkage in cooling and shifting of formation during geologic stress, which latter has resulted in small gold-bearing stringers running out from the main vein into the country rock.

It is hardly to be expected that the veins which have been found, owing to the fact that they occur upon protruding bosses of the higher ground, denuded of vegetation, are the only veins which will be discovered in the district, nor will all the veins be gold bearing although similar in other respects. The formation of the country for miles around gives evidence of a successive number of these veins in the conglomerate and porphyry. All of the veins are of a more or less general similar physical appearance, but it must not be expected that they will all contain gold, for there are no doubt a number of veins which have not been the channel for auriferous solutions. Many disappointments are bound to result, as is usual in the development of all districts, by the anticipation that because of the similarity of physical appearance veins must necessarily carry similar results in gold or silver values.

Glaciers have done a vast amount of development in the Kirkland Lake district, as in other sections of Ontario, and the present outcrops in all three districts above mentioned are hundreds of feet below the original surface. Nature has done development which the enthusiastic prospector should not overlook; he should realize that he is now standing upon the third, fourth or tenth level of his newly discovered vein. The present surface has been mined down hundreds of feet by this glacial action.

Referring particularly to the Tough-Oakes property in the above mentioned section—few gold mines can sort ore on a picking belt with little else than the metallic gold as a guide, as is being done at this property. The shipping average of such picked ore in carload lots is about $500 in gold per ton. The low-grade ore, ranging from $100 per ton downward, is partially extracted in a 5-stamp mill, the rich tailings being reserved for future reworking. This property has now been developed by a shaft to a depth of 300 ft. with drifts from 100-ft. levels, making a total development of over 1500 ft. Throughout this total development of the Tough-Oakes, gold was encountered, all headings being in ore at the time of my visit. At least 90% of the vein extraction is classed as ore, although the gold content varies considerably, still the total material extracted in development has a high average value.

Ontario is destined to be a large producer of gold, which statement is directly contrary to the opinion I entertained of Canada, previous to my later 10 years of critical investigation of its gold, silver and copper districts. Its possibility is hardly appreciated by the engineer who has confined his professional work to districts entirely outside of Ontario. The engineer would be called upon to set aside many of the fixed theories and practices, in his work in other districts of the world, in order to comprehend the possibilities of the Ontario district

Few of us comprehend that the Cobalt silver district alone, comprising a section of not to exceed two miles in width and two to three miles in length, has annually, for the last six or eight years, produced one-half as much silver as the total production of the United States (in other words, produces approximately 30,000,000 oz. against [illegible] 000,000 oz. for the United States). The Kirkland Lake district, together with that of Porcupine, and other as yet undiscovered sections of Ontario—figuring from [illegible]—are bound to make enviable records for themselves

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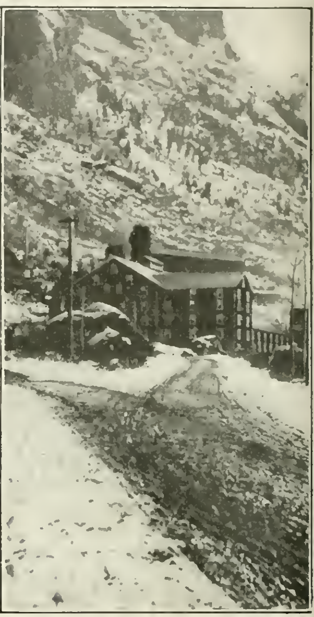
*Mining engineer; president, Hardinge Conical Mill Co., 50 Church St., New York

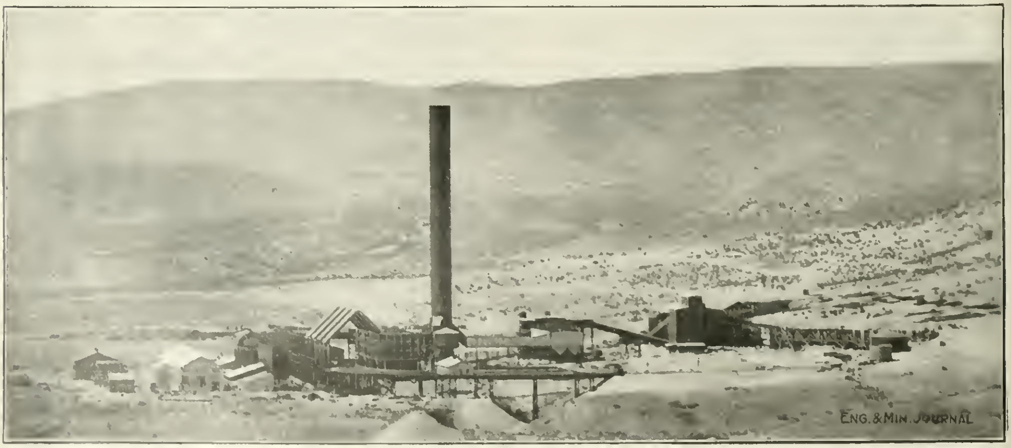
Photographs from the Field

Black Oak Mill, Soulsbyville, Calif.
The first all-sliming cyanide mine in California

Chinese Placer Miners, California

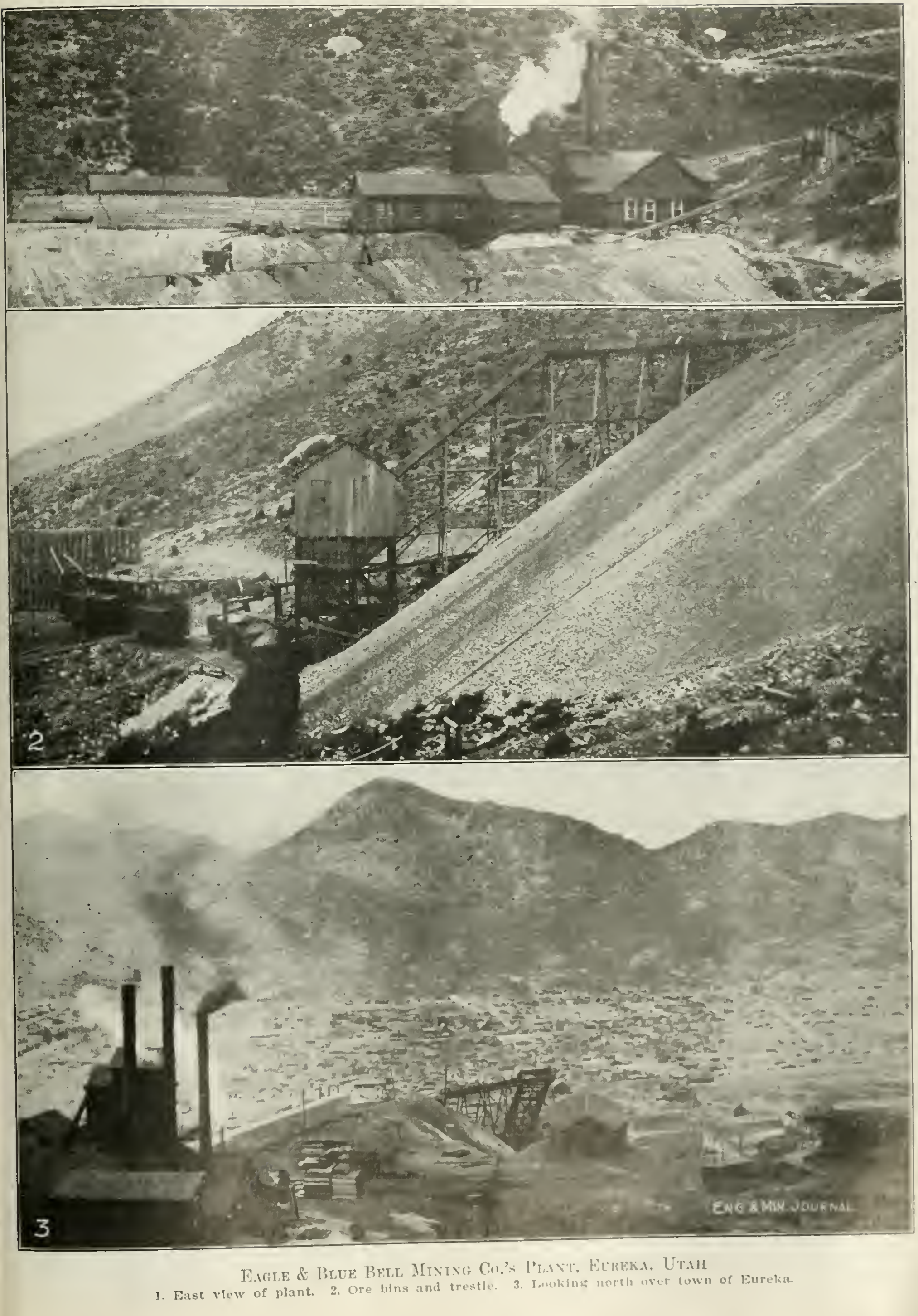


Smuggler Union Mills, Telluride, Colo.
Concentrator and cyanide plant operating on gold-silver ore



New United Verde Smelting Works, Clarkdale. Ariz.

The new works of the United Verde Copper Co. is nearly completed. It comprises six Wedge roasters, four 48x320-in. blast furnaces, three reverberatory furnaces and four upright converters. The new plant is on the Verde River about five miles from the mine which is at Jerome.



EAGLE & BLUE BELL MINING CO.'S PLANT, EUREKA, UTAH
1. East view of plant. 2. Ore bins and trestle. 3. Looking north over town of Eureka.

Editorials

Copper

The conditions of copper merchandizing are gradually regaining their equilibrium, but although domestic manufacturers have been taking considerable copper and, moreover, a considerable quantity of copper has been exported to Europe, the situation as it exists upon the basis of the curtailed production is still very far from being settled. As to just how far it is from being settled, opinions differ. Certain producing interests express themselves as feeling fairly comfortable. Others, and they are the majority, express themselves in a different way.

American consumption is probably now in the neighborhood of 10 million pounds per month, and the brass mills, wire drawers and other manufacturers have probably depleted the stock in their yards to a low figure; anyway, they have lately been buying more copper than previously. However, the copper that they are taking is still partly on old contracts, some of which run into October, we understand.

Among the foreign consumers, England and Italy, especially the former, want copper. France, apparently, wants very little. Germany, on the other hand, is evidently in great need of copper and willing to pay a high price for all she can get. Unfortunately, sellers cannot get any to her. Certain events of the last week illustrated this and also the difficulties and uncertainties of the present situation.

Shipments of copper were being made from New York to Rotterdam. The British Government suspected that the ultimate destination of this copper was Germany. Consequently, copper was declared to be conditional contraband of war, three cargoes in Holland-American ships were seized, arrangements were made to transfer stocks of copper in Rotterdam to England, and the Holland-America line announced that it would not take any more copper shipments.

This practical closure of the Dutch market, the risk of seizure at sea of copper going to any quarter, the high rates of insurance, the wild fluctuations in the rate of exchange, and the difficulty of arranging credits for the payment for the copper bought, all contribute to the complication of the export business. The London and Hamburg metal exchanges remain closed, on the latter there was complete liquidation by order of the German Government, and their opportunities for speculative equalization of commercial transactions no longer exist.

Until recently, the copper sent abroad, since Aug. 1, has been chiefly on the filling of old contracts or on consignment, i.e., the shipper sends the copper abroad on his own account for sale in some foreign market when opportunity may arise. In such way, advantage has been taken of the high prices prevailing at certain times in certain foreign markets. The old condition of a practically uniform international market, based on New York, with the ordinary freight differentials, no longer exists. Nor is there any longer any business in contracts for future deliveries, all of the present sales being for immediate shipments. Recently Europe has been placing some fresh orders in this market. The prices realized have been rather widely variable.

In the purely domestic market the producers have refrained from exerting any pressure to sell. Consumers have been supplied with whatever copper they have wanted, without there being any sharp competition for their business. In some cases they have simply been supplied with copper, leaving the terms to be adjusted later; in other cases, they have been supplied at a guaranteed price, which is practically the same thing; in most cases, however, the copper has been sold outright, most recently at the price of about 12c., regular terms. Such a price shows simply the figure at which copper is available and does not in any way reflect an open market in which sellers are free to act.

If there was an open market, with active competition, forced sales, etc., the price of copper would probably go down sharply. Nobody wants to see this, neither the producer, nor the manufacturer-consumer, nor the banks. The interruption to business on Aug. 1, suspended payments, either by virtue of the moratoria or otherwise, for copper sold abroad and the stocks piling up on this side resulted in a great accumulation carried. The banks have viewed copper as collateral in the same light that they have viewed as collateral the securities listed on the stock exchanges. Everybody is hoping that things can be held about as they are. When the revival in the copper business comes, as sooner or later it will come, it would be better for everybody to start upward from a level of 12c. than from a level of 11c., or even 10c.

In the meanwhile, everything possible should be done to preserve the situation that exists, or rather prevent it from becoming worse. Talk about big buying of copper, firmness of the price, etc., is all nonsense. Such firmness as there may appear to be is simply because there is no pressure. It is the firmness of the reed that does not bear any load. Safety lies in avoiding any further strain on financing. Lucrative refining and selling contracts have lately been turned down, because financing was involved. Production should be kept severely curtailed. There is profit to but few producers in selling copper at 12c. It is better that the resources of a mine be conserved than be sacrificed.

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What Mines Use

Every mine of any consequence whatever, and the number of such mines is large, is a great purchaser of a long list of supplies of a thousand sorts. It is only in the case of the very large mining companies that such supplies are scientifically purchased, cared for, distributed and accounted for.

Everybody knows that any article can be bought more cheaply in quantity than it can by retail, but a good many mine managers do not know how to buy advantageously by wholesale, because in the first place they do not know how much of each article they use during a given period.

For the lack of such knowledge some managers doubtless lose money in buying quantities, wholesale purchases not being in every case the most economical. Speaking generally, articles of regular consumption ought always to be bought by wholesale, but articles of only occasional requirement may often be purchased more economically from the local hardware dealer at a higher price than at a lower price at a central supply point if such article is to remain unused at the mine for several years.

The purchase of the supplies of all kinds for use at any mine, and the distribution of such supplies among the several departments of the mine ought to be done through the medium of a mine store, which ought to be conducted just as if it were an independent business. In conducting such a business the successful storekeeper sees to it that he does not carry too much slow-moving stock on his shelves, that his goods required constantly are always on hand, that his purchases be made on the most favorable terms and at such times and in such ways as will bring transportation, carting and handling charges to the minimum. The mine storekeeper ought to run his business in the same way.

Being convinced that many mine managers give insufficient attention to this department of operation, we undertook to prepare an article about it, going a good deal into detail. We conceived that it would be both interesting and surprising to show the great variety and great quantity of mine supplies that are used in important operations. Managers of several important companies, including the Nevada Consolidated, the Miami, the Hollinger and the Franklin mine of the New Jersey Zinc Co., courteously assisted us in this by giving us lists of their purchases during certain periods of time. These companies will exemplify mining conditions in several parts of North America and of several kinds. The Hollinger is an important gold mining and milling company, the Miami is one of the famous porphyry coppers, mining its ore by the caving system and operating a large and elaborate mill for the concentration of the ore. The Nevada Consolidated is a porphyry copper, which operates both an underground mine (the Veteran) and a steam-shovel, open-pit mine (the Copper Flat). The Franklin mine is one of the great mines of the East, being indeed the most important zinc mine of North America, which is situated within 80 miles of the City of New York. The publication of this article, which will run through two or three issues, begins in this number.

* * *

A Trial of State Price Fixing

Substantial equilibrium seems to have been restored in the petroleum market, petroleum being one of our great export commodities and having suffered from the derangement of the war, like copper and cotton. The Eastern refineries, which were put on half time, are now reported to be working at full rate once more and the embargo on production has been lifted at the wells.

Thus has one of our great industries been straightened out, i.e., in most districts except Oklahoma. That state, which has marked "progressive" tendencies, has a sort of a trade commission, which has the power of fixing minimum prices, at least in cases where unholy corporations are concerned. This commission recently fixed 65c. per bbl. as the price below which crude oil might not be purchased. Last week the Prairie Oil & Gas Co. reduced its buying price to 55c., figuring that as what it could afford to pay with present market conditions and requested the state commission to recognize that price. The commission refused, whereupon the company announced that it could not take any more oil from Oklahoma and consternation fell upon the producers.

Here is an illuminating example of the working of state regulation of prices. The state, of course, at the behest of the producers, says that oil must sell for at least 65c. per bbl. The corporation says that market conditions do not permit that price and that if it can't buy for less it can't buy at all. But apparently the producers do not like this condition, although they do not see what they are going to do about it.

* * *

Antimony Production

If antimony remains up around 10c. per lb., we ought to witness a revival of antimony mining in this country. From Arkansas, Utah, Nevada, California and Idaho are coming reports of antimony mines being reopened and we are receiving many inquiries as to where the ore may be sold.

The only antimony-smelting works in the United States is the plant of the Mathison & Co., on Staten Island, in New York harbor, which has been idle for several years. We understand that its owners have no plans for immediate resumption of smelting, but the plant can be put in operation on short notice. The agent for this works is Edward Hill's Son & Co., of New York.

Any of the dealers in ores whose advertisements are to be found in the advertising pages of the JOURNAL will be glad to negotiate business in antimony ore. Also, no doubt some of the lead smelters would be interested, inasmuch as they can smelt antimony ore with lead ore and make antimonial lead, which for many purposes is just as useful as smelting for antimony itself.

We shall be glad to assist our readers in promoting the buying and selling of antimony ores and any other kinds of ores. However, we suggest that the quickest way to inaugurate new business is by making use of our advertising pages. If you have antimony ore to sell and do not know where your best market is, advertise what you want to sell. If you want to buy antimony ore, advertise for it.

* * *

When the official quotations for silver were suspended at the beginning of August for the reason that it was then impossible to sell silver, the smelters were relieved of obligation to pay for the silver in ores consigned to them, the basis of settlement agreed upon in the contracts being temporarily nonexistent. However, the smelters offered to make an advance upon account of the silver and settle in full when silver could once more be sold. Most shippers of ore, etc., accepted this proposition, intelligently recognizing the fairness of it and the nature of the great emergency that had arisen. But there were some who demurred. One smelter met such objections by offering to hand back the silver itself. "We owe you for 200,000 oz. of silver," it said to one shipper. "We can't pay you according to our contract because we cannot sell any silver, nor is there any quotation. But here is 200,000 oz. of refined silver. Take it and sell it yourself, if you can." The miner took this silver, but long before he had succeeded in disposing of it the smelter was making final adjustments with its clients at a far better price than the smart [illegible] succeeded in realizing.

BY THE WAY

The will of James B. Haggin was filed for probate on Sept. 17 and, according to the *Times*, the estate was valued at $15,000,000, an amount much lower than was popularly supposed to represent Mr. Haggin's fortune.

⁂

The transmission line from Cedar Rapids in the St. Lawrence River through Cornwall to Massena, N. Y., is now nearly completed. It is 45 miles long and is expected to transmit 85,000 hp. The transmission wire is of aluminum. The telephone line, which is built alongside the transmission line, also has aluminum wire.

⁂

Down in Mexico there is a certain locality which a British explorer characterized as being "better adapted for habitation by eagles than by men." An American mining engineer examined a property at the place in question, and, his employers' rule being that each report should be filled in on a standard skeleton form, he naively dashed off the following:

GEOLOGY

"I have carefully examined the geology of the district in which this mine is situated, and find that the geology is highly satisfactory."

⁂

In the early '90s some Columbia School of Mines students studied practical mining at the Tamarack, on the Upper Peninsula of Michigan. The miners had a habit of singing hymns on the man cage, but were greatly shocked one day to hear some of the students sing a song consigning the faculty to a region much lower than the bottom of the shaft. One remarked to the hoisting engineer, "they be sinful lads." By some strange misunderstanding of signals, amounting to what might be called a coincidence, the cage which lowered the students the following morning went at approximately ore-cage speed or perhaps a trifle faster for part of the trip. After that, "Lead, Kindly Light" and "Why Not Now?" were the favorite college songs for underground use.

⁂

All eyes are now turned to South America to discern its commercial possibilities. We shall doubtless see and hear many things "that ain't so," both in mining and in trade. For example, the geological possibilities of the Turyassu gold field in Brazil are most extraordinary, if we are to believe an "engineer's" report recently submitted. It says: "Some gold-bearing fissure veins are known, but the gold deposits occur mostly as bed veins. The mineral contents of these bedded veins appear to have been introduced by fissures and are not due to surfacial sedimentary deposition. The form of these gold veins is probably due to a large extent to the softness and volubility of the rocks in which they occur, etc." We hope that most people who contemplate mining in South America will be more fortunate in the selection of their engineer.

A gentleman whose intentions may be perfectly honorable has been trying for some sixteen years to "finance" different schemes for working gold placers in a district not many hours from New York City. A reply to his postal-card *feeler,* prompted by incredulous curiosity, eventually led to his sending the report of his engineer. The report stated that on this 150-acre tract over 2000 measurements showed a superficial area of 1,795,200 sq.yd. of gold-bearing gravels, with an average depth of 3 yd., giving a grand total of 5,385,600. Pretty good showing for only 150 acres. "Exhaustive tests," made under adverse climatic and other conditions and therefore "undoubtedly conservative," showed an average of 78c. per cu.yd., making $4,180,788 worth of gold to be taken from the property. Inquiry and protest over 1,795,200 sq.yd. of gravel on a 150-acre tract brought forth the interesting reply that perhaps the engineer made some mistake in his figures and perhaps he was not as careful as he would have been if he had been paid his usual fee of $100 per day; but the report had been made as a return favor in acknowledgment of gratitude for being guided about to different offices in New York City, where the engineer had come as a stranger.

⁂

Here is an interesting case taken from Quinlan's History of Sullivan County, New York. "Daniel Niven came to Wurtsboro in 1812. * * * Daniel Gonsalus gave him information which led to the discovery of the Wurtsboro lead mine. The pioneers of Mamekating knew that the Indians obtained lead near Wurtsboro; but the latter obstinately refused to reveal where it was to be found, and became very angry whenever the subject was broached. A white hunter named Miller followed them at the risk of his life, until he ascertained that they obtained the ore on the west side of the Shawangunk, near a cluster of hemlocks, which was plainly visible from the valley. He heard them at work, and after they left, found the mine. When Miller was old and infirm, he intended to show Daniel Gonsalus where the ore was. He pointed out the hemlocks, and promised that, as soon as he had visited some friends in Orange County, he would go with Gonsalus to the point where the lead was visible. Before Miller returned from his visit, he was taken sick at Montgomery, and died. Gonsalus never attempted to find the ore. In 1813, he told Niven what he knew, and after thinking of the matter for years, the latter hired one Mudge to help him make a search. They were successful. A quantity of the galena was sent to Doctor Mitchell and others, chemists, who declared that it was valuable. Mr. Nivens made a confidant of Moses Stanton, a neighbor, who, as well as Mudge, insisted on sharing the profits of the discovery, and the three became partners. Not long after, those who had analyzed the ore were anxious to purchase the mine; but Nivens & Co. could not sell it. They were not its owners and they could not ascertain who were. So the matter rested until 1836, each agreeing to make no disclosure without the consent of all three. Their secret, however, was revealed after it had been kept for almost 20 years. Stanton had a habit of talking in his sleep, and while his eyes were closed, spoke of the mine in such a way that his son, who was present, had no difficulty in finding it. The young man found the owners, and made some $500 by keeping his ears open while his father *dreamed aloud.*

PERSONALS

J. Parke Channing is recovering steadily from his recent operation.

J. Nelson Nevius is a candidate for state senator from the 36th district of California.

Edwin S. Berry, of Pope Yeatman's staff, who has been at Chuquicamata, Chile, for a long time, has returned to New York.

James A. Richards, late at Royal View, Alberta, has been appointed district inspector of mines for the Calgary district, with headquarters at Calgary, Alberta, Canada.

L. D. Ricketts has been spending a few weeks in New York. He will go to Arizona next week, but expects to be back in New York next November or December.

H. F. Noyes, formerly general superintendent of the Dayton Coal & Iron Co., has been appointed superintendent of blast furnaces for the Broken Hill Proprietary Co., Ltd., Newcastle, New South Wales.

H. C. Hoover was expected to visit the United States this fall, but has been detained by his numerous activities in London, and now does not think he will be able to cross to this side until after the end of the year.

Dr. O. Sussman returned last week from Europe. He was in Germany for six weeks after the outbreak of the war and reports that neither he nor other Americans experienced any serious difficulties in leaving the country.

OBITUARY

John C. McLeod, one of the wealthiest citizens of Charlottetown, P. E. I., died suddenly of heart failure on Sept. 22, aged 68 years. He was one of the pioneer prospectors of the Yukon, having been engaged in gold digging there 10 years before the rush of 1898 to the Klondike.

William H. Allen was killed, Sept. 9, at the Coe mine, in Grass Valley district, Nevada County, Calif., while engaged in directing the taking down of the old stamp-mill building, from which he fell. He was a well known miner and had made a fortune in South African mines. He returned to California a few years ago; but, although provided with a competence, never seemed contented unless engaged in some occupation around the mines.

Edward Muldoon died at Oakland, Calif., Sept. 18. He was among the early miners in the Mother Lode region, and for many years owner of the Muldoon mine at Jackson, Amador County. This is the mine that was claimed by the Kennedy Extension Gold Mining Co. to have the apex of the Argonaut vein, over which a long legal battle was waged, and which was decided in favor of the Argonaut. Mr. Muldoon had resided at Oakland for 20 years prior to his death.

Joseph E. Gay, for many years well known in the Lake Superior copper-mining industry, died in New York, Sept. 28, aged 82 years. Notwithstanding his age, he retired from active business only a few weeks ago. He was for many years associated in business with the late John Stanton, and succeeded him as president of the Mohawk, the Michigan and the Wolverine copper companies. He was president of the Atlantic Mining Co. over 25 years. He owned some large tracts of land in Michigan, which have not yet been developed. Besides his copper interests, he was a director in the American Coal Co. and the Ohio & Kentucky R.R. Co Mr Gay was never married.

Charles Xavier Larrabee died suddenly, Sept 16, at his residence at Billingham, Wash. He was born in New York state in 1843, and went to Wisconsin at an early age He went to Montana in 1875, and worked as a miner for several years. The opportunity having been granted him, he sank 40 ft. of the shaft of the Anaconda mine for a half interest in that property. Later, he developed and sold the St Lawrence mine. At one time Mr. Larrabee owned the Mountain View mine in Butte. With the proceeds from the sale of some of his mining property, he purchased the Brooknook farm, in Madison County, where he indulged his passion for fine horses, being credited with having bred and raised some of the finest stock in Montana, with which for a time he disputed honors with Marcus Daly. In 1887, he moved to Portland, Ore., and in 1890 to Billingham He became owner of large tracts of land in Oregon and Washington, including some mining property

SOCIETIES

American Institute of Mining Engineers—The first annual meeting of the Utah Local Section will be held in the assembly room of the Commercial Club, at Salt Lake City, on Saturday, Oct. 10, at 8 p.m. The principal business before the meeting will be the election of officers for the ensuing year. The committee appointed to nominate candidates for the offices has submitted the names of R. C. Gemmell for chairman, C. W. Whitley for vice-chairman, and Ernest Gayford for secretary-treasarer.

International Engineering Congress—The attention of the engineers of the world is being more and more drawn to the program of the International Engineering Congress which is to be held in San Francisco in 1915. The interest which has been aroused in foreign countries is shown by the fact that at the present time there have been received enrollments and subscriptions from 42 such countries. It is furthermore to be noted that of the present total enrollment, approximately 25% is from countries other than the United States. The number of subscriptions from the members of the five national engineering societies of the United States under whose auspices and control the congress is being held is, however, not so gratifying. The percentage of the total membership of these five societies represented by the subscription list is only 3.7. It is probable that this is largely due to the fact that the date of the congress is still somewhat in the future. This, to a considerable degree, handicaps the work of the committee on management, and it is extremely desirable that as many as possible who intend to subscribe should do so at an early date.

INDUSTRIAL NEWS

The McIntyre-Porcupine Mines, Ltd., has contracted with the Merrill Metallurgical Co. for Merrill zinc-dust precipitation apparatus and process rights for a treatment of 800 tons of solution daily.

Among the recent orders received by the Dorr Cyanide Machinery Co. are 11 Dorr thickeners, part of them of the tray type, for the Aurora mill, recently purchased by the Goldfield Consolidated Co.

The St. Louis & Refining Co. of St. Francois, Mo., and Collinsville, Ill., is revising its catalog files, and manufacturers of goods such as it might use are requested to send two copies of their catalogs to both offices.

Dorr continuous decantation equipment, together with agitators and classifiers, have been recently ordered by the Benguet Mining Co., of Philippine Islands, the Corriman Mining Co., of Colorado, and the Pittsburgh Dolores Mining Co., of Nevada.

The A. M. Byers Co., manufacturers of Byers genuine wrought-iron pipe, has recently placed in operation a new galvanizing plant at its mills in Pittsburgh The Byers galvanizing operation provides for a careful weighing and inspection before galvanizing, a device for turning the pipe in the bath; an extra long cleaning period pyrometer-regulated kettles, and a final weighing that assures the proper amount of coating for which the texture of the wrought-iron pipe is said to offer a base of the most favorable quality. The Byers galvanizing specifications call for a coating of highest grade "prime western" spelter and a deposit 100% heavier than that required in Government galvanizing specifications

D. D. Herr, sales manager for Arthur G. McKee, consulting and contracting engineer, Cleveland, Ohio, returned from London, Sept. 4 While in Europe, Mr Herr closed a contract with the Russo-Asiatic Corporation of London, covering the design and construction of three large terminal coal- and ore-handling plants along the Irtish River in Siberia. The design of this work will be started immediately, the fabrication and construction work will be withheld pending the termination of the war in Europe Mr Herr was prevented from visiting the south of Russia due to the sudden declaration of war. The handling capacities for proposed terminals are as follows: Ust Kamenogorsk Terminal, 100,000 to 150,000 tons of zinc and lead concentrates to be handled from 15-ton railway [illegible] into 250-ton [illegible]. Concentrates will be delivered [illegible] along the Irtish River from mines [illegible] the [illegible] will be loaded into [illegible] delivered to destination [illegible] six months of the year. Seventy-five per cent of the [illegible] [illegible] delivered to the terminal in bulk and the remaining [illegible] will be shipped in bags of approximately 225 lb. each. Ekibastous Terminal, maximum of 500,000 tons of coal to be loaded during six months of the year from railway trucks into barges. Barges will have a carrying capacity of from [illegible] up to 2500 tons each. Coal will be mined at Ekibastous, a town approximately 75 miles interior, and will be delivered over the existing railway owned by the corporation to the town of Ermak on the Irtish River. Ermak is approximately equidistant between Ust Kamenogorsk and Omsk. Concentrates from the Ust Kamenogorsk terminal will be unloaded at Ermak and will serve as a return haul in the railway trucks to the Ekibastous plant, where the smelting works will be situated. The objective point for a large tonnage of the coal will be the Omsk terminal, which will have an unloading capacity of approximately 200,000 tons of coal in six months; 100,000 tons of this coal to be handled through the plant to railroad cars, the remaining 100,000 tons to be put into storage and reloaded into cars during the closed season for navigation.

TRADE CATALOGS

Western Electric Co., New York, N. Y. Catalog. Telephone Cords. 16 pp. Illus, 10½x8 inches.

Smooth-On Mfg. Co., Jersey City, N. J. Smooth-On Instruction Book, No. 15. 104 pp., illus. 6½x4½ inches.

Tate-Jones & Co., Inc., Pittsburgh, Penn. Catalog. Appliances for Burning Fuel Oil. 32 pp., illus. 11x8½ inches.

Easton Car & Construction Co., Easton, Penn. Catalog. Industrial railway material and cars. 52 pp., illustrated; 8x10½ inches.

Nordberg Mfg. Co., Milwaukee, Wis. Bull. No. 23. Steam and Air Hoists. 40 pp., illus. 8x10½ in. Bull. No. 24. Electric Hoists, 24 pp. 8x10½ inches.

Epping-Carpenter Pump Co., Pittsburgh, Penn., Bull. No. 102. Piston Pattern Pumps. 40 pp., Illus., 11x8½ in. Bull. No. 103. Center Packed Plunger Pumps 62 pp. Illus., 11x8½ inches.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y. Catalog Form 4033. "Little Tugger" Hoist. Eight pp.; illustrated. 9x6 in. From No. 8013, "Little David" Pneumatic Chipping, Calking and Scaling Hammer. Twelve pp.; illustrated; 9x6 in. Form No. 8207, "Little David" Pneumatic Drills. 36 pp., illustrated; 9x6 inches.

Hill Clutch Co., Cleveland, Ohio, Catalog No. 11. Power Transmission Machinery. 224 pp., illus., 6x9 inches.

The Hill company, established in 1886, has furnished a great deal of transmission machinery for mills and smelteries. The present catalog is most complete, fully illustrating its varied line of products, and is replete with tables of sizes, dimensions and prices, to insure ease and to guard against error in ordering.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

CRUSHING—Pebble Grinding Mill. Howard D. McLeod, Cleveland Heights, Ohio. (U. S. No. 1,110,069; Sept. 8, 1914.)

CRUSHING MILL. Charles G. Mayer, Jr., Durango, Colo. (U. S. No. 1,110,218, Sept. 8, 1914.)

DRILL—Rock Drill. John James Purcell, Burke, Idaho. (U. S. No. 1,109,782; Sept. 8, 1914.)

ELECTRIC FURNACE and Method of Operating the Same. Robert A. Bayard, Niagara Falls, N. Y. (U. S. No. 1,107,478; Aug. 18, 1914.)

ELECTRIC FURNACES—Improvements in Electric Furnaces. J. Rennerfelt, Stockholm, Sweden. (Brit. No. 226 of 1914.)

ELECTRIC FURNACES—Improvements in and Connected with Electric Furnaces. J. Rennerfelt, Stockholm, Sweden. (Brit. No. 24,850 of 1913.)

FURNACE—Metallurgical Furnace. Edward McCabe, Granite City, Ill. (U. S. No. 1,109,241; Sept. 1, 1914.)

ELECTRIC FURNACES—Stabilizing Means for Electric-Arc Furnaces. Charles Eugène Guye, Geneva, Switzerland, assignor to Southern Power Co., Charlotte, N. C. (U. S. No. 1,109,330; Sept. 1, 1914.)

ELECTRIC REFINING OF STEEL—Process of Electrically Treating, Melting and Refining Metals. Charles Albert Keller, Paris, France (U. S. No. 1,110,208, Sept. 8, 1914.)

EXCAVATING—Digging and Dredging Machinery. William J. Quimby, New York, N. Y., assignor to The Hayward Co., New York, N. Y. (U. S. No. 1,108,001 Aug 18, 1914.)

EXCAVATING—Dipper Tooth. Edward S. Black, Chicago, Ill., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,107,253; Aug. 18, 1914.)

EXCAVATING MACHINE. Charles E. Stahl, Hartford City, Ind., assignor to Jacob B. Stahl, Hartford City, Ind. (U. S. No. 1,108,268; Aug. 25, 1914.)

EXCAVATING—Two-Part Dipper for Excavating Machines. Edward S. Black, Chicago, Ill., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,107,252; Aug. 18, 1914.)

FERRO-SILICO-MANGANESE—Making an Alloy of Ferromanganese and Silicon. John C. Walker, Yonkers, N. Y. (U. S. No. 1,109,640; Sept. 1, 1914.)

FILTRATION—Improvements in and Relating to Apparatus for Making and Filtering Solutions, Applicable in the Extraction of Metals from Ores and for Like Purposes. P. C. C. Isherwood, Herts, Eng. (Brit. No. 6413 of 1913.)

MINE-DOOR CLOSERS, Improvement in. T. Ramsey and J. T. Tonge, Roslyn, Wash. (Brit. No. 3703 of 1914.)

LAMP—Miner's Lamp. Richard G. Harris, Bearden, Tenn., assignor of one-third to James W. Hill and one-third to Ira W. Hill, Bearden, Tenn. (U. S. No. 1,109,415; Sept. 1, 1914.)

LAMP—Pyrophoric-Ignition Miner's Safety-Lamp. Franz Fattinger, Treibach, Carinthia, Austria-Hungary, assignor to Treibacher Chemische Werke Gesellschaft M. B. H., Treibach, Austria-Hungary, a Corporation of Austria. (U. S. No. 1,109,055; Sept. 1, 1914.)

MELTING—Improvements in Means for Stirring or Agitating Molten Metal for Melting Pots. I. Hall, Birmingham, Eng. (Brit. No. 15,323 of 1913.)

MINE CAR. Walter D. Stockley, Fairmount, W. Va., assignor to Mining Appliances Co. (U. S. No. 1,108,808; Aug 25, 1914.)

MINING-CAR WHEEL. Alfred Bryant Day, Knoxville, Tenn. (U. S. No. 1,109,906: Sept. 8, 1914.)

MINING-MACHINE CHUCK. Frederick Nugent, Mace, Idaho, assignor of one-half to Levi R. Nugent, Missoula, Mont. (U. S. No. 1,109,865; Sept. 8, 1914.)

MINE-VENTILATING APPARATUS. William Clifford, Jeannette, Penn., assignor to Elliott Co., Pittsburgh, Penn. (U. S. No. 1,107,264; Aug. 18, 1914.)

NATURAL GAS—Process of Separating the Hydrocarbons Contained in Natural Gas. Heinrich Koppers, Essen-on-the-Ruhr, Germany, assignor to H. Koppers Co., Chicago, Ill. (U. S. No. 1,107,803; Aug. 18, 1914.)

OIL AND GAS WELLS—Method of Restoring and Increasing the Production of Oil and Gas Wells. Irwin L. Dunn, Long Beach, Calif. (U. S. No. 1,107,416; Aug. 18, 1914.)

PETROLEUM—Refining Petroleum and Its Byproducts. Eric A. Starke, Berkeley, Calif. (U. S. No. 1,109,187; Sept 1, 1914.)

PUMP—Method and Apparatus for Pumping Liquids. Henry M. Chance and Thomas W. Chance, Philadelphia, Penn. (U. S. No. 1,109,108; Sept. 1, 1914.)

REFRACTORY MATERIALS—A Process for Fusing Refractory Materials. E. Podszus, Berlin-Treptow, Germany (Brit. No 27,744 of 1913.)

ROASTING—Ore-Roasting Furnace. Adolph F. Herzig, East St. Louis, Ill. (U. S. No. 1,108,906; Sept. 1, 1914.)

ROASTING—Ore-Roasting Furnace. George P. Gibson, Braddock, Penn. (U. S. No. 1,107,601; Aug. 18, 1914.)

SAFETY CATCH—Incline Safety-Catch. Stephen Morris, Newcomer, Penn. (U. S. No. 1,109,693; Sept. 8, 1914.)

SEPARATOR—Magnetic Ore Separator. Gordon Land, Seattle, Wash., assignor to Leighton Howardsmith, King County, Wash. (U. S. No. 1,109,634; Sept. 1, 1914.)

SILICON STEEL. William E. Ruder, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,110,010; Sept. 8, 1914.)

SMELTING FURNACE—Thomas Howard Holyroyd, Southfield, England. (U. S. No. 1,108,175; Aug. 25, 1911.)

SMELTING FURNACE—William E. Williams, Massillon, Ohio, assignor of one-half to Philip H. Holdsworth, Seattle Wash. (U. S. No. 1,108,821; Aug. 25, 1914.)

SULPHURIC ACID—Improved Process of Manufacturing Sulphuric Acid. J. Lutjens, Hanover, Germany (Brit. No 6617 of 1914.)

TIMBER-TREATING APPARATUS—Henry C. Holthoff Riverside, Ill., assignor, by mesne assignments, to Allis-Chalmers Manufacturing Co. (U. S. No. 1,109,331; Sept. 1 1914.)

TITANIC-OXIDE CONCENTRATE and Method for Producing the Same. Auguste J. Rossi and Louis E. Barton, Niagara Falls, N. Y., assignors to The Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,106,106; Aug. 11, 1914.)

TUNGSTEN—Method of Manufacturing Alloys of Tungsten and Other Highly-Refractory Metals Related to It. Hans Kreusler, Wilmersdorf, near Berlin, Germany, assignor, by mesne assignments, to General Electric Co (U. S. No. 1,110,303; Sept. 8, 1914.)

VANADIUM-GOLD ALLOY—Felix von Oefele, New York N. Y., assignor of one-half to Heinrich Schweitzer, New York N. Y. (U. S. No. 1,107,181; Aug. 11, 1911.

WASTE FERROUS LIQUORS, Process of Utilizing. William F. Oesterle, Jr., Clifford A. Beale, and Joseph McFetridge Vandergrift, Penn., assignors to American Sheet & Tin Plat Co., Pittsburgh, Penn. (U. S. No. 1,108,387; Aug. 25, 1914.

WELDING—Process of Welding Metals. John C. Lincoln East Cleveland, Ohio. (U. S. No. 1,108,592; Aug. 25, 1914.

WELDING COPPER—Process for Welding Copper. Heishichi Suzuki, Shibaku, Tokyo, Japan. (U. S. No. 1,107,865 Aug. 18, 1914.)

ZINC FURNACES—Machine for Removing Slag, Ash an other Residue from the Retorts of Zinc Furnaces. Edward W Keith, Denver, Colo. (U. S. No. 1,109,533; Sept. 1, 1914.)

ZINC WHITE—Process of Making Zinc White. Elisha F Cutten, Erie, Penn (U. S. No. 1,109,173; Sept. 1, 1914.)

Editorial Correspondence

SAN FRANCISCO—Sept. 23

Operations on the Comstock for the past week were encouraging. The Con. Virginia carried its two-compartment raise for a distance of 15 ft. and saved 21 tons of ore averaging $16.51 per ton. In the south compartment the vein shows a width of 30 in. with average assays of $15.62 per ton. The Mexican deepened its inclined winze 4 ft. below the 2500-ft. level, making the total depth from that level 170 ft. Union Con. advanced its west crosscut from the winze for 27 ft., making a total length of 120 ft. The face is in mineralized diorite. The Pumping Association at the C. & C. shaft held the water at all points. The No. 2 pump placed on the Riedler station was provided with gypsum insulation on the pipes to reduce the radiation of heat. In the Gold Hill group, 1026 tons was shipped to the Yellow Jacket mill, 654 tons going from the dump and 256 tons from the mines. Two bars of bullion were also shipped to the smelter. The Belcher saved 186 cars of good milling ore from the stope above the 1600-ft. level. The vein at this point is 80 ft. wide. The stope has been opened to a width of 30 ft. with milling ore on all sides.

DENVER—Sept. 24

Railroad Traffic in Colorado Has Been Interfered with by mining operations at times through caving in of stopes and in various other accidental ways, but a new sort of interruption has just developed. The Colorado & Southern has suspended all business on its line between Breckenridge and Leadville for a period not less than 10 days and long enough to permit No. 1 dredge of the Tonopah Placers Co. to dig through the right of way to reach desirable ground on the opposite side. The fact that this tie-up has not elicited remonstrance from the traveling and shipping public of that section of the state betokens loyalty to the mining industry; for it is almost certain that a shut-down of the railroad line for any other premeditated motive would have provoked restraining action at law.

The Coal Operators are Unwilling to accept President Wilson's suggestions for a three-years' truce. Newspapers expected the matter to be quickly settled but persons in position to appreciate the operators' viewpoint and to hear their versions of the difficulties to be adjusted can readily see that, while the terms of truce will probably eventually prevail, it will be only over the strong protest of the companies and after the matter has been given more publicity. The stern refusal of President Wilson on Sept. 23, in his interview at the White House with Mr. Welborn, of the Colorado Fuel & Iron Co., to listen to any modifications in his terms of settlement shows that he is acting according to convictions based upon reports made to him by his special investigators of the strike troubles. Both sides in this tough controversy must make important concessions, it is true; but there is a pronounced feeling among the operators that the proposed truce is a clever scheme concocted in the interests of candidates now before the public for election on the ticket representing the prevailing party in state politics. While nobody doubts the President's frank purpose, the project smacks of partisanship nevertheless and the operators have hopes that a little delay will perhaps bring the existence of a cabal to the President's notice.

BUTTE—Sept. 24

In the Damage Suit of Elm Orlu vs. Butte & Superior, the latter has answered and sets up a counter-claim for $100,000 worth of ore taken out of the disputed ground by Clark; the Butte & Superior claiming to be the owner thereof. The company also asks for a permanent injunction and decree of ownership.

The Third Week of Military Rule has passed without important incident. The novelty of the situation has worn off and everybody is attending to his daily duties without interference by the military authorities. Following the restoration of order, the city and county officials and the civil courts have resumed their activities, excepting the Butte police force and the forces of the county sheriff, which will no doubt remain under military rule until martial law has ceased and troops have been withdrawn. A number of professional agitators and soap box orators have been arrested, tried in the summary court, convicted and sentenced to various terms in jail.

In the matter of the habeas corpus proceedings instituted by Muckie McDonald and others, the supreme court in an oral order on Sept. 22 dismissed the application for writ of habeas corpus, maintaining that the prisoners are lawfully held in jail by the military authorities. If it is shown at the end of 30 days, however, that the civil courts in Silver Bow County are able to execute their processes and the men are still in the custody of the military, they may renew the application for writs. The date of trial of these men has not yet been decided upon.

The hearing on ouster proceedings against Mayor Duncan was begun before Judge Ayers of the tenth judicial district in Fergus County after various unsuccessful attempts on the part of the mayor to set aside the order of Judge Donlan that such hearing should take place before a nonresident judge. Among the witnesses examined were Governor Stewart, Postmaster Gillis, a number of prominent business men, councilmen, policemen, miners who had been deported and many private citizens who witnessed the destruction of the Miners' Union hall and listened to the utterances of street corner orators. The direct testimony was meant to show that Mayor Duncan had done nothing to quell the disturbances or to stop the street corner talks in which direct action was urged. County Attorney McCaffrey, assisted by Peter Breen, the accuser, and others conducted the direct examination of the witnesses. City Attorney Mackel conducted the cross-examination. Up to date the examination has brought to light nothing that has not already been reported concerning the disturbances. The defense will begin immediately. It is expected to bring out phases of the situation which are new to the general public, as well as the Mayor's reason for not having his police force interfere with the dynamiting of the hall or the street corner meetings.

In line with the new policy of independence "The Committee of Safety of the City of Butte" has been organized and between 300 and 400 men have signed a declaration of principles and purposes, setting forth that a condition of lawlessness had arisen in Butte and that therefore: "Representing no class or faction, composed of men from business, professional and labor circles, we will not tolerate the coercion of any citizen or the deprivation of his civil rights, but we will not interfere in the relations or agreements between employers and employees. We pledge ourselves that, exercising our rights as American citizens, we hereby undertake to redeem this community from the rule of those thugs and criminals who flagrantly scorn the institutions of the United States, many of them having never sworn allegiance to our flag. We pledge ourselves to answer the call when the peace of this community is imperiled, and to be prepared to meet any situation that may arise and which may require those qualities of courage and determination characteristic of the best type of American citizenship."

SALT LAKE CITY—Sept. 24

The Mine and Mill of the Ohio Copper Co. at Bingham closed down Sept. 17, following litigation and the filing of a petition of involuntary bankruptcy against the company. A statement has been issued from the local offices announcing the appointment of receivers, who have taken possession of the company's properties; a change in the management was made at the election in July, and the action taken became necessary when the true condition of affairs became known to those who had assumed control. This, with the falling copper market and attachment suits brought at the instigation of those formerly controlling the company's affairs, which were so timed as to render the company's payroll funds unavailable for the purpose for which they were intended, is stated to have been responsible for what happened. Ohio Copper recently brought suit against the Bingham Central R.R., owner of the Mascotte tunnel, through which the Ohio Copper ores are transported, for $133,000 for alleged breach of contract. The railroad retaliated by filing suit for $25,000 for unpaid transportation charges. The payrolls were tied up and receivers appointed Sept. 16. The company's assets include 120 acres of patented mining ground in Bingham and a 1180 acre mill site. The mill at Lark has been treating about 2200 tons of ore daily. Besides the mine and mill equipment, the company is stated to have [illegible] copper heretofore delivered to the smelter. No [illegible] statement as to assets and liabilities has yet been made. Creditors have been assured by the receivers that they will be paid in full, and that the company would be reorganized and continue operations.

HOUGHTON—Sept. 26

The Only Two Mines Operating Full Time in the district are the Mohawk and Wolverine, of the Stanton group. The war necessitated a cut in wages, but the mines were fortunately fairly well sold up with their metal when the war started, and have since made several good sized domestic sales at satisfactory prices. The Stanton mines sell seven-eighths of their normal output to American consumers and are in a relatively strong position in the present situation. Wolverine mining operations now are confined to extraction below the 14th level.

ISHPEMING—Sept. 26

The Ropes Gold Mine buildings, machinery and other equipment have been sold by Corrigan-McKinney to an Ishpeming concern. The mine is situated five miles north of Ishpeming. The buildings will be demolished and the lumber used in construction work. The machinery will be sold as old iron. In addition to 14 dwellings, the buildings include an engine house, boiler house, miners' change house, blacksmith shop, office, laboratory, shafthouse and mill. There are 250,000 ft. of lumber and at least 1000 tons of iron. Corrigan-McKinney acquired the property at receiver's sale in 1897 for $30,000. The transfer included 80 acres of land. After experiments with a cyanide process for the treatment of the tailings, operations were suspended. The company sold the amalgamating plates of the mill, and it was reported at the time that it received several thousand dollars more for the gold contents recovered than had been paid for the property. The Ropes was the only largely developed gold and silver mine in Michigan. It was opened on a well defined vein of quartz lying in a schistose country rock. The shaft is 900 ft. in depth and the underground workings are extensive. During its period of activity, the Ropes produced gold and silver to the value of $650,000, the gold forming approximately four-fifths of this amount. The original company, organized and beginning to mine in 1882, was always hampered by lack of capital. The belief prevails in Ishpeming that some time the Ropes will be worked at a profit. At the time operations were suspended, the mill returns are said to have averaged $3.50 per ton. Corrigan, McKinney & Co.'s work was limited to the operation of the cyanide plant.

SEATTLE—Sept. 23

The Tacoma Smelting Co. Has Announced that until the copper market resumes its normal condition, it is prepared to make advances against shipments on a basis of 10c. per lb., without interest. This action will make possible the continuance of mining in the Alaska copper region and save properties from shutting down. The company agrees to settle for the copper at whatever price the metal is sold for, as soon as there is a copper market again.

The Gold Output of Alaskan Placer Mining for 1914 will exceed $10,500,000, according to an estimate made by J. F. Pugh, collector of customs for Alaska, who has just completed a trip through the territory. On his return to Juneau, he stated that the figure given was conservative. According to the data gathered, the Nome district will yield $4,000,000; Ruby, $1,000,000; Iditarod, $1,500,000, and Fairbanks, $4,000,000.

More Gold Will Be Produced in the Circle Country this year than last, and by 1915 it is hoped that the old camp will swell its output still further. The new Berry dredge is on the beach, ready to be freighted to Mammoth Creek. Anton Slater has just arrived with a new hydraulic plant, to be installed on Switch Creek, a tributary of Deadwood. Many claims are proving good producers and some of the properties which had been about given up are again on the producing list.

Authoritative Reports from Crow Creek, near Turnagain Arm, on Kenai Peninsula, Alaska, the scene of a recently reported gold strike, indicate that the properties held by the Alaska Crow Creek Mining Co. are promising and may develop into a large hydraulic mine. News of the strike was first reported in Cordova in August, and occasioned some excitement. The company struck its biggest pay streak earlier than had been expected, and there resulted somewhat of a stampede from the coast cities of Alaska.

The Bill For Exempting Mining Claims from assessment work in Alaska during 1914 has brought every Alaskan in the territory to his feet against its passage. Alaskans are of the opinion that wildcatters are endeavoring to put one over at Washington, and a delegation will leave Juneau within a few days to wait on Clay Tallman, commissioner of the general land office, to whom the bill has been referred and who refused to indorse it until he could hear from the people of Alaska. From the Alaskan point of view financial conditions in the United States have nothing whatever to do with the performance of assessment work in Alaska. The claims as a general rule are owned by individuals except in a few cases where large blocks of land have been acquired by syndicates and are not being developed. The miners and prospectors of Alaska are willing to do their assessment work as required by law, and if speculators want to hold their claims in the north they should be prepared to meet the same conditions. Otherwise they should turn the ground over to somebody who is willing to develop it. A respite from assessment work was granted by Congress for the Nome district last year, but that was because of a terrific storm which devastated the city and swept away hundreds of miners' cabins. Many of the claims are in places where the owners would not hear of the passage of the law before Christmas and its passage would simply favor men on the outside.

PLATTEVILLE, WIS.—Sept. 26

Mining Here Shows Considerable Activity. Operators are gradually employing more men, as the metal market conditions warrant it. During the lull in the market the operators cut down production and turned their attention to drilling and development work. The New Diggings district is still attracting attention for its contribution of new orebodies to the Wisconsin zinc field; it is interesting to know that the ore deposits are mostly found on the north sides of the hills.

The state now has a law taxing orebodies, which has proved harmful to the mining industry. Property owners, many of whom are farmers, have objected to making drilling contracts with the mining companies, or to developing lands themselves, for fear that this law would raise the taxes on their holdings; it is hoped by the people here that the law will be repealed at the next meeting of the legislature.

The Fields Mining & Milling Co. plans extensive building and development work, which includes the building of a 600-ton mill, a motor-truck ore-haulage system and the latest types of mining, and milling machinery. The Lawrence Mining Co., of Hazel Green, is about to complete its mill and get everything in readiness for mining operations. It has been reported that Kisler & Stevens have made a good strike in their property situated one-half mile northeast of the East End mine. The Wisconsin Zinc Co. has proved up an orebody on the Sietz land, near Platteville and is about to start shaft sinking. The West Hill Mining Co. is getting its milling equipment in readiness. This property is owned by local people. The North Unity Mine at Day Siding will be a producer, as soon as the mill is completed. Drilling results on the Kittoe land are good; this looks like another mine for the Vinegar Hill Co. The Mineral Point Zinc Co. is about to start work on the old Pittsburgh-Benton property.

TORONTO—Sept. 26

The Removal of the Minimum Prices at which mining stocks may be sold on the exchange has been agitated by some brokers. So far their efforts have been unsuccessful. The majority of the members took the view that this action would result in stocks being sacrificed at an abnormally low figure, and that there was no more necessity of permitting bargain-counter sales of mining stocks than of any other securities. The higher priced stocks are little affected, but some of the cheaper issues could be easily raided.

At a Recent Meeting of La Rose Directors, the regular dividend of 2% was declared, and a lengthy report on the conditions of the property was submitted by R. B. Watson, consulting engineer. Another report by P. A. Robbins, of the Hollinger mine, was also read. Both engineers advised further extensive exploration and development work. During the past few months, rumors have been current that La Rose would shortly close all its properties, as the ore in sight was rapidly becoming exhausted and the general impression prevailed that the possibility for the discovery of new orebodies was not encouraging. In the event of the closing down of the property, the surplus, amounting to approximately $1,500,000, would be distributed among the shareholders. In view, however, of the recommendation submitted at the meeting, it is now probable that work will be continued for some time. A report, explaining fully the position of the mine and the course of action thought best by the directors, will be mailed with the dividend checks. It is also stated that the last dividend was not fully earned, but was paid out of the surplus.

The Mining News

ALASKA

LITTLE GIANT (Valdez)—Claims on Mineral Creek being opened by Herbert Jaynes promise to become good producer, if vein holds out. Six tons being sacked from outcrop for mill run at Valdez. Assays had from $4.80 up. A 125 ft. tunnel gives 40-ft. backs. Outcrop shows width of 4 in. to 4 ft.

ARIZONA

Cochise County

SHATTUCK (Bisbee)—Dividend passed. Last paid, 50c. three months ago.

Greenlee County

SHANNON (Clifton)—Mines at Gleason and Metcalf closed. Smelting plant was to close Sept. 26.

Mohave County

RAINBOW (Chloride)—New pumping plant installed and sinking begun from 400- to 500-ft. level.

HACKBERRY—Qualey Bros., of New York, recently installed larger pumping equipment and new compressor. As soon as water is lowered, sinking will be resumed.

DISTAFF (Chloride)—Mine under option to John Campbell being actively prospected with excellent results. Machine drills installed and main shaft to be deepened.

Pinal County

MAGMA (Superior)—New strike on 1000-ft. level. Ore crosscut for over 5 ft., showing high copper and silver contents.

KELVIN-SULTANA (Kelvin)—Heavy rain storm damaged mine by flooding. Large dumps of carbonate ores at No. 1 shaft washed away and shaft injured. Car of ore shipped by leasers to Hayden carried 15% copper.

RAY CONSOLIDATED (Ray)—Traffic on railway between mine and Ray Junction impossible until repairs are made. Several large fills washed out. Shops at mine and upper portion of town suffered damage from high waters.

Santa Cruz County

A PORPHYRY COPPER is reported by George D. Gross, veteran prospector, with several good discoveries to his credit. Deposit lies in the Patagonia Mountains, 15 miles northwest of Nogales; quartz-porphyry rock with disseminated chalcopyrite; shows 700 ft. in width and two miles in length on the surface. Assays stated to increase regularly to 2½% in going down. Thought by neighbors Mr. Gross has made valuable discovery.

THREE STARS (Patagonia)—Mine leased by agent of old Apache Co. to John and Chris H. Schultz, of Denver, who will begin work at once on new shaft. Ore carries lead, copper and silver.

CONGRESSIONAL (Patagonia)—Property of Josiah Bond examined by Kirby Thomas, for New York people. Is deposit of copper ore, with large surface showing, but is opened only to 75 ft., giving good promise at that depth.

BRADFORD (Bluxton)—A. L. Harroun, who purchased old Salero mines from Ferry estate, removed boilers and some other machinery to Bradford mine, near Bloxton. Will not tear down buildings, being minded to give Salero one more try. Shaft on latter is down 400 ft. with good indications; is proposed to sink to at least 600-ft. level, as showing on 400 level warrants further work.

O. K. (Patagonia)—This group, formerly known as the Glove, property of the Sheehey boys, now being worked by the O. K. company, with about 40 men under T. M. Parks. Ore shipped to El Paso and elsewhere. Is difficult and requires care to keep the lead and zinc apart. Lead goes to El Paso. Has been stated that El Paso works would be equipped with zinc retorts, but so far nothing has been done. Zinc goes to Colorado or Kansas and Missouri for treatment. Up to middle of September, seven cars had been shipped, and production goes on at rate of 20 tons per day, most of which can be shipped. Thought that mill will be necessary.

FLUX (Patagonia)—Richardson has bonded this mine to California operators represented in field by Bierce Bros. & Collie for last three months; they made careful investigation, and many concentrating tests on ore, before entering into contract. Large tonnage developed as result of former work, will run about $12, and parties have contracted to install concentrator; location to be announced later. Buyers have commenced work and will devote energies to prompt construction of works and additional development. Sale means much to district, as standing of engineers assures adequate treatment of immense bodies of ore in mine and consequent heartening of others with similar bodies of milling ore.

R. R. R. (Patagonia)—N. L. Amster, after working under bond and lease for two years, shipping more than million dollars' worth of copper ore, gross, and operating at profit, has thrown up contract. War partly responsible, but immediate cause is result of Heney-Richardson trial, involving title to part of mine. Heney & Richardson were originally partners in mine, but Heney got "cold feet" and sold out to Richardson for $5000, his interest being approximately one-third. Latter, being game, drove long tunnel hitting vein at 600 ft., and opening up body of ore, on strength of which he sold to Amster. Later, Heney commenced suit to set aside deed, on ground of Richardson's having made development, without imparting result to Heney. Suit ended in verdict for Heney, but so much extraneous testimony was introduced that Richardson is applying for new trial. Failing that, case will be appealed to Supreme Court; and new trial will in all likelihood be ordered by one or the other court. Case attracted attention, being argued for plaintiff by Frank Heney, well known lawyer of San Francisco, and for defendant by Frank Hereford, chancellor of University of Arizona.

Yavapai County

DOLPHIN(Crown King)—Messrs. Braun & Bilchenstaff, working under lease, will soon be milling ores in their plant at Saratoga mine.

WAR EAGLE (Crown King)—In breast of War Eagle-Gladiator tunnel, 5 ft. solid sulphide encountered. Property controlled by Detroit capital.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Eighty-stamp mill running full capacity on ore from 3000- and 3100-ft. levels.

PLYMOUTH CONSOLIDATED (Plymouth)—First cleanup reported encouraging. New 20-stamp mill said to be handling 300 tons per day owing to improved processes.

Butte County

WILLIAM BIEK (Forbestown)—Mine being put in shape to resume operations coming winter. Equipped with 5-stamp mill.

OROVILLE UNION GOLD DREDGING CO. (Oroville)—Company incorporated by J. G. Nisbet, W. H. James, S. W. Cheyney, W. C. Putnam of Oroville and John Bradbury of San Francisco, to operate on recently purchased properties.

Calaveras County

DUCHESS (Vallecito)—Cyanide plant being erected. Active development work in progress.

BOWLING GREEN (Vallecito)—New mill for washing gravel erected. New 60-ft. headframe and pipe line installed.

Eldorado County

ALDERSON (Placerville)—William Williams, miner, imprisoned by cave-in, rescued after 12 hours. Cave-in caused by rotting timbers in tunnel.

Kern County

HAYDEN HILL (Hayden Hill)—Crushing and cyanide plant being installed.

PLACER GOLD CO. (Randsburg)—Company intends increasing output by installing additional dredge machinery.

ANTAROSA (Caliente)—Strike reported. Installation of mill contemplated. High waters in past winter said to have disclosed large outcroppings. Property abandoned several years ago as being worthless.

Madera County

MADERA-ENTERPRISE (Grub Gulch)—Reported operations will be resumed, after 30-day shutdown.

Modoc County

HESS (Adin)—Reported company intends increasing milling capacity.

Placer County

BOBTAIL (Auburn)—Property bonded by William Recknagel who contemplates erection of 5-stamp mill, concentrator and new hoist. Shaft will be deepened

PARAGON (Forest Hill)—J. F. Thompson has filed on water rights in Volcano Cañon to develop power for mine. Small dam to be erected and flume ¾ mile long

BELL (Auburn)—Property bonded to W. G. Ruhl, of San Francisco. Active development work commenced to determine extent of orebody. Erection of mill contemplated

Plumas County

BELLEVUE (La Porte)—Tailings in Wallace Creek being cleaned up. Development work suspended since outbreak of war, but expected to resume shortly

San Benito County

ALPINE (Hernandez)—This quicksilver mine will resume operations. Retorts have capacity of 40 flasks per month.

San Bernardino County

DAMAGE SUIT instituted by Henry E. Lee against California Trona Co., American Trona Co., and a detective agency, aftermath of Searles Lake potash war. Lee charges false imprisonment and malicious prosecution.

AMERICAN TRONA (Searles Lake)—Railroad connecting potash fields and Southern Pacific railway completed for general traffic Road 30 miles long, gives outlet for company's products and provides transportation for machinery for increasing plant

BONANZA KING—Suit instituted by Charles E. Usher and W. K. Krips, representing Bonanza King Development Co., against Trojan Mining Co., to quiet title to Rattler, E[illegible]ora, Maud, Gypsy, Donald, Amboy, Cincinnati and other mines in Trojan district. Trojan company defunct

Santa Clara County

PHOENIX (San Jose)—Quicksilver property reopened after long shut-down

Shasta County

BALAKLALA (Coram)—Stated this First National mine may erect sulphuric-acid plant. Has $275,000 cash and bills receivable sufficient for purpose. Stated reserves are 3,000,000 tons 2.85% copper or carrying $1.20 in silver. Standard Oil, General Chemical and Hercules Powder companies among others along coast use sulphuric acid. Standard Oil makes acid from sulphide ores bought from Mountain Copper.

Sierra County

SIERRA CONSOLIDATED GOLD MINING CO. (Camptonville)—Company organized to work property on Mountain House ridge. Incorporators are V. Grey, W. H. Stokes and M. Stokes, of Stockton, and A. B. Hennessy, of San Francisco.

BALD MOUNTAIN (Downieville)—Surveys completed, plans drawn for buildings, machinery in transit, preparatory to developing quartz ledge discovered during working of gravel channel on this property. Development under charge of William Copeland who, with associates, holds property under bond.

OXFORD (Downieville)—Quartz group, owned by Diwnieville people, passed under bond to Grant Snyder and associates of Salt Lake City, who will develop on large scale. Gold Bluff group, adjoining, expected to be handled in conjunction, lower tunnel to be used in working Oxford ground, all ore to be reduced in the Gold Bluff plant. Oxford vein lies close to serpentine contact, believed rich. Extensive sampling under way, in charge of Sol Camp.

Trinity County

PAULSEN RANCH, near Lewiston, is being prospected for dredging ground.

BELLEVUE (Hayfork)—Five-stamp mill being installed.

NEVER SWEAT (Lewiston)—Sam and Ed Sorenson have purchased this property.

TRINITY ASBESTOS (Carrville)—Installation of machinery nearly completed. Product will be quarried; is reported to be of fine quality. Plant will have initial capacity of 50 tons per day. Shipments expected to commence in October. Options taken on extensive area of adjacent ground, which will be thoroughly prospected.

Tuolumne County

SANTA YSABEL (Stent)—Unwatering completed and examination proceeding.

PROVIDENCE (Tuolumne)—Strike reported. Ledge uncovered while clearing débris at 700-ft. level. Samples show tellurium and free gold.

OLD DOMINION (Columbia)—Suit instituted by Thomas P. Bacon against George F. and Adel Lewis Grant, owners of property. Plaintiff alleges fraudulent representations regarding property.

COLORADO

Ouray County

COLUMBUS (Ouray)—Dividend Gold Mines Co. title of new operator developing orebody said to be 5 to 30 ft. thick with good gold content.

San Juan County

HAMLET (Middleton)—James O'Kelly, superintendent, after year's steady development, has put property into condition for starting up mill.

KITTIMAC (Middleton)—Force of men under Frank Card completely remodeling mill while another force is repairing aërial tramway and getting mine in shape. Electric underground haulage will be installed.

San Miguel County

CARRIBEAU (Ophir)—Property will be reopened and operated throughout winter by Ralph Hansen.

SMUGGLER-UNION (Pandora)—Force of men employed sorting ore from mine dumps in Marshall Basin and drawing old stopes in Mendota mine. This material treated in mill and cyanide plant at Pandora.

Teller County

ACACIA GOLD MINING CO. (Cripple Creek)—Sinking of South Burns shaft resumed.

JERRY JOHNSON GOLD MINING CO. (Cripple Creek)—Erection of 50-ton mill for treatment of low-grade ores under consideration.

EL ORO MINING & MILLING (Victor)—On 500-ft. level of Eclipse shaft, large orebody opened on Mullen vein. Shoot exposed for 100 ft. and is 30 ft. wide. Ore runs $12.

GEORGIA

Lumpkin County

TOLEDO MINING CO. (Dahlonega)—Mill practically completed, linings of tube mill only feature lacking; are looked for daily.

CONSOLIDATED MINING CO. (Dahlonega)—New company has bought holdings and recently took possession. Water shortage still hampering mining operations.

IDAHO

Coeur d'Alenes

CHICAGO-BOSTON (Wallace)—After building water-power flume, installing compressor, erecting new buildings and making other improvements, company has resumed work underground.

KEYSTONE MINES CORPORATION (St. Joe)—Spokane men have organized company to operate 21 claims in the Blacktail district, about 5 miles east of St. Joe. F. O. Berg, president; E. C. Tousley, secretary; M. L. Fox, treasurer Properties taken over include those of Little Joe Mining Co. and those operated by late W. H. Brown. Mine has already been opened to depth of 700 ft. by tunnel and considerable high-grade ore shipped. Ore is silver, with some gold and copper. Stated much will be shipped direct to smelter and milling ore treated by contemplated concentrator at property. E. A. Ely, mining engineer and director in company, will direct work at property

MICHIGAN

Iron

YALE (Bessemer)—Mine closed. 150 men affected. Is property of Lake Superior Iron & Chemical Co., only ore producer of that corporation.

DAVIDSON (Iron River)—Shipments for year suspended this week and all ore hoisted now will be placed in stock. All ore hoisted since navigation opened and large part of that in stock was sent out.

BALKAN (Alpha)—New shaft being sunk from surface over caved raise will not be completed for some time. In stripping, one of drag-line machines is working on second lift, and stripping is not so easy as on first cut, where only pure sand was encountered. As soon as pit is a little wider, other machine also will be sent to second cut.

OGLEBAY, NORTON (Iron River)—Company has secured option on most of land between the Ravenna mine and Fortune Lake, in Iron County, and started several churn drills. As soon as work of testing out ledge is completed, diamond drills will be employed. Ground under option comprises several hundred acres; believed chances of locating iron ore deposit are excellent.

ROGERS (Iron River)—Munro Mining Co. erecting 15 dwelling houses for accommodation of miners. Company recently gave picnic at Rogers mine for employees and families—most successful. Crowd of 1000 to 1500 people on grounds during day; at night well attended dance wound up festivities. Two special trains, one from Iron River and one from Chicagon mine, conveyed most of assemblage to park. George L. Woodworth, general manager, welcomed employees and delivered short address. Rogers mine brass band furnished music. Company distributed 50 gal. ice cream, 300 lb. of peanuts and barrels of lemonade. Sports included drill-rigging contest, shoveling contest, demonstration of first-aid work and fire extinguishing. Nursery and resting place for babies and mothers in three tents was in charge of company's visiting nurse. In drill-rigging contest, two Hiawatha mine employees won first prize in record time of 2 min. and 37 sec. Hiawatha mine also took first honors in shoveling contest, winner loading 2500 lb. of ore into car in 3 min. 7 sec. Long list of sports, for which company gave $150 in prizes, was run off. Baseball game between two teams of miners was another feature.

MINNESOTA

NEAR BARROWS, the Brainerd Mining Co. and Barrows-Mississippi Iron Co. are both operating drills. Nothing known of discoveries.

CUYUNA-MILLE LACS (Ironton)—New air compressor of larger dimensions just installed.

BARROWS MINING CO. (Barrows)—Drills on this property all moved to another quarter. First hole showed 200 ft. of ore.

KENNEDY (Cuyuna)—Arrangements completed whereby future shipments will be divided between Soo and Northern Pacific. Heretofore all tonnage went via Soo Line.

ADAMS (Oreland)—Through series of mishaps to both steam and electrical pumping equipment, mine permitted to fill with water; 2000-gal. bailer installed to unwater.

CUYUNA MILLE LACS (Brainerd)—Mine rushed with orders for manganese ore, as is Cuyuna-Duluth, both owned by American Manganese Mfg. Co. (shipped East as fast as mined.

PENNINGTON (Ironton)—After having been put into shape to ship and kept thus for several months, this openpit has now been closed for winter without having shipped this season.

WILCOX (Woodrow)—Shaft down 190 ft.; drifting will be started at 200 ft. All mine buildings completed and foundation now being made for hoist. Ore will soon be hoisted as deposit is close to shaft.

CUYUNA-SULTANA (Crosby)—Drilling on the Campbell forty about completed; thirty acres of 40 known to be underlaid with ore. Second exploratory shaft will soon be sunk. Company also meeting with success drilling on Almar property on Vermilion range.

JONES & LAUGHLIN (Crosby)—Company given option for lease of strip on south side of Sultana property, to be used as slope for openpit operations. Jones & Laughlin will probably take over and strip Cuyuna Iron & Manganese ground.

IRON MOUNTAIN MINING CO. (Iron Mountain)—Company sold stockpile of several thousand tons manganiferous iron material to company installing the John T. Jones furnace near Marquette, Mich. This furnace, adaptation of step-process furnace, intended to simplify reduction of high manganese, low-iron ores such as abound on Cuyuna range.

CROFT (Crosby)—Mine buildings about completed, also concrete chimney, tallest in Cuyuna district. Sinking on working shaft about to begin. Shaft will be concrete, circular about 18 ft. in diameter, with 3-ft. walls. Tonnage will be handled by the N. P., which is working on trackage connections now. This shaft will open up only known deposit of bessemer ore on Cuyuna range.

Mesabi Range

BENNETT (Keewatin)—Mine closed Sept. 16 for season.

MISSISSIPPI (Keewatin)—Mine reopened Sept. 15, employing about 30 men.

SILVER (Virginia)—After shipping about 200,000 tons, mine closed for season, throwing 150 men out of work.

DEAN (Buhl)—This openpit owned by Great Northern Ore Co. and now being stripped, leased to Tod, Stambaugh & Co. who will operate next season.

ALLEN (Virginia)—Mine to be closed down Oct. 1. Only small force employed for two years past, output for two years being 75,000 tons. Shaft house will be dismantled; understood ore suply is exhausted. Morris Mining Co. was operator

REPUBLIC IRON & STEEL (Duluth)—F. J. Webb, general manager in the Lake Superior district, reported as stating he would not be surprised if all of company's mines on Mesabi closed within 30 days. Only thing to prevent such action will be receipt of unexpected orders for ore. Said demand for iron and steel had been lighter than usual of late and considerable ore was stored in East and at mines. However, good times are looked for next year in iron business.

MONTANA

Cascade County

FLORENCE (Neihart)—Property sold by sheriff to Carl Schenk, Great Falls, as result of action by Mr. Schenk to foreclose. Schenk had secured 23 labor liens against property, and paid $4293 for title.

Madison County

FLORIDA-GIANT MINE (Bear Gulch)—New 180-ton cyanide plant rapidly nearing completion. Developed tonnage roughly estimated at several hundred thousand, running from $8 to $12. Senator Foraker and son of Ohio are interested in company.

Silver Bow County

THREE MEN KILLED by cave in prospect shaft at Maiden Rock near Butte. Slide came from surface around collar of shaft. Men buried 14 ft., were dead when rescuers reached them; bodies found standing. One victim, Henry Rodda, well known as blind miner.

BUTTE & SUPERIOR (Butte)—According to August report, 28,912 tons of ore treated by flotation, resulting in recovery of 6424 tons of concentrates at cost of $4.223 per ton. Concentrates valued at $31.028 per ton; increase in percentage of extraction was accompanied by increase in cost of treatment, which in July was $3.083.

BULLWHACKER (Butte)—At special meeting of stockholders in Butte, Sept. 21, motion was adopted favoring plan for reorganization that involves assessment of 15c. per share to pay off $125,000 indebtedness and provide about $20,000 needed to complete mill and resume operations. Resolution was preceded by sensational attack upon "Patsy" Clark and present management by Samuel Alexander representing a number of minority stockholders. Said Clark had run company in debt to get control for himself. In reply Mr. Clark submitted audit covering company's affairs since 1906 and containing vouchers and canceled checks for every cent paid out. Also made proposition that new company be organized under laws of Montana to take over Bullwhacker property. Majority of stockholders present thought that only thing to do was to go ahead as suggested by Mr. Clark for reorganization of the company and completion of mill.

ANACONDA (Butte)—Experiments being carried on at mines of company with new explosive "Sabulite" under direction of company officers and of Mr. Davis, representing manufacturers. Sabulite, patented in Belgium, claimed to be explosive of great strength, perfect safety in manufacture, transportation and handling, insensible to shock, friction, fire or frost and with fumes absolutely harmless. Only about one-third of amount usually employed in dynamite is required to get same effect. On Sept. 18 demonstration was made at Original mine but result was unsatisfactory, owing to fact, according to Mr. Davis, that expert from factory got his weights mixed. Second test was made at Anaconda mine Sept. 22 with satisfactory results. Round of nine holes was loaded with powder, about 75% of usual amount of dynamite; effect was acknowledged better. Those watching experiment walked back to breast immediately after blast and found that although air was filled with smoke, it had no fumes nor choking effect. Assistant general manager Dunshee of Anaconda, who witnessed test, stated that to all appearances explosive was all claimed for it, probable further experimenting will be carried on. [A Belgian powder was tried in California mine three years ago. Each stick in two parts, one hollow and other slipped in. Neither could be set off alone. Great safety claimed. Foreman John Hogan said it worked like seidlitz powder but was mistaken; didn't work at all. This probably no fault of powder, however. At underground trial in granite, Belgian expert scorned assistance of native-son miner in loading. Charge didn't crack rock. Powder rejected by mine management.—Editor.]

NEVADA

Elko County

FLANIE (Jarbidge)—Stated milling plant decided on. Water right on Bear Creek acquired and will be developed to run mill. Estimated 55 hp. can be developed in season of low water under head of 1280 ft.

Esmeralda County

PITTSBURGH-SILVER PEAK (Blair)—Blacksmith shop destroyed by fire Sept. 12. Fire discovered when night crew came off shift. Shop total loss, but machine shop adjoining and rest of surface plant saved, due to sufficient water supply and efficient fire-fighting apparatus. Leyner drill sharpener may be repaired.

Eureka County

CYANIDE MINE (Eureka)—Work will be resumed Oct. 1, on this and other silver properties on Adams Hill.

Humboldt County

ROCHESTER CONSOLIDATED (Rochester)—In railroad construction work, unique locomotive, consisting of a 60 hp. automobile engine on light railroad trucks, is used and gives satisfaction, while its operating cost is low.

Lincoln County

VIRGINIA LOUISE (Pioche)—Deal for sale of controlling interest to Prince Consolidated Mining Co. closed and money paid.

DAY-BRISTOL (Pioche)—Application for sale of property to clear indebtedness held in abeyance until Oct. 11. Fred W. Frost, attorney for company, states steps have been taken to finance property and pay indebtedness, which is $90,000.

Mineral County

LUNING GOLD MINES CO. (Luning)—Reports current that property has been leased to Sacramento mining men and active operations will begin early next month.

WAGNER AZURITE (Luning)—Leaching plant so far not successful in filtering solution. Now intended to try pressure instead of vacuum. If this fails, decanting will be resumed. Large bodies good-grade ore exposed, sulphides coming in, which will necessitate roasting.

COPPER QUEEN (Luning)—Option taken up by C. B. James and associates; force of men will be put to work at once in further opening up showings on St. Patrick and Erma group. This property consists of 44 claims north of Luning, adjoining Geroux property on north and Luning-Idaho property on south. Development to date has exposed copper ore, with silver running well. Property has been large producer.

Nye County

TONOPAH MINING CO. vs. TONOPAH EXTENSION SUIT—Tonopah Mining has made application to district court for orders restraining Extension from removing ore from Sandgrass claim of former. Suit is for recovery of $200,000, value of 12,000 tons ore alleged extracted from plaintiff's territory during last seven months.

BIG PINE (Manhattan)—Crushing system for handling ore from glory hole successful. Blake crusher at shaft collar crushes ore hoisted from 200-ft. level. Oversize from grizzly trammed to waste dump does not run over 60c. per ton. This oversize is about one-half of ore hoisted so that separation is highly economical. Tests being made on feasibility of eliminating stamps and feeding from crusher to tube mill.

TONOPAH MINING CO. (Tonopah)—Company announces to stockholders that it has option on property of Panama Mining Co. in Nicaragua until Feb. 1, 1915. If exercised, new company controlled by Tonopah Mining will be organized, 40% of stock being turned over to Panama company. Tonopah buys property, not stock. Probably no decision will be made until full time of option expires.

Washoe County

THE NEVADA ENGINEERING WORKS at Reno had its entire plant except foundry destroyed by fire of unknown origin, Sept. 16. Loss to company estimated $50,000, partially covered by insurance; total loss, including railroad rolling stock, etc., $75,000. Arrangements made with N. C. O. R.R. to use their shops at night and as much in day time as possible. Stated construction of new plant will commence at once and will be in operation within 60 days.

NEW MEXICO

Grant County

APRIL FOOL MINING CO. (Fierro)—Work suspended owing to misunderstanding among stockholders.

EMPIRE ZINC (Hanover)—Tramway from Nason tunnel to Santa Fé railroad practically completed. Ore bins being erected at loading point. Operations may soon commence on sulphide claims east of present workings.

Santa Fé County

AMERICAN GOLD, COPPER MINING & SMELTING CO. (Santa Fé)—Property failed to bring bidders at receiver's sale in Santa Fé. Will be offered again, Oct. 15. Consists of five developed claims and 160 acres patented mining land in Cerrillos mining district. Ore is low grade.

Sierra County

ANDREWS MINES (Hillesboro)—Property sold to Messrs. Moore and Van Deeman and Mrs. Connor. Will be put in workable condition. Reported new machinery will be installed in El Oro mill.

Socorro County

LARGE MINING COMPANIES OF MOGOLLON [illegible] call for more miners. All operators working full time.

PRECIOUS METALS EXPLORATION CO. (Mogollon)—Winze started in No. 3 1200-ft. tunnel to penetrate No. 1 orebody of milling ore. Contract for milling made with Deadwood Co. E. M. Carter in charge.

Taos County

CHAMPION COPPER CO. (Embudo)—Company expects to begin operations soon. Will sink 500-ft. shaft. Showing of copper oxides on claims located 20 miles south of Taos.

NEW YORK

St. Lawrence County

TALC BUSINESS somewhat stimulated by war on account of increased demand from paper mills and because of the slackening in importation of foreign clays and talc. International Pulp Co., largest talc company, recently had unusual run of water in its No. 2½ mine at Talcville, so that at present mine is full of water from bottom at 600 ft. depth, to about 300 ft., and water is still coming in. Although workings are close to Oswegatchie River it is not thought water comes from there. Freeman mine adjoining has not yet been affected. Uniform Fibrous Talc Co. at Talcville and St. Lawrence Talc Co. at Natural Bridge, have recently increased capacities for mining and milling.

NORTHERN ORE CO. (Edwards)—Company preparing specifications for new concentrating mill to replace one burned several months ago. Will be tile and concrete construction, fire-proof. Burned machinery cleared from mill site, and some repaired to be used again. Regretted that month more of experimental work was not possible in old mill, to put finishing touches on special process evolved for separating blende from pyrite. Mine development continues in Brown, White and Williams shafts; depths of 170 ft. on the incline of 20° to 60° attained. Connections made underground between Williams and White shafts, and former will become permanent hoisting shaft, being on top of hill, which will serve to give gravity drop to mill. With depth ore persists in quality and quantity; pyrite not seeming to increase. Other zinc lands being explored in district, and several promising properties known to exist.

OREGON

ARTICLES OF INCORPORATION of Gleeson Development Co., mining concern capitalized at $75,000, filed with Corporation Commissioner by Walter A. Gleeson, Fred M. Coleman and E. M. Wright all of Portland.

THE FIRST GOLD DUST TO ENTER PORTLAND from Alaska since 1899 came in recently on the "J. B. Stetson." Purser Crichton's safe held $35,000 worth owned by James W McClosky, of Juneau. Stetson is one of fleet being operated by Portland people in effort to get back Alaska trade

Baker County

RESTRAINING ORDER GRANTED in case of R. C. Crawford vs. Susie Norwood et al., in which defendants are enjoined from occupying or developing certain mining claims in Virtue district, title of which was involved in suit. Miss Norwood and Mrs. Grace Carmalt have been working the claims for over a year.

COLUMBIA GOLD MINING COMPANY (Sumpter)—Company has large stock of cyanide on hand. Price in this section is now 75c per lb.; ordinarily is 19c.

Curry County

LOYAL GOLD MINING & MILLING—Company in market for new equipment for installation at mine near Gold Beach; includes three boilers, four steam engines, four gasoline engines, two centrifugal pumps and other apparatus. J. R. Peters in charge.

Jackson County

BRADEN MINE (Gold Hill)—Mine recently closed down owing to the European war, throwing 40 men out of work, is to resume operations.

Josephine County

COPPER QUEEN (Leland)—Property three miles from Leland actively developed and 20-ton cyanide plant now about completed. Manager L. W. Beach, of Grants Pass, states that company has good supply of cyanide ordered and does not expect to shut down during war.

GOLD RIDGE CONSOLIDATED (Holland)—J. S. Windell, representing company, has gone out to property recently purchased on Illinois River to start extensive development work. Property includes some of best placer ground in section. Mine was producer for number of years; there is still large acreage of unworked ground.

OREGON GOLD MINES COMPANY (Granite Hill)—Company which is reorganization of Oregon Gold Fields Co., of Chicago, under the management of Messrs. O'Grady and Setchell is nearing producing stage. Workings are being unwatered and machinery put in shape to run; stamp mill is in operation for test run. New vein discovered and is being milled while deep workings are being retimbered.

PENNSYLVANIA

FRENCH CREEK IRON MINES reopened and modern methods will be applied. [Newspapers have reported some ore running 90% iron and all running better than 75%. Some iron and some newspapers!—Editor.]

NEW JERSEY ZINC reported to have purchased additional property at Friedensville, Penn., for zinc prospecting. Near old zinc mine flourishing 1872-1888. Company now owns 600 acres; shipping in drills; will provide work for 300 men.

AMERICAN MANGANESE MANUFACTURING CO. (Dunbar)—Reported company would start plant Sept. 28, to manufacture "ferro" out of Cuyuna ore, of which 200 cars are said to be on way. Product will be low grade, 30% to 40% Mn as against 80% of imported. Ores not suitable for high-grade alloy.

TENNESSEE

LEONARD CONSTRUCTION (Embreeville)—Operations for zinc begun. Reported concentrating and smelting plant to be installed.

UTAH

Beaver County

NOONDAY (Milford)—Drifting on 200 level, present bottom of shaft, has encountered iron with some lead.

MOSCOW (Milford)—Seven teams hauling ore and shipments of 15 to 20 cars monthly being made. Output to be increased.

UTAH MINING, MILLING & TRANSPORTATION (Milford)—Two feet of ore running well in silver opened on 400 level of Lady Bryan property, half a mile from the Moscow. Usual ore from this property carries silver with large excess of iron.

Juab County

TINTIC SHIPMENTS for week ended Sept. 18, show substantial gain, being 119 cars compared to 86 for week preceding. Eighteen properties made shipments, among which were Opohongo and Grand Central, which for several weeks have been absent from list. Eagle & Blue Bell shipped, though shaft sinking is in progress. Heavier shipments made by Lower Mammoth.

CENTENNIAL-EUREKA (Eureka)—Latest available reports of accident state one man rescued, two bodies taken out, three more discovered. Remaining six men supposed dead.

LOWER MAMMOTH (Mammoth)—Work on zinc ore being done between 1000- and 1100-ft. levels. There are large deposits of zinc ore too low-grade for direct shipment, for which no suitable treatment has yet been found. Lead, copper and zinc ores being shiped.

AMERICAN STAR (Eureka)—Company owns claims—formerly the Town View ground—adjoining Chief Consolidated on southeast. Drifting being done from Eagle & Blue Bell to reach property. About half of necessary 400 ft. of work covered. Imer Pett is president.

Summit County

PARK CITY SHIPMENTS for the week ended Sept. 18 amounted to 1,856,720 lb., by five shippers. Considerable satisfaction felt in the camp at resumption of operations by Daly-Judge.

DALY-JUDGE (Park City)—Development work going on, and hauling of concentrates started. Practically full force of 250 men working.

SILVER KING CONSOLIDATED (Park City)—Through error in Park City shipments for week ended Sept. 18, company's output was given as 110,200 lb. instead of 634,000 lb. From 40 to 60 tons first-class ore being mined and shipped daily.

DALY (Park City)—Arrangements made with Mines Operating Co. for testing low-grade ore. Low-grade silver ores of Daly are similar to Ontario stope fillings, being treated successfully at Mines Operating Co.'s mill. Thought much of Daly stope fillings can be treated.

SILVER KING COALITION (Park City)—Work being done on 200 level of new shaft at Silver Hill station. There is a good showing and more men will be worked here as soon as possible. Preparations being made to sink central shaft below 1300 level. When 1600 level is reached drifting will be done for extension of known orebodies.

THOMPSON-QUINCY (Park City)—Operations resumed Sept. 23. Shipment of ore already broken in the mine will soon be made. Air, etc., is obtained from Daly West, and when this company's mill and power connections are completed work at Thompson-Quincy will be facilitated. Milling ore broken or in sight may be treated at Daly West mill.

VIRGINIA

VIRGINIA SMELTING CO. (Norfolk)—Plant being operated by Norfolk Smelting Co. Inc., in which it is understood Beer, Sondheimer & Co. is interested. Blast furnace started Sept. 14, after being shut down two months; 150 men are employed. Dwight-Lloyd sintering machine has been working some time on zinc-retort residues, pyrite residues from acid works and fine Cuban copper ore. Puts out from 75 to 100 tons daily, product being smelted with other copper ore in blast furnace; 300 tons in all is smelted daily, with output of about 60 tons of matte. Copper leaching plant being erected to recover copper from acid works residues, which will afterward be sintered and used in iron blast-furnaces. Two bessemer converters and additional Dwight-Lloyd machine to be added to smelting plant; modern sampling mill to be built.

CANADA

Manitoba

NEW STRIKES AT GOLD LAKE in Rice Lake district have induced another rush of prospectors. First production brought to Winnipeg, gold brick worth $260 from treatment of 1½ tons of ore. Stated this represents only 60% of gold content of ore, remainder being on plates of mill and awaiting cyanide treatment. Property is owned by Independence Mining Co., which is arranging to install five-stamp mill complete with concentrator and cyanide plant. In meantime will ship high-grade ore to Montana for milling.

Ontario

DOMINION STEEL has deferred dividend on preferred shares.

NOVA SCOTIA STEEL COMPANY has received large order for steel shells from government.

LAKE SUPERIOR CORPORATION has decided not to pay interest on the income bonds which falls due Oct. 1. Directors state that while business has been maintained and earnings compare favorably with those of previous year, outlook is decidedly uncertain.

SCHUMACHER (Porcupine)—Practically all miners discharged.

CANADIAN EXPLORATION (Sudbury)—Now producing gold bullion to value of approximately $22,000 per month.

COBALT LAKE, it is officially stated, will be lowered about 6½ ft. this year but will not be pumped out until spring.

HOLLINGER (Porcupine)—First unit of new power plant in commission. Practically all development on Acme stopped as there is sufficient ore developed for proposed 20 stamps.

JUPITER (Porcupine)—Option to McKinley-Darragh extended until October to permit of sinking to 500-ft. level. Development at 400 ft. not so satisfactory as expected.

VIPOND (Porcupine)—Financial reorganization plan adopted last May has fallen through, but property was financed and put on operating basis on guarantee by Henry H. Ward, president of the company.

MEXICO

General Conditions

R. M. RAYMOND, managing director of Exploration Co., Ltd., of London, reported, while in San Francisco recently, that El Oro Mining & Railway was preparing to resume operations on an extensive scale. Supplies of cyanide ordered months ago arrived in Mexico while operations were suspended, and consequently company now has sufficient for long period. Understood some of other important mining concerns of Mexico are similarly fortunate in respect to cyanide. Santa Rosa Mining & Milling Co., of state of Zacatecas, controlled by Exploration Co., will not resume operations at once. Reports from state of Chihuahua are that mining, milling and smelting operations are at present handicapped by labor scarcity. Recent recruiting for army of Gen. Villa extensively affected the labor supply, already depleted, but is expected that as result of curtailment of operations at copper camps in United States many Mexican laborers will return to northern Mexico. Chihuahua plant of A. S. & R. operating two furnaces. In Jalisco, Amparo and Cinco Minas companies doing some work, and work probably will be resumed soon at El Favor, Mololoa, Casados and Espada properties. Much work will be soon in progress in Pachuca and Guanajuato districts.

The Market Report

METAL MARKETS

NEW YORK—Sept. 30

Dullness and pessimism have been the characteristics of the markets for copper, lead and zinc. In tin there has been a little more doing.

Copper, Tin, Lead and Zinc

Copper—It is feared that the closure of the Dutch outlet for copper will necessitate a further restriction of production if the existing situation is to be preserved. During the last week domestic manufacturers have wanted to order but very little copper. On the other hand the producers have continued to refrain from making any real effort to sell. Nobody knows what the market would be if any opportunity of disposing of a big quantity of copper should present itself. Some scattered transactions are reported at 11¾@12c., regular terms. At the end of the week it is said that copper is to be had at 11¾c., delivered in Connecticut, less ½% commission.

Base price of copper sheets is 17½c. per lb. for hot rolled and 18½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 13¾@14c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 2151 long tons. Our special correspondent gives the exports from Baltimore at 1346 tons copper.

Tin—Business in future deliveries was done this week. Some spot tin was pressed for sale but not much business was done.

Lead—On Sept. 24 the A. S. & R. Co. reduced its price to 3.75c., New York, thus coming more nearly into step with the open market at St. Louis, which had previously stood at a price whereof the New York parity was 3.80c. The cut may have been for the purpose of curtailing ore production, many of the mining companies having failed to read the signs of the times. Anyway it has apparently been futile in stimulating a buying movement, the market having been conspicuously dull right through the week and during the last few days there has been further shading of prices by independents. A little domestic lead is reported sold for export.

Spelter—Certain producers having stolen a march on their competitors and disposed of a round tonnage at 5c., about all came down to that figure, but found that the demand had been filled and that it would be necessary to go lower to arouse further interest. At 4⅞c. a moderate business was done on Monday and Tuesday. On Wednesday spelter was offered at 4.80@4.85c. This is getting down to about the present parity of London, where spelter is offered at £24, which one exporting house reckoned as equivalent to about 4.80c., St. Louis. No export business in prime western spelter was done during the week, but there was a continued demand for high-grade spelter, 99½% Zn and upward, and some sales of that sort were made.

DAILY PRICES OF METALS

NEW YORK

Aug. Sept.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
24	4.9525	53	*	31¼	3.75	3.60	5.05 @5.15	4.90 @5.00
25	4.9635	53	*	31	3.75	3.60	5.05 @5.15	4.90 @5.00
26	4.9725	53⅛	*	31	3.75	3.60	5.00 @5.10	4.85 @4.95
28	4.9900	52⅝	*	30¾	3.70 @3.75	3.55 @3.60	5.00 @5.05	4.85 @4.90
29	4.9925	53⅜	*	30¾	3.70 @3.75	3.55 @3.60	5.00 @5.05	4.85 @4.90
30	4.9775	52¾	*	30¾	3.70 @3.75	3.55 @3.60	4.95 @5.00	4.80 @4.85

*No quotations

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

Other Metals

Aluminum—The market remains quiet and rather dull. Quotations are rather nominal and lower, 18.50@19c. per lb. being named for No. 1 ingots, New York.

Antimony—The market remains dull, with small sales, and prices are rather nominal. Ordinary brands—Chinese, Hungarian, etc.—are quoted at 8½@9½c. per lb. For Cookson's, 10½@11c. is asked. For other special brands there is no sale. There are fair stocks on hand at present, but no supplies are coming in except a little from China.

Quicksilver—The market is quieter than it was. Prices are easier, but are firm at the lower quotation, which is $65 per flask of 75 lb., New York. High prices are expected as long as the war continues. The demand is very large and supplies are cut off to some extent.

Minor Metals—Quotations for **Bismuth** are $2.85@3 per lb. —**Magnesium,** $1.50 per lb., New York.—**Selenium,** $3@3.25 per lb. for lots of 100 lb. or over, $5 per lb. for small quantities.

Nickel—Shot, blocks or plaquettes are 40@45c. per lb. Electrolytic is 5c. per lb. higher.

Foreign Trade of Great Britain in Metals other than iron and steel six months ended June 30, in long tons:

	Imports		Exports	
Metals:	1913	1914	1913	1914
Copper	68,023	85,321	35,677	32,782
Tin	23,417	24,013	22,051	22,214
Lead	104,779	110,104	31,846	29,227
Zinc	73,019	65,266	4,758	5,673
Quicksilver	1,334	1,178	591	401
Minor metals	4,300	4,822	14,745	13,732
Ores, etc.				
Tin ore and concentrates	17,262	19,799	..	..
Pyrites	423,187	419,493		

Copper includes contents of ore and matte imported. Exports include reëxports of foreign material.

German Foreign Trade in Ores half-year ended June 30, in metric tons:

	Imports		Exports	
	1913	1914	1913	1914
Gold and silver	987	781	1	1
Copper	14,022	15,303	14,400	7,122
Tin	9,170	9,219		
Lead	70,087	83,818	2,437	2,414
Zinc	157,157	153,866	18,040	22,826
Nickel	6,643	13,012		
Wolfram	2,105	2,235	110	192
Chrome ore	7,731	6,327	284	1,292
Pyrites	508,957	570,805	16,966	13,752

Imports of slags and slag products were 655,245 tons in in 1913 and 558,872 in 1914. Exports were 86,395 tons in 1913 and 95,620 tons this year.

German Foreign Trade in Metals other than iron and steel is reported as follows for the half-year ended June 30, in metric tons

	Imports		Exports	
	1913	1914	1913	1914
Copper	127,700	131,[illegible]	[illegible]	[illegible]
Tin	7,[illegible]	7,[illegible]	[illegible]	[illegible]
Lead	41,773	[illegible]	[illegible]	[illegible]
Zinc	[illegible],213	[illegible]	[illegible]	[illegible]
Nickel	1,181	[illegible]	[illegible]	[illegible]
Al[illegible]	[illegible]	7,[illegible]	[illegible]	[illegible]
Mi[illegible]	958	1,276	[illegible]	[illegible]

M[illegible] includes the minor metals and [illegible] [illegible] alloys and manufactures of the [illegible]

Gold, Silver and Platinum

Gold—Arrangements are nearly completed for the pool of $100,000,000 gold to be raised by the banks, chiefly for the purpose of regulating exchange.

Imports of gold in Great Britain eight months ended Aug. 31 were £47,631,335; exports, £29,325,256; excess of imports, £18,306,079, against £15,566,485 last year.

Platinum—There is no excitement in the market, though no increase of supplies is in sight, and the future is uncertain. Dealers still hold at about $50 per oz. for refined platinum and $57.50 for hard metal.

The latest report received from our Russian correspondent says that the market is dull and inactive. No demand can be noted either from abroad or on the internal markets. Russian export trade owing to political events is in course of stopping. Work in the platinum mines is sensibly shortened, as many miners are called out to the army. The prices are only nominal, no business being reported. The quotation at Ekaterinburg is 9.50 rubles per zolotnik—equal to $35.72 per oz.—for crude metal, 83% platinum; in St. Petersburg, no quotations.

Silver—The market is dull, at present. The English mint is the only buyer. No outside business is possible. Continental demand is expected when exports can be made.

London quotations for silver were on Sept. 24, 24¼d.; Sept. 25, 24¼d.; Sept. 26, 24¼d.; Sept. 28, 24d.; Sept. 29, 24¼d.; Sept. 30, 24d., per oz. sterlinz.

Exports of silver from London to the East, Jan. 1 to Sept. 17, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£5,148,500	£4,466,000	D. £682,500
China	592,000	42,000	D. 550,000
Total	£5,740,500	£4,508,000	D. £1,232,500

Since July 30, this year, shipments to India have been only £114,500; to China, none.

Imports of silver into Great Britain eight months ended Aug 31 were valued at £7,709,287; exports, £8,972,798; excess of exports, £736,489.

Gold and Silver Movement in the United States eight months ended Aug. 31, as reported by the Bureau of Commerce:

	Gold		Silver	
	1913	1914	1913	1914
Exports	$73,583,242	$135,769,576	$43,166,040	$33,090,463
Imports	41,572,860	37,169,961	24,331,964	15,992,663
Excess, exports	$32,010,382	$98,599,615	$18,834,076	$17,097,800

Imports of gold in August were $3,034,824; exports, $18,125.617; leaving $15,090,793 as the excess of exports.

Zinc and Lead Ore Markets

JOPLIN, MO.—Sept. 26

The high price of blende is $44, the assay base $39@42; metal base, $39@40 per ton of 60% zinc; calamine base, $23@24 per ton of 40% zinc; average all grades of zinc, $39.62 per ton. The high price of lead is $48.20, the base $46 per ton of 80% metal content; the average of all grades is $46.62 per ton.

SHIPMENTS WEEK ENDED SEPT. 26

	Blende	Calamine	Lead	Value
Totals this week	10,774,680	628,780	1,673,290	$264,710
Totals this year	391,505,780	28,972,600	67,314,740	$9,711,970

Blende value, the week, $217,620; nine months, $7,778,410.

Calamine value, the week, $8080; nine months, $338,080.

Lead value, the week, $39,010; nine months, $1,595,480.

Letter of Sept. 19, delayed in trasmission, shows prices of blende $47 high, $41@44 assay base, $40@41 metal base; calamine, $25@26; average all grades zinc ore, $42.20; lead ore, $46.40; base, $46. Average all ores, $45.90. Shipments, 9,052,790 lb. blende, 362,630 lb. calamine, 1,962,210 lb. lead ore. ore.

PLATTEVILLE, WIS.—Sept. 26

The base price paid this week for 60% zinc ore was $40@42 per ton. The base price paid for 80% lead ore was $44 per ton.

SHIPMENTS WEEK ENDED SEPT 26

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	3,399,570	60,000	157,860
Year	117,051,760	3,922,500	25,652,630

Shipped during week to separating plants, 4,058,530 lb. zinc ore.

Letter of Sept 19, delayed in transmission, shows price of zinc ore, $42@43; lead ore, $44@45 per ton. Shipments, 3,502,610 lb. zinc ore and 254,060 lb. sulphur ore Deliveries to separating plants, 2,953,550 lb zinc ore

IRON TRADE REVIEW

NEW YORK—Sept. 30

The month ends with little change in the markets. Business is largely at a standstill as far as new orders are concerned, and specifications on contracts are not increasing.

The reasons are found chiefly in the financial position, which remains unsatisfactory. Foreign orders come slowly, and nothing definite has yet been done about the large English inquiries for billets and sheet bars. Some sales of wire and of wire rods are noted.

PITTSBURGH—Sept. 29

The domestic market has grown still quieter, but the export market has undergone some improvement. The export branch of the Steel Corporation last week entered definite orders for 48,000 tons of steel, and although much of this was business closed some time ago, only final details being left to be arranged, the showing is a very satisfactory one, representing more tonnage than the average rate just before the war. Canadian business was especially prominent, while South American business made a very good showing.

Actual bookings of shipping orders in the steel trade do not promise to average more than about 30% of capacity during the next week or two, while shipments are at about 50% of capacity and are likely to decrease, there being little accumulation of business on books. In some products specifications are heavier at the moment than a fortnight ago, or than they are likely to be in the next two weeks, because they are filed against contracts expiring with this month, at lower prices than in contracts these buyers have for fourth quarter. In many cases, however, buyers have contracts for fourth quarter at as low levels as for third quarter. The wire mills have advised holders of contracts based on $1.50 for nails that Sept. 30 is the last day on which they can specify. Most of these contracts had already been closed out, and the trade will now be on the basis of $1.55 contracts. The openly quoted market is $1.60, but hardly any business is done except on old contracts.

Plates have grown still weaker and many mills will sell at 1.15c., Pittsburgh, though some of the large mills still adhere to 1.20c. In bars there is likewise business done at 1.15c., though not as large a proportion as in plates. Structural shapes are still held at 1.20c., but there is not enough new business going to test the market.

Pig Iron—The market continues absolutely stagnant. Even with the considerable decrease in merchant furnace production that occurred two or three weeks ago shipments are hardly up to production and it is not improbable that production will have to be curtailed further. Of new buying there is hardly any. Prices apparently are well maintained at old levels: Bessemer, $14; basic, $13; malleable and No. 2 foundry, $13@13.25; gray forge, $12.50@12.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The English makers have reduced their price on ferromanganese for forward delivery to $75, Baltimore, and there is resale material also offered at this price. Russia has removed the embargo on ferromanganese export shipments. Shipments are fairly good on old contracts with the English producers, and with the present reduced steel production, and prospects of further reductions the last thing that worries steel producers is the ferromanganese supply.

Imports and Exports of Iron Ore in the United States six months ended June 30, long tons:

	1913	1914	Changes
Imports	1,136,153	709,046	D. 427,107
Exports	320,535	282,903	D. 37,632

Imports of manganese ore for the six months were 190,867 tons in 1913 and 135,089 in 1914; decrease, 55,778 tons this year.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 243,695 short tons; shipments, 256,537 tons. Production of Greensburg and Upper Connellsville districts, 37,354 tons.

Coal and coke tonnage of Pennsylvania R.R. lines east of Pittsburgh and Erie eight months ended Aug. 31, short tons:

	1913	1914	Changes
Anthracite	6,851,626	7,153,407	I. 301,781
Bituminous	33,396,286	31,821,349	D. 1,574,937
Coke	9,731,462	6,867,676	D. 2,863,786
Total	49,979,374	45,842,432	D. 4,136,942

The total decrease this year was 8.3%, the heaviest loss being in the coke tonnage.

Mining Companies—United States

Name of Company and Situation		Shares		Dividends		
		Issued	Par	Total	Latest	Amt.
Acacia, g.	Colo.	1,438,989	$1	$122,004	Jan '11	$0.01
Adams, s.l.c.	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c.	Mich.	50,000	25	2,230,000	July '14	2.00
Alaska Mexican, g.	Alas.	180,000	5	3,381,381	Aug. '14	0.20
Alaska Treadwell, g.	Alas.	200,000	25	14,485,000	Aug. '14	1.00
Alaska United, g.	Alas.	180,200	5	1,702,880	Aug. '14	0.20
Am. Zinc, Lead & Sm.	U. S.	168,640	25	983,320	Jan. '14	0.50
Anaconda, c.	Mont.	4,992,500	25	91,413,750	July '14	0.75
Argonaut, g.	Calif.	200,000	5	1,500,000	July '13	1.50
Arizona Copper, pf.	Ariz.	1,426,120	1.20	1,950,242	Apr. '14	
Arizona Copper, com.	Ariz.	1,519,896	1.20	16,815,497	July '14	0.30
Bagdad-Chase, g., pf.	Calif.	81,819	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	100,000	25	7,950,000	Dec. '13	2.00
Bingham N. H., c.	Utah	228,690	5	385,695	Apr. '14	0.10
Bonanza Dev., g.	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	Calif.	200,000	1	856,000	Aug. '14	0.05
Bunker Hill & Sul., l.s.	Ida.	327,000	10	15,383,250	Aug. '14	0.25
Butte-Alex Scott, c.	Mont.	74,000	10	148,000	Oct. '13	0.50
Butte & Ballaklava, c.	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	616,758	10	20,632,831	June '14	1.25
Calumet & Hecla, c.	Mich.	100,000	25	124,250,000	June '14	5.00
Camp Bird, g.s.	Colo.	1,100,051	5	9,861,942	July '14	0.24
Centen'l-Eur., l.s.g.c.	Utah	100,000	5	4,050,000	Apr. '14	1.50
Center Creek, l.z.	Mo.	100,000	10	505,000	July '14	0.05
Champion, c.	Mich.	100,000	25	8,400,000	Oct. '13	1.00
Chief Consolidated, s.g.l.	Utah	876,764	1	262,969	Aug. '14	0.05
Chino, c.	New Mex.	864,820	5	5,135,370	June '14	0.75
Cliff, g.	Utah	300,000	1	90,000	Jan. '13	0.10
Cliff, g.	Alas.	100,000	1	210,000	Oct. '13	0.01
Colo. Gold Dredging	Colo.	100,000	10	550,000	Jan. '14	2.50
Colorado, l.s.g.	Utah	1,000,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s.	Utah	285,540	5	226,832	Oct. '07	0.20
Commercial Gold	Ore.	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercur, g.	Utah	1,000,000	1	3,445,313	July '13	0.03
Continental, z.l.	Mo.	22,000	25	319,000	July '14	0.50
Copper Range Con., c.	Mich.	393,692	100	13,986,746	Oct. '13	0.75
Daly Judge, s.l.	Utah	300,000	1	810,000	July '14	0.15
Daly West, s.l.	Utah	180,000	20	6,606,000	Jan. '13	0.15
Doctor Jackpot, g.	Colo.	3,000,000	0.10	45,000	Mar. '11	0.00½
Doe Run, l.	Mo.	65,783	100	3,550,969	Dec. '13	0.76
Eagle & Blue Bell, g.s.l.	Utah	893,146	1	267,943	Aug. '14	0.05
Elkton Con., g.	Colo.	2,500,000	1	3,379,460	May '14	0.02
El Paso, g.	Colo.	490,000	5	1,757,545	Aug. '14	0.10
Ernestine, g.s.	N. M.	300,000	5	165,000	Mar '13	0.05
Fed. M. & S., com.	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho	120,000	100	8,747,226	June '14	1.50
Florence, g.	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	244,000	Aug. '14	0.02
Frontier, z.	Wis.	1,250	100	146,202	Nov. '13	2.00
Gemini-Key'ne, l.g.s.	Utah	5,000	100	2,280,000	June '14	10.00
Gold Chain, g.	Utah	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	100,000	Dec. '12	0.00½
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	2,955,000	Aug. '14	0.03
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	Nev.	3,558,367	10	27,398,214	Apr. '14	0.30
Grand Central, g.	Utah	500,000	1	1,595,750	May '14	0.05
Granite, g.	Colo.	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g.	Cal.	900,000	1	971,000	Dec. '13	0.01
Hecla, l.s.	Idaho	1,000,000	0.25	3,110,000	Aug. '14	0.02
Hercules, l.s.	Idaho	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	S. D.	218,100	100	35,577,994	Aug. '14	0.65
Horn Silver, l.s.z.	Utah	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	216,832	July '13	0.00½
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	2,070,000	Aug. '14	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,900,000	Apr. '14	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	175,000	Aug. '12	0.01
Kendall, g.	Mont.	500,000	5	1,505,000	July '14	0.06
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Piquette, z.l.	Wis.	20,000	1	187,500	Apr. '13	0.50
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0.00½
Liberty Bell, g.	Colo.	133,552	5	1,559,179	Sept. '13	....
Little Bell, l.s.	Utah	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	Nev.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g.	Colo.	1,309,252	1	1,169,308	July '14	0.02
May Day, g.s.l.	Utah	800,000	0.25	132,000	Feb. '13	0.03
Mexican, g.s.	Nev.	201,600	2.50	161,910	June '14	0.75
Miami, c.	Ariz.	746,759	5	3,732,249	Aug. '14	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk, c.	Mich.	100,000	25	3,275,000	Aug. '14	2.00
Monarch-Mad'a, g.s.l.	Colo.	1,000,000	1	10,000	May '11	0.01
Montana-Tonop., s.g.	Nev.	921,865	1	530,000	Dec. '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.41
National, g.	Nev.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Nev.	1,999,524	5	16,226,911	June '14	0.37½
New Century, z.l.	Mo.	330,000	1	237,600	[illegible] '09	0.01
New Idria, q.	Cal.	100,000	5	1,740,000	Apr. '14	0.10
North Butte, c.	Mont.	110,000	15	11,890,000	July '14	0.50
North Star, g.	Cal.	250,000	10	4,262,040	June '11	0.30
Old Domin'n, M. & Sm.	Ariz.	162,000	25	3,969,000	July '14	1.25
Ophir, s.g.	Nev.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging	Cal.	700,000	5	1,153,086	Aug. '14	0.12
Osceola, c.	Mich.	96,150	25	12,179,675	July '14	1.00
Parrot, c.	Mont.	229,850	10	7,393,562	Aug. '14	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,122	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g.	Alas.	5,000,000	1	2,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Ida.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g.	Nev.	2,790,000	1	771,200	July '14	0.02
Portland, g.	Colo.	3,000,000	1	9,697,080	July '14	0.02
Quilp	Wash.	1,500,000	1	67,500	Feb. '12	0.01
Quincy, c.	Mich.	110,000	25	20,952,500	Dec. '1[illegible]	1.25
Ray, c.	Ariz.	1,454,304	10	2,720,832	June '14	0.37½

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares		Dividends		
		Issued	Par	Total	Latest	Amt.
Republic, g.	Wash.	1,000,000	1	85,000	Dec. '10	0.01½
Rochester, l.z.	Mo.	4,900	100	188,396	Dec. '10	0.50
Round Mountain, g.	Nev.	866,426	$1	$363,365	Aug. '13	$0.04
Seven Troughs Coal., g.	Nev.	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l.	Mo.	1,472,252	10	9,279,180	June '14	0.05
Shannon, c.	Ariz.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	2,100,000	July '14	0.50
Silver King Coal., l.s.	Utah	1,250,000	5	2,534,085	Apr. '14	0.15
Sioux Con., s.l.g.	Utah	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal.	1,000,000	5	325,000	Aug. '14	0.02½
Snowstorm, c.g.	Ida.	1,500,000	1	1,192,103	Oct. '13	0.02
South Eureka, g.	Calif.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	Cal.	178,394	10	5,274,407	Nov. '13	0.25
Stratton's Ind., g.	Colo.	1,000,000	0.60	546,750	May '14	0.06
Success, z.	Ida.	1,500,000	1	925,000	May '13	0.02
Superior & Pitts., c.	Ariz.	1,499,792	10	7,179,028	June '14	0.38
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	4,156,250	June '14	0.75
Tomboy, g.s.	Colo.	310,000	4.85	3,482,905	June '14	0.48
Tom Reed, g.	Ariz.	909,555	1	2,015,372	Aug. '14	0.06
Tonopah Belm't, s.g.	Nev.	1,500,000	1	6,508,000	July '14	0.25
Tonopah Ext., g.s.	Nev.	943,433	1	566,060	July '14	0.07½
Tonopah of Nev., s.g.	Nev.	1,000,000	1	11,850,000	July '14	0.25
Tri-Mountain, c.	Mich.	100,000	25	1,450,000	Dec. '13	2.00
Tuolumne, c.	Mont.	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l.	Utah	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.) g.	Colo.	4,000,100	1	110,135	Jan. '1[illegible]	[illegible]
United Globe, c.	Ariz.	23,000	10	1,886,000	July '14	4.00
United Verde, c.	Ariz.	300,000	10	34,822,000	Aug. '14	0.75
Utah, s.l.	Utah	100,000	10	281,860	Dec. '10	0.02
Utah, c.	Utah	1,624,290	10	23,371,079	June '14	0.75
Utah Con., c.	Utah	300,000	5	8,400,000	July '14	0.50
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,947,500	July '14	0.03
Wasp No. 2, g.	S. D.	500,000	1	451,965	Aug. '14	0.01
Wellington Mines, g.	Colo.	10,000,000	1	400,000	July '14	0.00½
Wolverine, c.	Mich.	60,000	25	7,740,000	Apr. '13	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.00½
Yak, s.l.	Colo.	1,000,000	1	1,757,685	Mar. '14	0.02
Yankee Con., g.s.	Utah	1,000,000	1	167,500	Jan. '13	0.01
Yellow Aster, g.	Cal.	100,000	10	1,154,789	July '13	0.03
Yellow Pine, l.z.s.	Nev.	1,000,000	1	403,008	June '14	0.02
Yukon Gold, g.	Alas.	3,500,000	5	6,037,500	June '14	0.07

Iron, Industrial and Holding Companies

Name of Company and Situation		Issued	Par	Total	Latest	Amt.
Amalgamated, c.	Mont.	1,538,879	100	$91,380,147	Aug. '14	$1.50
Am. Sm. & Ref., com.	U. S.	500,000	100	26,353,333	June '14	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	48,208,333	June '14	1.75
Am. Smelters, pf. A	U. S.	170,000	100	8,895,000	July '14	1.50
Am. Smelters, pf. B	U. S.	300,000	100	13,462,000	July '14	1.25
Greene Cananea	U. S.	486,302	100	4,363,646	June '14	1.00
Guggenheim Expl.	U. S.	380,315	25	20,393,701	July '14	0.87
Inter'l Nickel, com.	U. S.	115,826	100	12,950,172	June '14	2.50
Inter'l Nickel, pfd.	U. S.	89,126	100	8,091,113	Aug. '14	1.50
National Lead, com.	N. Y.	206,554	100	8,106,055	June '14	0.75
National Lead, pf.	N. Y.	243,676	100	28,903,779	June '14	1.75
Old Dominion, c.	Ariz.	293,245	25	5,633,697	July '14	1.00
Phelps, Dodge & Co.	U. S.	450,000	100	33,971,527	June '14	4.00
U. S. Steel Corp., com.	U. S.	5,083,025	100	215,465,145	June '14	1.25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	363,988,417	Aug. '14	1.75
U. S. S., R. & M., com.	U. S.-Mex.	486,348	50	6,362,181	July '14	0.75
U. S. S., R. & M., pf.	U. S.-Mex.	351,114	50	14,241,857	July '14	0.87

Canadian, Mexican and Central American Companies

Name of Company and Situation		Issued	Par	Total	Latest	Amt.
Ajuchitlan, g.s.	Mex.	50,000	$5	$212,500	Oct. '12	$0.2[illegible]
Amparo, g.s.	Mex.	2,000,000	1	1,400,881	Aug. '14	[illegible]
B. C. Copper	B. C.	591,709	5	615,198	Jan. '13	0.15
Beaver Con., s.	Ont.	1,936,490	1	[illegible]	[illegible] '14	[illegible]
Buffalo, s.	Ont.	1,000,000	1	2,757,000	[illegible] '11	0.03
Canadian Goldfields, g.	B. C.	600,000	0.10	237,000	[illegible] '14	0.00½
Chontalpan, g.s.l.z.	Mex.	7,000	25	63,000	May '14	0.75
Cobalt Townsite, s.	Ont.	1,000,000	1	1,180,000	May '14	0.48
Coniagas, s.	Ont.	800,000	5	6,100,000	May '14	0.15
Con. M. & S. Co. of Can.	B. C.	58,052	100	[illegible]	July '14	2.00
Crown Reserve, s.	Ont.	1,768,811	1	5,810,[illegible]97	Aug. '14	0.02
Crow's Nest Pass C. Co.	B. C.	248,500	25	2,182,[illegible]	Mar. '11	[illegible]
Dos Estrellas, g.s.	Mex.	300,000	0.50	9,885,000	Sept. '13	1.25
El Oro, g.s.	Mex.	1,147,500	4.85	[illegible]	July '13	0.24
Esperanza, s.g.	Mex.	455,000	4.85	11,996,303	Jan. '14	0.24
Granby, s.l.c.	B. C.	148,[illegible]	100	7,533,357	June '14	1.50
Greene [illegible]	Mex.	1,000,000	10	9,044,100	May '14	0.50
Guanajuato D., pf., s.	Mex.	10,000	100	[illegible]	[illegible] '11	[illegible]
Hedley Gold	B. C.	120,000	10	1,353,520	June '14	1.50
Hollinger, g.	Ont.	600,000	5	2,160,000	Aug. '14	0.15
Kerr Lake, s.	Ont.	600,000	5	5,220,000	June '14	0.25
La Rose Con., s.	Ont.	1,498,627	5	4,787,[illegible]	July '14	0.25
Le Roi No. 2, g.	B. C.	120,000	24.30	1,472,[illegible]	Jan. '1[illegible]	[illegible]
Lucky Tiger Com., g.	Mex.	715,337	10	2,506,134	Aug. '14	[illegible]
McK.-Dar.-Sav., s.	Ont.	2,247,692	1	4,270,[illegible]	July '14	[illegible]
Mines Co. of Am. (new)	Mex.	1,700,000	10	*1,215,000	July '13	0.12½
N. Y. & Hond. Ros., g.	C. A.	150,000	10	3,410,000	July '14	[illegible]
Nipissing, s.	Ont.	[illegible]	5	12,000,000	July '14	0.25
Peñoles, s.l.g.	Mex.	[illegible]	25	6,361,[illegible]	June '13	[illegible]
Peregrina M. & M., pf.	Mex.	10,000	100	[illegible]	Sept. '1[illegible]	[illegible]
Pinguico, pf., s.	Mex.	20,000	100	160,000	Apr. '12	[illegible]
Right of Way Mines	Ont.	1,685,500	1	202,240	Dec. '11	[illegible]
Rio Plata, s.	Mex.	574,518	5	347,745	Feb. '1[illegible]	[illegible]
San Rafael, g.s.	Mex.	2,400	25	1,441,18[illegible]	Oct. '1[illegible]	[illegible]
San Toy, g.s.	Mex.	5,750,000	1	[illegible]	July '1[illegible]	[illegible]
Sorpresa, [illegible]	Mex.	19,200	20	3,979,240	Jan. '11	[illegible]
Stand'd Silver-Lead	B. C.	2,000,000	1	1,157,[illegible]	Aug. '1[illegible]	[illegible]
Timiskaming, s.	Ont.	[illegible]	1	[illegible]	Apr. '1[illegible]	[illegible]
Tem. & Hud. Bay, s.	Ont.	7,761	1	[illegible]	[illegible]	[illegible]
Tretheway, s.	Ont.	1,000,000	1	[illegible]	[illegible]	[illegible]
Wettlaufer [illegible]	Ont.	[illegible]	1	[illegible]	[illegible]	[illegible]

*Previous [illegible] $5,2[illegible]8,881

†Previous [illegible] $421,[illegible]

Fuel Exports of Great Britain eight months ended Aug. 31, in long tons:

	1913	1914	Changes
Coal	48,320,608	44,257,161	D. 4,063,447
Coke	712,698	694,061	D. 18,637
Briquettes	1,363,324	1,324,937	D. 38,387
Steamer coal	13,720,560	13,249,027	D. 471,533
Total	64,117,190	59,525,186	D. 4,592,004

The decrease shown this year was mainly in the month of August, when there was a loss of 2,110,052 tons in exports and of 602,470 tons in coal sent abroad for the use of steamships in foreign trade.

SAULT STE. MARIE CANALS

The total freight passing the Sault Ste. Marie Canals in July was 8,830,256 short tons. For the season to Aug. 1, the total tonnage was: Eastbound, 17,939,685; westbound, 7,741,288; total, 25,680,973 net tons, a decrease of 11,992,514 tons from last year. The total number of vessel passages was 8872, giving an average cargo of 2895 tons. Mineral freights included in the totals were, in short tons, except salt, which is in barrels:

	1913	1914	Changes
Coal	9,412,435	7,040,372	D. 2,372,063
Iron ore	23,344,042	14,739,927	D. 8,604,115
Pig and m'f'd iron	198,762	142,116	D. 56,646
Copper	46,967	30,087	D. 16,880
Building stone	5,973	......	D. 5,973
Salt, bbl.	335,136	403,331	I. 68,195

Iron ore was 57.4% and coal 37.4% of the total freight this year. Of the coal reported this year, 1,133,532 tons were anthracite and 5,906,840 tons bituminous.

CHEMICALS

NEW YORK—Sept. 30

The general market is still unsettled and rather uneasy, and business is rather limited.

Arsenic—The market is slow and quiet. Prices are nominally unchanged, at $4.50 per 100 lb. for both spot and futures.

Copper Sulphate—Business continues fair. Prices are steady at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market has been dull for the past week. Quotations are rather nominal at 1.95c. per lb. for all positions.

Potash Salts—A dispatch from U. S. Consul C. B. Hunt, at Barcelona, says: "Potash deposits over 250,000 acres discovered three years ago, near Barcelona, owned by Rene Macavi, Cours Victor Hugo, 80, Bordeaux, France. Product not yet commercially available. Work on property interrupted by war. Under most favorable circumstances, export not possible for 10 months."

Assessments

Company	Delinq.	Sale	Amt.
Best & Belcher, Nev. (post.)	Sept. 25	Oct. 16	$0.05
Black Bear, Ida. (post.)	Oct. 1	Nov. 1	0.01
Black Traveler, Ida.	Sept. 22	Oct. 24	0.005
Bullwhacker, Mont.		....	0.15
Carney Copper, Ida	Sept. 21	Oct. 21	0.00225
Cedar Creek, Ida.	Sept. 10	Oct. 10	0.003
Chalona, Nev.	Oct. 3	Oct. 21	0.0025
Coeur d'Alene Investment, Ida.	Oct. 10	Nov. 14	0.002
Columbine, Colo.	Sept. 15	Oct. 20	0.02
Comstock Copper, Ida.	Oct. 5	Nov. 5	0.001
Continental, Ida.	Oct. 6	Nov. 5	0.016
Copper Crown, Ida.	Oct. 10	Nov. 14	0.002
Copper King, Ida.	Oct. 1	Nov. 1	0.01
Dalmatia, Ida.	Oct. 1	Nov. 2	0.001
Davis-Daly, Mont.	Oct. 15	.....	0.25
Diamondfield Black Butte, Nev.	Sept. 15	Oct. 15	0.01
East Hercules, Ida.	Oct. 1	Nov. 1	0.001
Emerald, Utah.	Sept. 15	Oct. 10	0.0033
Eureka, Ida	Sept. 25	Oct. 26	0.001
Federal Ely, Nev.	Sept. 21	Oct. 21	0.005
Giant, Ida.	Sept. 21	Oct. 23	0.003
Honolulu, Ida.	Sept. 15	Oct. 12	0.0025
Lead King, Ida	Oct. 1	Oct. 16	0.0005
Lewis & Clark, Ida.	Sept. 15	Nov. 13	0.001
Liquidator, Ida.	Sept. 12	Oct. 12	0.002
Lucky Swede, Ida	Sept. 19	Oct. 19	0.001
Monarch-Pittsburgh, Nev. (post.)	Sept. 14	Oct. 19	0.01
Nabob, Ida.	Oct. 1	Nov. 2	0.005
National Copper, Ida.	Oct. 5	Nov. 5	0.03
Orange-Manhattan, Nev.	Sept. 12	Oct. 10	0.01
Overman, Nev.	Oct. 8	Oct. 29	0.05
Pacific, Utah.	Oct. 5	Oct. 21	0.0025
Reindeer-Queen, Ida	Sept. 21	Oct. 21	0.002
Rescue Eula, Nev.	Sept. 10	Oct. 15	0.01
Royal Mining, Ida.	Sept. 23	Oct. 19	0.0015
Silver Pick, Nev.	Sept. 14	Oct. 19	0.01
Snowshoe, Ida.	Sept. 19	Oct. 19	0.005
Sonora, Ida.	Sept. 28	Oct. 27	0.002
Sunset, Nev.	Sept. 21	Oct. 26	0.01
Tar Baby, Utah.	Sept. 3	Oct. 5	0.005
Tarbox, Ida	Sept. 26	Oct. 26	0.0025
Tonopah Gipsy Queen, Nev.	Sept. 2	Oct. 17	0.01
Treasure Vault, Ida.	Sept. 15	Oct. 12	0.02
Umatilla, Nev	Sept. 3	Oct. 8	0.01
United Copper, Wash.			0.005
Valentine, Ida	Sept. 12	Oct. 12	0.001

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.642	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26.788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	58.175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25.948
July	60.654	58.721	54.678	27.919	27.074	25.219
August	61.606	59.293	54.344	28.375	27.335	25.979
September	63.078	60.640	53.290	29.088	27.986	24.274
October	63.471	60.793	.....	29.299	28.083	......
November	62.792	58.995	.....	29.012	27.263	......
December	63.365	57.760	....	29.320	26.720	.....
Year	60.835	59.791		28.042	27.576	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50.298	37.779	238.273	171.905
February	48.766	39.830	220.140	181.556
March	46.832	38.038	213.615	173.619
April	49.115	36.154	224.159	163.963
May	49.038	33.360	224.143	150.702
June	44.820	30.577	207.208	138.321
July	40.260	31.707	183.511	142.517
August	41.582	‡	188.731	......
September	42.410	32.675	193.074	....
October	40.462	....	184.837	....
November	39.810	....	180.869	....
December	37.635	....	171.786	....
Av. year	44.252	....	206.279	....

New York in cents per pound; London in pounds sterling per long ton. ‡Not reported.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5.228	25.338	21.413
March	6.078	5.250	5.926	5.100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5.074	5.256	4.924	24.583	21.393
June	5.124	5.000	4.974	4.850	22.143	21.345
July	5.278	4.920	5.128	4.770	20.592	21.568
August	5.658	5.56[illegible]	5.508	5.418	20.706	....
September	5.694	5.380	5.544	5.230	21.148	...
October	5.340	.....	5.188	....	20.614	....
November	5.229	.....	5.083	.....	20.581	...
December	5.156	.....	5.004	.....	21.214	..
Year	5.648	.....	5.504	......	22.746	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16.48[illegible]	14.223	71.741	64.304	77.750	69.488
February	14.971	14.491	65.519	65.259	71.575	70.188
March	14.713	14.131	[illegible]	64.[illegible]76	70.658	69.170
April	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.99[illegible]	[illegible]	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14.190	13.22[illegible]	61.166	60.540	69.446	64.955
August	15.400	‡	69.200	‡	74.[illegible]	‡
September	16.328	‡	73.1[illegible]5	‡	78.6[illegible]4	‡
October	16.337	...	73.38[illegible]		79.250	....
November	15.182	...	68.27[illegible]		73.825	....
December	14.224	..	[illegible]5.22[illegible]		69.583	....
Year	15.269		68.335		73.740	

New York, cents per pound. London, pounds sterling per long ton. ‡Not reported

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4.048	4.175	3.937	1[illegible].550	19.606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3.688	17.[illegible]97	18.225
May	4.342	3.900	4.226	3.80[illegible]	[illegible]	1[illegible].503
June	4.325	3.900	4.190	3.810	20.22[illegible]	19.[illegible]11
July	4.353	3.891	4.223	3.738	20.0[illegible]8	19.051
August	4.621	3.875	4.550	3.715	20.4[illegible]6	......
September	4.698	3.825	4.579	3.658	20.61[illegible]	......
October	4.402	.....	4.253	.....	20.302	......
November	4.293	.	4.146	......	19.334	......
December	4.047		3.929	....	17.798	......
Year	4.370		4.2[illegible]8		18.743	

New York and St. Louis cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14.94	$17.35	$13.2[illegible]	$18.59	$13.99
February	1[illegible].15	15.06	17.22	14.1[illegible]	18.13	14.08
March	1[illegible].15	15.07	16.96	13.94	17.53	14.10
April	17.90	14.90	16.71	13.9[illegible]	16.40	14.13
May	17.68	14.90	15.80	13.9[illegible]	15.40	14.27
June	17.14	14.90	15.40	13.90	15.10	13.96
July	16.31	14.90	15.13	13.90	14.74	13.90
August	16.63	14.90	15.00	13.90	14.88	14.90
September	16.65	14.90	15.04	13.90	14.93	14.03
October	16.60	...	14.61	....	14.80	......
November	1[illegible].03	.	1[illegible].91	...	14.40	....
December	1[illegible].71	...	13.71	.....	14.28	.....
Year	$17.09		$15.57	.	$15.77	.....

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The Engineering and Mining Journal

VOLUME 98 OCTOBER 10, 1914 NUMBER 15

Platinum Ore in Southern Nevada

By Fred A. Hale, Jr.*

SYNOPSIS—Some recent discoveries, four miles east of the California line and 10 miles west of Goodsprings, Nev., are much richer in platinum than earlier finds in Clark County. The ore in the Boss mine occurs in a crushed fault zone in limestone, which also traverses a batholitic intrusion of acid porphyry. The ore so far developed contains from 0.5 to 1 oz. of platinum per ton, a greater amount of gold, some silver, and small amounts of the base metals.

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The presence of platinum and metals of the platinum group in ores from southeastern Nevada was noted by members of the U. S. Geological Survey as early as 1909, the platinum metals occurring with copper, nickel and cobalt in ores from the Key West and Great Eastern mines, near Bunkerville in Clark County. In these properties, the orebodies are associated with pegmatites and very basic intrusions, carrying pyrrhotite and chalcopyrite, the content of platinum metals in the ore varying from 0.1 to 0.2 oz. per ton, so far as data are obtainable.

A deposit of ore, containing the platinum metals in greater quantity and entirely dissimilar in occurrence, has recently been discovered in the western portion of Clark County at the property of the Boss Gold Mining Co. This deposit is 10 miles west of Goodsprings, in the Yellow Pine mining district, and only four miles from the California line. It is easily accessible by team or automobile from Goodsprings, which is connected with the main line of the S. P. L. A. & S. L. R.R. by the narrow-gage railroad of the Yellow Pine Mining Co. at Jean.

Boss Mine Originally Worked For Copper

The property of the Boss Gold Mining Co., formerly known as the Boss mine, was originally explored in the early '90s on account of the copper content of the ore, there having been a large outcrop of copper-carbonate ore at the surface. A leaching plant was constructed at Goodsprings to treat the ore from this and the Columbia mine. The leaching plant proved a failure, and the mine reverted to the original owners, Yount & White, of Goodsprings. Not recognizing the more valuable constituents of the ore, the property was permitted to remain idle until the spring of 1911, when the Boss Gold Mining Co. was organized for its further development.

Boss Mine Where Rich Platinum Ore Has Been Found, 10 Miles West of Goodsprings, Nevada

Upper workings of Boss mine

Boss Hill, showing workings and tramway of Boss Gold Mining Co.

The country rock in the vicinity of the Boss property consists of thick-bedded limestones, probably of upper Mississippian age, dipping about S 60° W at an angle of 10° to 20° from the horizontal. These limestones are cut by a large batholithic intrusion of acid porphyry, which has been identified as a quartz monzonite, showing large phenocrysts of orthoclase feldspar and occasional quartz crystals in a fine-grained ground mass, the whole presenting a facies almost identical with the numerous porphyry intrusions throughout the Yellow Pine district.

The orebodies so far developed occur entirely in limestone, in a crushed fault zone, striking N 30° E. which traverses both limestone and porphyry. A tunnel has been driven into this fault zone from the point where the largest outcrop occurred; at lower levels, two other tunnels have been driven, the first of which, about 30 ft. lower than the upper tunnel, has encountered the main ore zone. The lowest tunnel is being driven at an elevation several hundred feet lower than the upper workings, and has not yet reached the main ore zone.

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*Superintendent, Yellow Pine Mining Co., Goodsprings, Nev.

Ore Richer in Platinum Than First Discoveries

The main of upper tunnel followed the ore for a distance of 200 ft. along its strike, in a northeasterly direction. The ore varies in thickness from 2 to 10 ft., the average being about 6 ft., and in appearance is a brownish granular mass, showing occasional streaks of hard quartzose material. Both walls of the ore are shattered limestone, and along these walls occurs an encasement of malachite, varying in thickness from a few inches to several feet. The main body of the ore zone carries little copper. An average of the ore, sampled at 5-ft. intervals for 200 ft. along the upper tunnel gave the following results: Gold, 1.13 oz. per ton; silver, 5.20 oz.; copper, 0.20%. These samples were not analyzed for metals of the platinum group, but H. K. Riddall, chemist for the Yellow Pine Mining Co., who analyzed the samples, reported that metals of the platinum group were present, this being the first report of the presence of these metals. It has since been learned that this ore contains 0.5 to 1 oz. of platinum per ton.

In June, 1911, a winze was started from the upper tunnel following the ore on its dip, and high-grade ore was encountered within a few feet. The appearance of the ore did not change materially except for the occurrence of small masses of a greenish talc within the vein. Some of these masses were sufficiently large to be mined separately, and two small shipments, aggregating about one ton, were forwarded to the American Smelting & Refining Co. at Murray, Utah. Their settlement analysis was as follows, platinum not being determined or paid for: Gold, 124.79 oz. per ton; silver, 23.9 oz.; lead, 1.05%; copper, 0.65%; insoluble, 73.2%; sulphur, 3.1%; iron, 6.7%.

On the same control sample of this shipment, Ledoux & Co., of New York, report the following analysis for metals of the platinum group: Platinum, 99.08 oz. per ton; palladium, 16 oz; iridium, trace.

The winze has been sunk to a depth of about 35 ft., and drifts driven on the ore in both directions, developing a considerable tonnage of ore. A carload shipment of material from this development, without sorting, returned as follows: Gold, 8.752 oz. per ton; silver, 5.02 oz.; copper, 0.97%; insoluble, 80.7%.

On similar material from this location, Ledoux & Co. report as follows: Gold, 11.55 oz. per ton; platinum, 7.38 oz. Several carloads of material of about this class are now broken in the mine, pending negotiations for the satisfactory disposition of the ore.

Ratio of Platinum to Gold

It has been fully determined that metals of the platinum group are present in all of the ore thus far developed. Ledoux & Co. state as their opinion that the metals are in the free state, "being apparently alloys of gold and platinum metals." It would also appear from numerous assays that the platinum metals bear a fixed ratio to the gold content, being in the proportion of about $^2/_3$ oz. platinum to 1 oz. gold. The ore is thoroughly oxidized, no sulphides having as yet been recognized, and the gold alloys have a "rusty" appearance, showing no colors after panning until they have been thoroughly scrubbed or treated with acid.

The occurrence of the ore is especially peculiar in that it occurs entirely in limestone, the nearest known porphyry contact being about 600 ft. distant. The ore apparently follows the stratification of the limestone more or less regularly, indicating replacement, but appears to be confined in a fault zone about 60 ft. in width, following the fault planes along their strike. A gouge occurs along some of these fault planes, which is strongly indicative of porphyry, and metamorphism is noticeable in the adjacent limestone, indicating that an igneous intrusion may be closer to the orebody than is apparent from the present development. It is probable that the porphyry was the original source of the ore, the precious metals having been deposited in the crushed fault zone, with copper and iron sulphides, which since have been thoroughly oxidized. It is a noticeable fact that the malachite above described carries little gold or silver and no platinum metals are evident. A carload shipment of copper ore from the same workings contained 23.4% copper, but only 1.4 oz. silver and 0.16 oz. gold per ton.

From present development it would appear that the district bids fair to become an important producer of platinum. The Boss Gold Mining Co. has erected a tramway from its upper workings to the wagon road, and is in a position to maintain steady shipments as soon as satisfactory terms for the ore have been arranged. Some difficulties have been encountered, as the Western smelteries appear unable to handle this class of ore to advantage, but it is hoped that satisfactory arrangements can be made with Eastern firms. The company is also conducting a series of tests on the lower-grade ore, and expects to erect an experimental plant for treatment of ore on the ground. Numerous other claims have been located in the vicinity, and are now under development. The Azurite Mining Co., whose ground adjoins that of the Boss, has developed some ore, although of somewhat different character from that of the Boss mine.

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First-Aid Instruction in California

By Lewis J. Eddy

Mine rescue and first-aid training instructions were given to miners at Grass Valley by U. S. mine rescue car No. 5 on Sept. 16. The car was not sent to Grass Valley on account of the fact that the railroad from Colfax to Grass Valley and Nevada City is narrow-gage. The car remained at Colfax but the equipment was shipped and the full complement of men went with the equipment. The work was in charge of E. Steidel, junior mining engineer, and George W. Riggs, first-aid instructor. Both operators and mine bosses, and the miners as well, showed a great deal of interest in the work as taught by the government men, and it has been planned that a half-shift tri-monthly practice will be inaugurated. Instructions were given miners at the North Star, the Brunswick, the Empire and the Champion. Practical demonstration of rescue training was successfully carried through in an abandoned end-drift on the level 28 of the North Star mine. A fire was kindled and the men under instruction were obliged to work under actual mining and mine-fire conditions. The smoke and gas generated by the timber fire extinguished the carbide lamps. The men were provided with self-contained oxygen-breathing apparatus allowing them to penetrate gas and smoke. The North Star has two sets of breathing apparatus in perfect condition, and is otherwise provided, as other mines in the district are, with the necessary apparatus for rescue work. At the conclusion of the evening demonstration by two teams of five men each, one from the North Star, one from the Empire, A. B. Foote, superintendent for the North Star Mines Co., addressed the government men and miners on the subject of first-aid and rescue work and assured the miners that the management of the North Star would do everything in reason to aid them in their efforts. H. M. Wolflin of the Industrial Accident Commission and the Bureau of Mines was present at the night demonstration and commended the miners for their excellent work.

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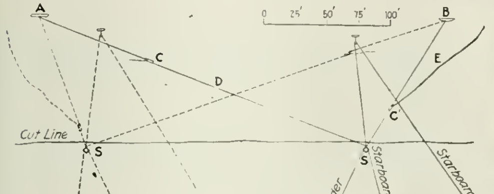
Side Lines in Dredging

By W. H. Wright*

If you ask a man experienced in gold dredging what parts of the dredge most affect yardage, he will surely put the main winch among the first three if he does not place it first and the main winch is important only because it controls the working lines.



Arrangement of Dredging Lines

On both head-line and spud dredges the operation of the side lines is much the same. The bow-swinging lines are in constant motion when the dredge is digging. These lines carry a large part of the digging strain. In dredges of the type of which Natoma No. 10, in the American River district, Calif., is an example, the bow lines are 1¼-in. high-grade steel-wire rope. This rope passes from the winch through proper sheaves and fair-leads to a sheave on short; then around this sheave to the digging ladder just aft of the lower tumbler bearings. The shore sheave weighs in the neighborhood of 800 lb., and is anchored by 1½-in. lines to two deadmen which are 300 ft. or more apart along the cut line. The methods of handling this heavy equipment with little, or no, loss of time are very interesting. Those here described are the practice of the Natomas Consolidated in American River district, Calif.

In Fig. 1, *A* and *B* are the deadmen; *C* and *C″* the "come-alongs" fastened at the ends of the anchor lines. The pennant lines, *E* and *D*, are fastened to the sheave *S* by a heavy clevis and lead in the opposite directions to the "come-alongs" *C* and *C″* through which they pass. Beginning in the position shown by the full lines, the pennant line *D* is out through the "come-along" *C* to its full extent, while only a small part of the line *E* has passed through the "come-along" *C″*. The stern line *SL* runs through a light independent sheave, anchored to a stump or a small deadman, then is fastened to a shackle on the shore sheave *S*. When it becomes necessary to move the lines and sheave ahead, a strain is taken on the stern line and the sheave, side line and anchor lines are pulled far enough out on the bank to give the necessary amount of slack. The grips of the "come-alongs" are loosened. The slack of the pennant line *D* is pulled through the "come-along" *C* by hand, and the grip tightened. The stern line is now slackened and the strain is taken on the bow line which pulls the sheave out over the edge of the cut; at the same time the pennant line *E* is pulling through the "come-along" *C″*. When the sheave *S* reaches its proper position, the grip of the "come-along" *C″* is tightened and the lines on the starboard side are ready for another day's run. The same movements are gone through on the port side.

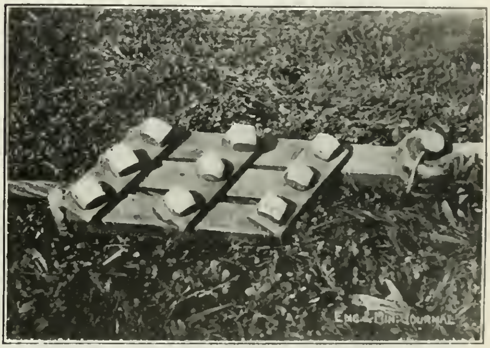


Fig. 4. "Come-Along" with Permanent Line Gripped in It

This operation is repeated as often as the length of the lines will permit. When the position is reached as shown by the broken lines, a connection is made with a deadman still farther ahead than *A* and by using a longer anchor line on *B*, the "come-along" *C″* is advanced until it can be fastened to the deadman *A*.

Fig. 4 is a photo of a "come-along" showing the pennant line gripped in it. Another style of "come-along" which is much more easily handled, is now coming into use. This is given in detail in Fig. 5. It consists of two plates riveted to a forged block, which has a 1¼-in. groove in one end. Through each end of the plates a 1¾-in. pin is passed. At the grooved end of the forging, the clearance between the pin and the forging is juset sufficient for a 1½-in. rope to pass freely when the "come-along" is lying at right angles to the rope. At the end of the anchor line, Fig. 2, a small sheave, 12 in. or 14 in. diameter is placed. The pennant line from the shore sheave S passes around this sheave and back to the "come-along" C', to which it is fastened by one of the pins. The pin at the grooved end is now removed and the "come-along" is fastened over the pennant line. When the line is slack the "come-along" will move freely up and down the pennant line, but when there is a strain on the line, it is gripped between the pin and the grooved end of the forged piece, as shown in Fig. 5. A similar arrangement is on the other pennant line, allowing either line to be quickly shortened or lengthened. This device is much lighter and more easily handled than the other and is preferred by the men.

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*Mining engineer, Foxcroft Building, San Francisco, Calif.

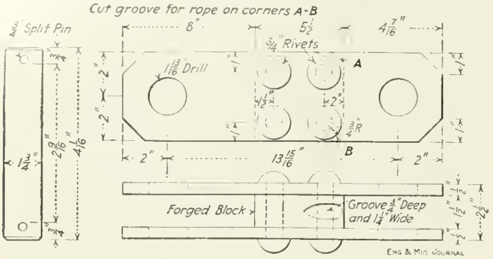
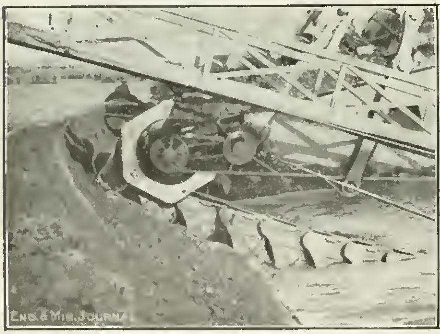


FIG. 5. "COME-ALONG" FOR HANDLING DREDGE LINES



METHOD OF FASTENING BOW LINE ON PORT SIDE

SHORE SHEAVE AND SIDE LINES IN ACTION

In shallow ground, where the progress is rapid, another arrangement is used. This is shown in Fig. 3, and is known as a trolley. A long anchor line is stretched between two deadmen A and D. The length varies, but a 1000-ft. length is often used. The line is reinforced by other deadmen as B and C. The shore sheave S has a single pennant line which is fastened again to a small sheave which runs, or "trolleys" upon the anchor line. Sometimes a bridle is used instead of a single line. The trolley sheave is kept in the desired place by a short rope sling, at either end of which is fastened an "Indian-head," a device similar to the "come-along." The stern line is fastened in the same manner as in the other methods described, but is anchored to the anchor line. By loosening this sling the trolley is quickly shifted to the proper place. Often the pull of the side line will bring it there with no effort.

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Opportunities for Mineral Development in Canada

SPECIAL CORRESPONDENCE

The scarcity of certain metals and alloys resulting from the war conditions in Europe has been pointed out in the JOURNAL. For some of these Canada may be able to offer supplies. Of antimony, for instance, there are known deposits in Nova Scotia and New Brunswick, some of which have been exploited, and could be put on a producing basis in a short time. Some of the Nova Scotia ores carry gold, but have been worked only in a small way. Antimony ores have also been found in Wheaton district in the Yukon.

The arsenical ore-bearing belts of Hastings and Frontenac counties in Ontario, offer opportunities for securing a supply of this product, and should be worked to advantage as many of the ores contain sufficient gold to defray operating expenses. This field has the benefit of excellent transportation facilities and cheap electric power, and the Ontario government allows a bonus of $10 per ton on all white arsenic produced. Good arsenical ores are also found on the eastern coast of Nova Scotia. Canada already furnishes arsenic to the United States markets.

The feldspars of eastern Ontario present an opportunity for the production of potash and potash salts to take the place of the extensive importations from Germany.

A shortage in the supply of chromite and magnesite from Greece, Turkey and Asia Minor, could be well made up from the chromite deposits in the eastern townships of Quebec and the magnesite which occurs in important quantities on the north shore of the Ottawa River.

Molybdenite occurs through eastern Canada in many places and tungsten deposits are also available should the war create an additional demand of these minerals for alloying steel for armament purposes.

The Ishpeming First-Aid Contest

Special Correspondence

The first annual first-aid contest, held under the auspices of the Lake Superior Mining Institute, was described to some extent in the Journal of Sept. 5. The contest took place at Ishpeming, Mich., Aug. 31. Twelve teams participated, representing those mining companies in the Lake Superior district that have been most progressive in first-aid and mine-rescue work.

The first prize, five bronze medals given by the American Mine Safety Association, together with $50, was won by the Republic Iron & Steel Co.'s Marquette range team. The second prize went to the Cleveland-Cliffs Iron Co.'s Negaunee mine team, and consisted of six silk umbrellas, given by the Pluto Powder Co., and $30 in cash. The Oliver Iron Mining Co.'s Marquette range team took the third prize, a self-rescue apparatus, given by the Dræger Oxygen Apparatus Co., and $30. The cash prizes were given by the Institute and by the du Pont Powder Co.

The mining companies represented in the contest were the Cleveland-Cliffs Iron Co. with four teams from the Marquette range; the Republic Iron & Steel Co. with two teams, one each from the Mesabi and the Marquette; the Oliver Iron Mining Co. with two teams, one each from the Marquette and the Gogebic; Pickands, Mather & Co. with two teams, one from the Iron River district and one from the Mesabi; the Newport Mining Co. of the Gogebic with one team; and the Breitung Iron Co. of the Marquette also with one team. The Calumet & Hecla Co. had no entries but sent down two teams to observe the demonstration.

An Iron-Country First-Aid Team

The judges were Dr. A. F. Knoefel, vice-president of the Vandalia Coal Co., of Linton, Ind.; R. Y. Williams, director of the Illinois Miners' and Mechanics Institute; and G. H. Hawes, rescue engineer, of Pittsburgh, Penn.

In a first-aid contest the subject or patient is supposed to have been injured, the nature of his injuries being stated beforehand, and the team of five men puts on the bandages and splints it considers necessary before transporting the victim to a doctor. The following are examples of the problems given the teams: Treat a compound fracture of the middle third of the right thigh, accompanied by violent bleeding; treat a simple fracture of the right thigh, fifth and sixth ribs on left side broken, compound fracture of the right wrist with bright red blood bleeding; treat a man insensible from drowning. The teams all work on the same problems or similar problems to make comparison easier, and are graded by the judges on the basis of one hundred perfect. Discounts are made for improper treatment, failure to be aseptic, failure to stop bleeding, lack of neatness, not doing the most important thing first, and similar mistakes. In this contest each team had five problems or events to work on, the average of the marks given for each event being the final score. The highest score made in this contest was 97, the lowest 90, an excellent showing altogether.

It is surprising the amount of interest taken in these contests by the men at the mines. The rivalry for places on a first-aid team to represent the mine in a contest is keen. Men living on the mining locations often get together on winter evenings and practice among themselves in order to make the team in summer. Since the teams are picked from the best men at each mine and as nearly all of the teams in this contest were winners in contests with other teams of their companies for the honor of representing the company and for the trip to Ishpeming, the work in the final contest was extremely well done.

The results in this campaign for first-aid work are satisfactory to all parties interested. The most noticeable are the decreasing amount of time lost from work by the men from injuries, the fewer complications of injuries from improper handling, and the better feeling of the employees toward their employers.

⁂

Nevada State Mine Rescue Meet

By Francis Church Lincoln*

An interesting mine-rescue and first-aid contest was held on the Mackay athletic field of the University of Nevada, Reno., Nev., on Labor Day, Sept. 7, 1914. The meet was held under the auspices of the engineering colleges of the University of Nevada with the assistance of the U. S. Bureau of Mines, the American Red Cross Society, and the Nevada Industrial Safety Association.

Arrangement of Drift at Nevada Mine-Rescue Meet

The miners participating in these contests were trained by E. Steidle, mining engineer, and George W. Riggs, first-aid instructor, who were attached to Mine-Rescue Car No. 5 of the U. S. Bureau of Mines. Since the first of July this car has trained 69 miners and ten University students in mine-rescue work, and 130 miners and 15 University students in mine first-aid in the state of Nevada. In addition to training these men, week-end lectures have been given to 1400 Nevada miners, and 5200 people have visited the mine-rescue car. Prior to the State meet, two local contests were held in Nevada one at Ely on the Fourth of July, in which eight teams competed, and the other at Tonopah on Aug. 9., where there were five contesting teams.

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*Mackay School of Mines, University of Nevada, Reno, Nev.

The mine-rescue maneuver in which the several teams participated took place in a model drift consisting of timber, laths and tarred paper, built according to the design of E. Steidle. The side toward the grandstand was left open, save in the part used as a gas and smoke area, which was provided with windows on the grandstand side. The model was 6 ft. high and 260 ft. long. It consisted of 8 ft. of drift 6 ft. high, followed by 20 ft. of drift representing a hanging fall in which the height was only 3 ft. Next to this came 20 ft. more of open drift and then a gas and smoke chamber 40 ft. in length with an inclined obstacle in the center. Beyond the gas and smoke chamber were 20 ft. more of open drift and then 20 ft. representing a fall with an opening 3 ft. in height above the fall; and, finally, there were 60 ft. more of open drift to the face.

The teams underwent physical examination at the hands of doctors and then each in turn tested and adjusted its apparatus, stood a 3-min. test in a small test house filled with smoke and gas and then went through the model drift and rescued a miner supposed to be overcome near the face of the drift. Each team carried a stretcher and oxygen breathing apparatus for the use of the injured man, and proceeded with all the precautions laid down by the U. S. Bureau of Mines. The first prize was won by the team from the Tonopah Mining Co., the other contestants being teams from the Veteran mine of the Consolidated Copper Co., the Tonopah-Belmont Development Co. and the Goldfield Consolidated Mines Co.

The mine first-aid teams worked on the problem of a miner found in a drift under a fall of rock and in contact with an electric wire. Their object was to rescue the patient, restoring breathing, and attend to his injuries, which included a deep electric burn on the small of the back, scalp wound and cut in left eyeball with severe bleeding, fracture of the right collar bone, simple fracture of the right forearm, and compound fracture of the right thigh 5 in. above the knee, with severe bleeding. The time allowed for this was 25 min. The winner of the first prize was the McGill concentrator team of the Nevada Consolidated Copper Co. The second prize was won by the Tonopah Extension Mining Co., the third by the Tonopah Development Co., and the fourth prize was tied between the West End Consolidated Mining Co. and the Goldfield Consolidated Mines Co. Other contesting teams were those from the Tonopah Mining Co. and the Veteran mine of the Nevada Consolidated Copper Co. Three teams of students from the University of Nevada, two from the Mackay School of Mines and one from the Electrical Engineering Department, also competed against each other.

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California First-Aid Meet

By Lewis H. Eddy*

The initial first-aid meet in the mining history of California was held at Jackson, Amador County, and was participated in by teams made up from mines in the Mother Lode region. The meet was a part of the program prepared by the Labor Day celebration under the auspices of the Miners' Union. Teams were entered from Amador City, Sutter Creek, and Kennedy mine. A team from Plymouth was also expected, but was prevented from participation by an automobile breakdown on the way to the grounds.

Team from Kennedy Mine at Work

Patient after Treatment by Amador City Team

The standing of the teams at the conclusion of the meet was as follows:

Kennedy team, first prize, $65 cash; general average of team, 99%. Amador City team, second prize $30 cash; general average of team, 97%. Sutter Creek team, third prize, $20 cash; general average of team, 94%.

Kennedy mine team was composed of Capt., H. E. Stewart, R. White, William Dougherty, Gordon Ireland, John Church, Nick Snell. Amador team: Capt., L. C. Cain, O. Anderson, Williamson, I. Brown, E. Worth, D. Kelly. Sutter Creek team: Capt., Henry Loge, William White, Gustave Schroder, Fr. Gehironi, James Jury, W. R. Forbes. The judges were Dr. Gall, Dr. Endicott and S. E. Robbins.

The prizes contributed amounted to $115. The Miners' Union contributed $50; Supt. W. S. O'Brien, of the Amador mine, contributed $20. The balance was made up by contributions from the Kennedy, Argonaut, South Eureka, Central Eureka, Keystone, Bunker Hill, Treasure, Fremont and Plymouth mines.

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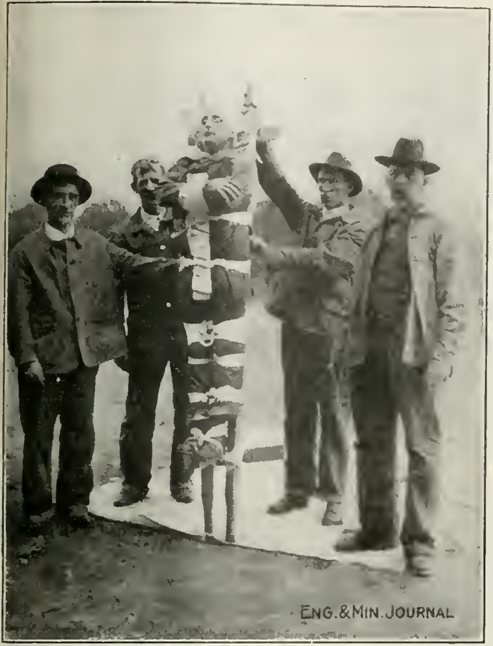
*Associate editor, "Engineering and Mining Journal," San Francisco, Calif.

A feature of the meet was the attendance of a large number of interested spectators who were not in the least stingy in offers of advice. Anyway, there was more actual interest aroused in first-aid-to-the-injured work at the Jackson meet than has ever been stirred up by any similar undertaking in the state.



Sutter Creek Team, Showing Method of Preparing Man with Injured Back for Transportation on Mine Cage

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An Australian Steel Plant

The steel plant under construction by the Broken Hill Proprietary Co. at Newcastle, N. S. W., is now well advanced so far as the first unit is concerned, and that unit will probably be at work early in 1915, according to the *Australian Mining Standard*. The plans include six units, for which provision has been made. The work now in progress includes a blast furnace of 10,000 tons monthly capacity, three 65-ton basic openhearth-steel furnaces, a blooming mill and a 28-in. three-high rolling mill. The company owns 264 acres of land, which will be sufficient for the proposed extensions. At present the product will be rails and structural shapes, but plate and bar mills will be added later.

The iron ore will come from the company's Iron Knob property in South Australia, and the limestone for flux from Wardang Island, South Australia. Coal will be brought from the government mines at Tighe's Hill, and coke will be made at the plant in a battery of 66 Semet-Solvay recuperative byproduct ovens, now being erected. The gas will be used in the works. Electricity will be extensively used for lighting and power, though the blowing engines and rolling mills will be operated by steam engines.

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The Quicksilver Situation

The quicksilver situation is at present of unusual interest because of the large use of mercury in the preparation of fulminate for explosives, the present and probable future consumption of which must have an important bearing on the market for the metal, withdrawal of available supplies and future demands. The following notes by H. D. McCaskey of the U. S. Geological Survey are of interest at this time:

The world's production of quicksilver, in metric tons, was 4171 tons in 1913, and has averaged 3728 tons, or 109,584 flasks of 75 pounds net each, annually for the past 10 years. During 1901 and 1905, the United States led the world in production, but from 1906 to date the leading producer has been Spain, whose great cinnabar deposits of Almaden, the output of which has been controlled by the Rothschilds and marketed chiefly in London, have proved very rich. The deposits of quicksilver ore in Idria (Carniola, Austria), and at Monte Amiata (Tuscany, Italy), have with those of the United States (chiefly California) furnished the bulk of the remainder of the world's supply. The figure given in the Survey report for 1913 show that during that year Spain produced approximately 1490 metric tons, Italy, 388 tons, Austria, 855 tons, the United States, 688 tons, and Mexico and all others, 150 tons.

The production of the United States was 20,213 flasks of 75 lb. each; the imports were 2289 flasks, and the exports 1140 flasks, giving an approximate consumption and stocks available of 21,666 flasks, which is probably not far from the present domestic consumption. The domestic demand is mainly for making fulminate, for amalgamation of gold and silver ores, and for manufacture of electric and other appliances. It seems unlikely that domestic production will greatly increase, so that there will hardly be any surplus in the United States for export.

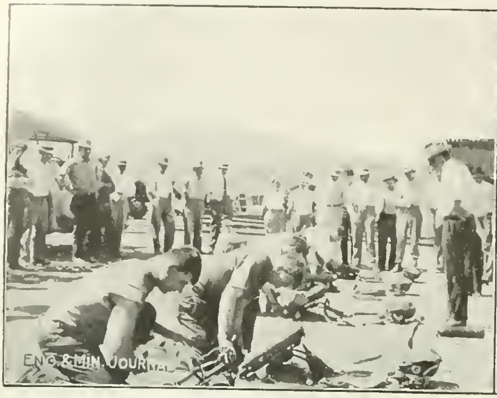
The Austrian production of quicksilver, controlled as it is by the government, is definitely cut off from the world's markets, and the Italian supplies must be considered uncertain. The Spanish output is mainly controlled in London, and if this remains, but little metal will be free, for a time at least, for the foreign trade. Undoubtedly large quantities of available European quicksilver will be immediately utilized in the manufacture of explosive caps for fixed ammunition for both small arms and artillery. In the countries now involved in the war, present stocks are unknown, but even if extensive they must be heavily drawn upon for some time to come, and exportation is not only prohibited by some of these countries, but quicksilver is declared contraband by all of them.

The demand from Mexico, Central and South America and from China and Japan must be met from the United States, if at all. But, as shown above, this country has little or no surplus over its own consumption. It is apparent that, for a time at least, demand will exceed the supply and prices are likely to be high. At present, they are about double those prevailing in the earlier part of the year, the quotations being $75@80, New York, against $36@37 per flask in June last.

Old Dominion Mine Rescue Contest

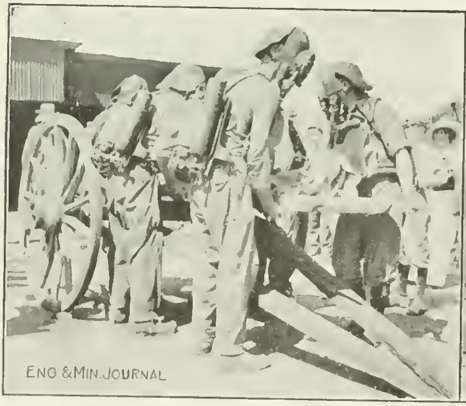
The accompanying page of illustrations shows various phases of a mine-rescue contest held on Labor Day by the Old Dominion Copper Mining & Smelting Co. at Globe, Ariz. This was one of the first contests of its kind held in the Southwest, and was a highly successful affair.

The contest included carrying a patient on a stretcher through timbered drifts in which were placed obstacles of various kinds, work in a smoke chamber and application of the pulmotor. Two teams of underground men were entered and one team from the engineering department.

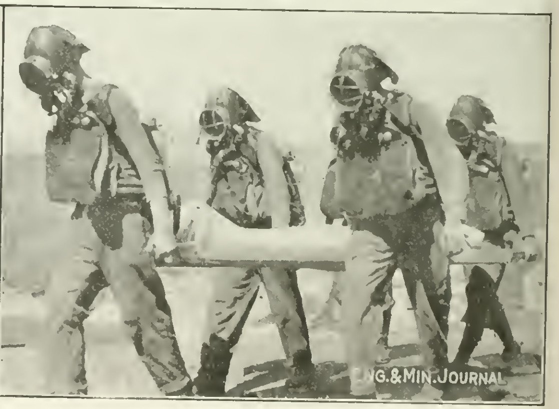


Assembling Apparatus

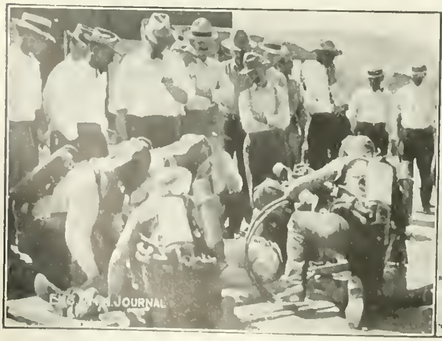
Judges Inspecting Assembled Apparatus



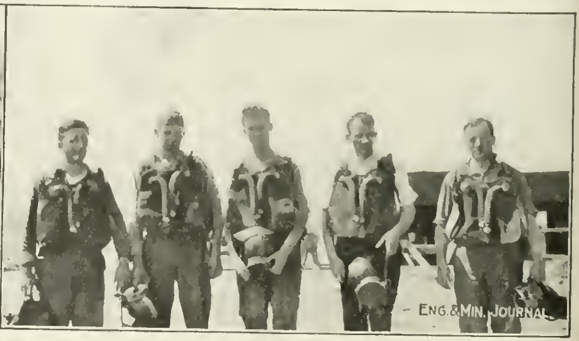
Carrying Patient on Stretcher across Obstacle



Crew of Four with Patient on Stretcher



Applying Pulmotor to Patient



The Winning Crew

Mine Stores and What Mines Use--II

SYNOPSIS—In this continuation of a previous article are detailed the tramming supplies, building material, general hardware, and machinery used in 10 months of steam-shovel and 10 months underground work by the Nevada Consolidated Copper Co., six months work by the Miami Copper Co., and one year's work by the Hollinger.

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In the previous article a list of fuels, power, lumber, explosives, oils and greases, iron and steel, pipe and fittings, and tools used at the Nevada Consolidated Copper Co., Ely, Nev.; Miami Copper Co., Miami, Ariz.; New Jersey Zinc Co., Franklin Furnace, N. J.; and the Hollinger Gold Mines, Porcupine, Can., was published. The following list gives details of other supplies consumed at these mines during the same period covered by the previous article.

NEVADA CONSOLIDATED COPPER CO.

Mine Supplies for 10 Months in Steam-Shovel Mining; 2,376,966 Dry Tons Ore and 2,480,962 Cu.yd. of Waste Mined.

Tramming and Haulage Supplies

Cars, dump and parts:	
Car wheels	160
Knuckle locks	132
Knuckle locks, sets	128
Brake beams	10
Brake-beam heads	7
Bottom body rests	28
Top body rests	93
Tower draw bal cut	11
Draw bar	1
McCord oil boxes	30
Draft springs	86
Nest truck springs	56
Triple union	6
Nonpressure auxiliary reservoirs	9
Bottom center posts	5
Clevises and pins	81
Cut-out cocks	7
Car swivels	25
Spring seats	13
Cut-out handles	75
Yoke	1
Spring barrel	1
Column posts	207
Column guides	85
C. S. truck bolster	12
Steel draft lugs	118
Air hose, 1¼-in., ft.	150
Hose gaskets	825
Hose clamps	8
Steel carrying arms	12
Angle cocks, 1¼-in	77
Train-line tees	12
Brass wedges	16
Steel center plates	24
Fulcrums	78
Cylinder gaskets	5
Check-valve gaskets	12
Oil-box covers	8
Release valves	5
Car unions	25
Triple valves	3
Triple-valve gaskets	9)
Angle cock handles	96
Brake block	1
Rails, fittings, etc.:	
60- and 70-lb. rails, lb.	277,530
Track bolts, kegs	285
Track spikes, kegs	503
60- and 70-lb. tie plates	12,359
Guard rail	2
Switch-lamp reflectors	3
Switch-lamp lenses	22
Switch-lamp wicks	864
Angle bars, pr.	1,605
Switch points	12
Frogs, 8-in., 60-lb.	2
Frogs, 75-lb.	6
Connecting-rod	1
Switch lamp complete	4
Switch-lamp burners	106
Switch and crossties	13,132
Steam-locomotive parts:	
Injector repairs, pc.	802
Blowoff cocks	6
Cylinder cocks	24
Cast-steel dog wheels	3
A. B. C. springs	40
Headlights	4
Locomotive whistles	3
Driver brake shoes	600
15-in. knuckles	12
Boiler checks	14
Injector nozzles	12
Sand, tons	122
Westinghouse air pumps	2
Air-pump parts	98
Boiler check valves	12
Eccentric and boxes complete	4
C. S. hangers	20
Comp. coil springs	200
Gage cocks	24
Boiler-front ends	4
Triple-feed lubricator	2
Brake-beam hangers	8
Brake hangers	2

Building Material

Cement, lb.	6,000
Fireclay, lb.	759
Concrete filler, lb.	400
Lime, lb.	1,000
Brick	3,950
Corrugated roofing sheets	2,108
Glass, 10x12 and 12x24-in. panes	326
12-light windows	177
Doors	111
Compo board, ft	6,373
Shingles	4,350
Transoms	12
Building paper rolls	10

General Hardware

Machine bolts, lb.	14,438
Stove bolts, lb.	82
Boiler patch bolts, lb.	198
Cotter keys, lb.	710
Lag screws, lb.	391
Wood screws, gross	117
Setscrews, lb.	70
Capscrews, lb.	776
Boat spikes, lb.	2,550
Nails, lb.	8,585
Galvanized iron, sheets	439
Stove-pipe iron, sheets	61
Ridge roll, ft.	1,276
Window spring bolts	282
T-hinges, pr.	106
Wire screen, rolls	2
Lock washers, lb	431
Cut washers, lb.	1,580
Tapped nuts, lb	7,022
Rivets, lb.	5,658
Copper rivets, boxes	30
Copper rivets, lb	6
Tin rivets, lb.	28
Upholstering tacks, lb	31
Steel brads, packages	50
Sash chain, ft.	310
Sundry locks	224
Head washers, lb	190
Steel butts, pr	204
Screen-door springs	52
Coat and hat hooks	197
Sash pulleys	237
Sash locks	63
Sash lifts	56
Casement fasteners	70
Blank keys	24
12-in. bb. acting door hinges	1
Door pulls	29
Drawer pulls	24
Door springs	120
Shelf brackets, pairs	2
Casters, sets	14
Strap hinges	56
Hasps	61
Hooks and eyes	8

Machinery and Parts

Steam-shovel parts:	
Panama dipper teeth (14,812 lb.)	161
Vanderhoef dipper teeth (12,672 lb.)	96
Hoisting chains, 990 lb.	9
Missing links	370
Prop. chain links	364
Asbestos brake blocks	87
Bolster springs	50
Friction band blocks	40
Boiler flues	80
Eccentric straps	29
Rail clamps	26
Rocker arms	20
Throttle casings	10
Crossheads	11
Crosshead shoes	21
Crosshead pin	1
Propelling sprockets	2
Crankshafts	3
Eccentric sheaves	8
Mang. dipper door front	1
"A" frame legs	2
Dipper rails	7
Car bolster	1
Crosshead pins and shoes	3
Crank brasses	4
Connecting-rod	1
Half bushing	1
Sprocket sheave	1
"A" frame castings	2
Propelling gears	2
Swing drum	1
Thrust cylinder	1
Thrust springs	1
Exhaust pipe	1
Manganese-steel rack	1
Manganese-steel lip	2
Piston gland	1
Throttle valve	1
Crank disks	2
Hinge frames	2
Dipper hinges	6
Side frames	4
"A" frame collar	1
Cylinder heads	2
Propelling shaft	1
Propelling chain plates	8
Rail cleaner	1
C. S. Bed plate	1
Transom casting	1
Miscellaneous machinery:	
Cold cutting-off saw	1
Bevel gear for radial press	1
Bull wheel and pinion	1
Compressor parts	6
Locomotive steam gages	3
Air gages	4
50,000 gal. water tanks	4
Grease cups	1,811
Lubricators	3
Lubricator repairs, pc.	56
Water gages	10
3-hp. motors	3
10-hp. motor	1
Vacuum pump repairs, pc.	390
Oil pumps	10
Oil-pump repairs, pc.	305
Electric pump	1
Water-valve rubbers	9
Water-valve springs	3
Water-valve stems	3
Injector repairs, pc	98
Pet cocks	218
Water-gage glasses	1,562
1-hp. motor	1
7½-hp. motor	1

NEVADA CONSOLIDATED COPPER CO.

Supplies Used in Underground Mining at the Veteran Mine 10 Months, Jan. 1, to Oct. 31, 1913; 216,784 Dry Tons of Ore Mined.

Tramming Supplies

Car trucks	15
Carwheel keys	24
Car boxing	1
Fish plates	50
Brake blocks	11
Carwheels	5
Track spikes, lb	1,400

Building Materials

Common pressed brick	500
Firebrick	450
Cement, sacks	232
Lime, lb.	2,030
Corrugated iron sheets	156
Shingles	6,000
Six-light windows	19
Gravel, cu.yd.	37
Window glass lights	287
Plate glass, 40x72	1
Malthoid roofing rolls	75
Compo board, sq ft.	1,128
Screen doors	67
Doors	3

General Hardware

Machine bolts, lb	537
Nails, lb.	7,882
Rivets, lb.	308
Copper rivets lb	11
Roofing tacks lb	64
Lag screws, lb	344
Nuts, lb.	136
Cut washers, lb	164
Wood screws	3,960
Galvanized iron, 30x96, sheets	19
Stove bolts	6
Butt hinges, pairs	86
Hinges and hasps	69
Roller casters	10
Window shades	3
Inside door sets	11
Ridge roll, ft	15
Placit slate bbl	1
Slop jars	4
Spring hinges	14
Fence wire, lb	600
Padlocks	26
Night latches	7
Rim locks	7
Window bolts	144
Screen-door catches	6
Screen-door hooks and eyes	18
Roof jacks	2
Fly screen, rolls	5
Water tank 50 gal	1
Tacks, lb	3
Skeleton keys	60

Machinery, Parts, Etc

Compressor parts	
Follower heads	2
Crossheads	2
Valve seats	4
Stay-bolts	1
Valve	1
Pump	1
Intake valves	14
Gland nuts	2
Valve stems	8
Valve springs	9
Stuffing-box gland	1
Stuffing-box nut	1
Valve caps	8
Skip parts	
Pins	3
Prospector hoist	1
Pinions	2
Indicator gears, set	1
Orebin gates, sets	1
Shop pump	[illegible]
Grease cups	[illegible]
Lubricators	1
4-in motor pulleys	3
1-hp. motor	[illegible]
"Iler" pulverizer	[illegible]
20-in. Barnes drills	[illegible]
Part for mine bell	[illegible]
Keystone blower	[illegible]
Pet cocks.	[illegible]
Steam gages	[illegible]
Gage glasses	4

Lugs	1
Shafts, 2x22 in.	2
Castings	22
Cage dogs	2
Mine-hoist parts	
3-hp. motors	8
5-hp. motor	1
Sand-line sheave	1
Valve casings for pump	6

MIAMI COPPER CO.

Mine Supplies, Jan. 1 to July 1, 1913. Underground Mining: 48[illegible],627 Tons of Ore and 32,668 Tons of Waste Mined

Tramming and Railroad Supplies

Tram cars	6
Tram-car wheels and caps	48
16-lb. steel rails, lb.	8,657
30-lb. steel rails, lb.	194,300
40-lb. steel rails, lb.	8,500
70-lb. steel rails, lb.	268,680
Track spikes, lb.	10,259
30-lb. fish plates, sets	1,160
Tie plates	7,500
Angle bars, 70-lb. rails	400
Gard braces, 70-lb. rails	250
70-lb. filler blocks, sets	20
70-lb. rigid frogs	6
70-lb. joints	16
Steel switch lugs	50
15-ft. switches	6
Ground throw stands	2
3-ft. gage turntables	3
Automatic ground throws	52
Cross-overs	3
Cattle guards	2

Building Materials and General Hardware, Etc.

Nails, lb.	40,334
Litholitic plaster, sacks	143
Cement, sacks	8,680
Lime, lb.	30,869
Hydrated lime, lb.	7,400
Asphaltum, lb.	1,060
Six-light sashes	123
Doors	49
Screen doors	33
Windows	8
Maple hand rails	8
Bricks, common and fire	1,735
Galvanized-steel skylights	5
Awnings	35
Corrugated iron, sheets	506
Bridge flooring, sheets	461
Drag-belt scrapers	1,298
Diamond-drill carbons and bortz	$850
Linoleum, yd.	388
Chute gates	75
7-oz. burlap, yd.	11,800
Talcott belt hooks	1,266
Bolts, nuts, washers, etc.	$2,353

Machinery, Parts, Etc.

Callow screen drums	4
Callow screens	51
Chile mill ring dies	6
Chile mill roll shells	12
Chile mill screens	516
Chile mill shafts	3
Quarter-section manganese steel	24
Liner plates	37
Hearts for rolls	4
Roll shells	22
Roll shafts	3
Pump valves with seats	8
Packing rings and keepers	8
Boiler tubes	60
Brass flywheel bushings	28
Boss elevator pulleys	2
Elevator buckets	305
Braun pulverizer disks	16
Bronze worms	3
Pulleys	2
Working sticks	2
Hammer cylinder for drill sharpener	1
Bore ring for coupling clutch	1
Box and cap countershaft	1
Nonburn brake lining, ft.	61
Step bearing buttons	2
Chicago spring butts	26
Pitman crank	1
Manhole covers	2
Holman hoist cylinder	1
Pebbles for tube mill, lb.	1,291,264
Silex lining for tube mill, lb.	101,040
New machinery:	
42x16 automatic rolls	3
Elevator head shafts	4
Hardinge mills, 8-ft.	4
Power hacksaw	1
Blake crusher, 9x15	1
Braun pulverizers	2
C C D generator and pulley	1
Motor-generator set W autostarter	1
Motors, two 1-, and one 2-, 5- and 120-hp.	5
Transformers	2
Switchboard panels	2
Hoist, 5x7	1
Leyner drills	14
Pumps	2

NEW JERSEY ZINC CO.

Mine Suplies Used in Six Months; Ore Broken, 261,650 Tons; Waste Broken, 97,770 Tons; Total Tons Broken, 359,420 Tons

Tramming Supplies

Haulage and underground cars and parts:	
Cars complete	10
Wheels	12
Packing collars	11
Coil springs	42
Axles	30
Electric haulage parts and track parts:	
Rail bonds	31
Frogs	6
Insulators	8
Drift pins	2
Sleeves	8
Suspension screws	26
Terminals	14
Harps	9
Trolley harp screws	4
Spikes, lb.	11,592
Fish plates, pairs	40
Plain ears	48
Switches	3
Switch parts	2
Ins. screws	13
Suspensions	13
Suspension pipe thread	8
Metal bushings	4
Trolley heads	3
Trolley wheels	6
Track bolts	251
Electric locomotive and parts:	
Locomotive complete	1
Carbon brushes	49
Controller	1
Ftg. fingers	60
Draw heads	1
Insulator	1
Lining	1
Pinions	2
Rheo. complete	1
Rev. segments	2
Sleeving, yd.	5
Mica tubes	10
Mica washers	108
Draw bars	2
Coils	2
Fingers	6
Grids	39
Brush holder	1
Studs	6
Arm lining	1
Divis. plates	3
Optg. segments	58
Brake shoes	4
Springs	3
Packing, lb.	1

Building Material

Cement, bags	12
Fire clay, lb.	179
Asphalt, lb.	4
Galvanized iron, sheets	1

General Hardware

Stove bolts	30
Machine bolts, lb.	1,467
Elevator bolts	26
Shear off bolts	2
Carriage bolts	29
Washers, lb.	441
Split washers	582
Felt washers	624
Rivets, lb.	5,093
Copper rivets, lb.	8
Cotter pins	145
Nuts, lb.	258
Nails, lb.	64
Awning pulleys	9
Tacks, packages	1
Door hangers	1
Butt hinges, pair	2
Strap hinges, pair	8
Hasps	7
Bolt hooks	35
Latches	2
Padlocks	18
Brass machine screws, lb.	35
Capscrews	36
Wood screws	262
Lagscrews	944
Setscrews	10

Machinery, Parts, Etc.

Ingersoll-Rand drill sharpener	1
Drill press	1
Leyner drill sharpener parts:	
Sharpener complete	1
Shank device	1
Pin pullers	2
Cup leathers	4
Die	1
Springs	9
Dolly springs	34
Grid springs	3
Crimps	2
Hammer cylinder	1
Turbo pump shaft	1
Roller bearings	2
Grease cups	2
Pet cocks	2
Sheave, 20-in.	1
Mine signal parts:	
Coil springs	10
Contact springs	3
Rubber pieces	2
Cameron pump parts:	
Valve springs	27
Water valves	11
Fiber gaskets	2
Follower	1
Rev. valve	1

HOLLINGER GOLD MINES

Supplies for one year. (Part Used in Construction); 140,131 Tons of Ore and 11,541 Tons of Waste Mined

Tramming Supplies

Cars:	
Ore cars	12
Dump cars	3
Carwheels	52
Car axles	23
Tracks, steel rail, 12-lb., lb.	40,064
Track bolts	6,200
Fish plates, pairs	156
Track spikes, kegs	107

Building Material

Asbestos mill board, lb.	573
Asbestos steets, 48x48 in.	11
Asbestos paper	17
Asbestos fiber board, crates	9
Common brick	18,500
Firebrick	6,750
Cement, bags	3,200
Plaster, bags	2,400
Corrugated sheeting, sheets	2,979
Roofing paper, rolls	64
Tar paper, rolls	594
Building paper, rolls	1,100
Metallic laths, sq.yd.	5,250
Galvanized siding, squares	275
Doors	107
Sash, pairs	481
Window glass, cases	83
Fire clay, tons	8.5
Corrugated ridge caps	1,943
Barn door hangers, ft.	64
Galvanized shingles, squares	332
Corner blocks	870
Wall board, sheets	47

General Hardware

Bolts, ¼ to 1⅛ in. diam.	14,657
Carriage bolts, ¼ to ⅝ in. diam.	7,720
Elevator bolts	6,300
Stove bolts, packages	7
Washers, pressed, lb.	1,395
Bridge and lock washers, ½ to 1 in.	2,554
Nuts, various sizes, lb.	5,814
Cotter pins	420
Door bolts	47
Nails, various sizes, kegs	589
Staples, kegs	95
Hasps and staples	190
Inside door locks	143
Padlocks	324
Miscellaneous locks	115
Thumb latches	35
Coat and hat hooks	432
F. H. B. screws, gross	332
Rivets, ¼ to ⅝ in., lb.	316
Screw hooks	60
Carpet tacks, pkgs.	513
Lagscrews, ¼ to 1 in.	5,333
Capscrews, [illegible] to ⅞ in.	580
Setscrews, ⅜ to ⅞ in.	717
Engine studs	714

Machinery, Parts, Etc.

Electrical Machinery, etc.:	
Transformers	6
Transformer tank	1
Bristol rec. gages	4
No voltage releases for circuit breaker	2
I. G. resistance	1
Field rheostat	1
Bus bar clamps and terminals	14
200 amp. ammeter with shunts	1
Rheostat	1
Bristol rec. ammeters	3
Circuit breaker	1
10,000 Ohm magneto	1
Motors, 25 hp.	3
Motors, 50 hp.	2
Motors, 10 hp.	3
Portable ammeter	1
Telephone switchboard	1
Hoist parts.	
Asbestos brake blocks	30
Quadrant stand	1
Crank pin brasses, set	6
Indicator chain, ft.	30
Side frame and cylinder	1
Eccentric strap	1
Crosshead guides	32
Steel springs	90
Valves	32
Valve seats	40
Valve bolts	40
Pinions	4
Cylinders	2
Frames	2
Crossheads	3
Crankshaft	1
For 10x12 vertical triplex pumps:	
Crucible steel valve seats	24
Cast-iron ball valves	12
Renewable guides	24
Cast-iron glands	3
Bronze crank bearings, sets	8
Bronze crossheads and bearings	4
Cast-iron plunger rings	12
Garlock rings	12
Stuffing-box rings	6
Insertion rings, cast iron	6
Cast-iron crosshead	1
Chilled plungers	2
Gears	3
Cast-iron pinions	2
Valve chamber	1
Leather valves and bolts	18

Crosshead brasses, sets	7
Crosshead pins	4
Quadrant complete with connections and levers	1
10-in. sheaves	6
24-in. sheaves	3
48-in. sheaves	2
Drum shaft friction gear	1
Pinion	1
Cylinder head and gland	1
Crank disk and pin	1
Crossheads	2
Friction pins, sets	12
Throttle valves	5
Crank pin brasses	3
Friction brake band	1
Friction screws and nuts	6
Cage springs	66
Counterweights for cage	3
Cage	1
Compressor parts:	
Discharge valve cages	6
Cut-off valve	1
Cut-off valve spindle	1
Inside plugs for discharge valve	6
Bottom case for eccentric	1
Inside valve plugs	9
Inside plugs for H & L pressure valves	30
Valve springs	18
Crushers:	
Stationary jaw plates	4
Swinging jaw plates	1
Cheek plates, pairs	3
Toggles, sets	14
Gyratory spider cap	1
Gyratory top shell	1
No. 5 Bz. Ball crusher complete	1
Gyratory, discharge spouts	3
Gyratory, C. I. hoppers	5
Gyratory, lower dust cover	1
Gyratory, C. I. wearing plate	1
Gyratory, rock shaft and levers	2
Crusher pitman	1
Stamps and challenge feeders:	
Stamp stems	6
Chrome steel heads	14
Chrome steel cams	16
Mang. steel end liners	31
Mang. steel front liners	19
Mang. steel back liners	23
Stamp shoes	145
Dies	160
Forged steel dies	30
False dies	95
Cast iron hoppers	3
Cast steel tappets	6
Hard iron false bottoms	9
Boss heads	7
Spout liners	9
Lower back spout liners	8
Cam shaft pulley flanges, pairs	2
Cam shafts	3
Wood battery pulley, 72x17	3
Hand wheel and screw	1
Center box	1
Conveyor parts:	
Upper guide rollers	[illegible]
Troughing carriers	36
Screw conveyor couplings	38
Return rollers	40
6-in. screw conveyor, lengths	56
Grinding pans:	
Shoes, sets	4
Spiders	5
Dies, sets	4
Adjusting screws	4
Tube Mill:	
Tube mill scoops	34
End liners	24
Spiral scoops	3
Discharge screens	1
Head liners, set	1
Cover liners	6
Manhole covers	4
Spiral liners	3
Special C. S. head mach. bolts	109
Silex lining, lb	91,120
Pumps and parts—for 8x10 Vacuum:	
Cast-steel crankshaft	1
10x5x13 Cameron pump	1
Prospectors' sinking pump	2
For 16x9x12 fire pump:	
Cast-iron slide valves	2
Water cylinder brass liners	2
Brass plungers	2
Suction discharge valve seats and stems	8
For 8x5x7 pump:	
Iron packing gland, steam end	1
Valve rods	1
Diaphragm pump parts:	
Large gear wheel	1
Rubble diaphragm	14
Diaphragm castings	32
No. 4 diaphragm pumps	4
For 7x9 vertical triplex pumps:	
Crosshead bearings, sets	6
Leather U packing rings	24
Valve seats	14
Valve plates	9
Valve springs	48
Valve stems	45
Garlock rings	18
Wrought-iron valve rings	18
Cast-iron ways	48
Bronze crankhead Bearings	5
Chilled-iron plungers	2
Cast-iron gears	3
Cast-iron ball valves	6
Pumps, complete	2
Cameron pump rubber valves, sets	6
Pulleys:	
Split wood, 4x6 to 56x10 in.	26
Solid iron, 8x8 to 30x4 in.	14
Steel, 6x3 to 18x12 in.	40
Steel pulley bushings	67
Diester Slime Tables:	
Extended ball and socket bearings	53
Wedge sockets	24
Bolts for adjusting eccentric	48
Handwheel, rods nuts and collars	3
Setscrews for adjusting eccentric	48
Riffles with steel tacks, sets	58
Crankpin brasses, sets	31
Roller bushings, set	12
Rollers, sets	12
Linoleum table covers	68
Rocking end supports	12
Holding down springs	53
Wedges	29
Spring seats	17
Ball castings	2
Curved levers	3
Special setscrews	23
Oil guards	1
Box cranks	1
Adjusting plates	12
Table pullers	14
W. A. collars	12
Main springs	48
Steel tacks, lb.	30
Table ball castings	16
Miscellaneous machinery and parts.	
Filter leaves	46
Belt driven blower	1
Merrill precipitating press	1
Dorr thickener mechanism	4
Merrill zinc feeder	1
Burr keyseater machine	1
Plain engine lathe	1
McDougall drill No. 3	1
Floor plates for copper furnace, lots	1
20 Rd water jacket, copper furnace	1
Parks pusher complete	1
Locomotive jack-screws	2
Oil bath chain cases	9
Worm for Dorr thickener	1
Worm gear for Dorr thickener	1
Lifting device for Dorr thickener	1
Settler discharge fittings	12
Deister cone baffles	2
For Dorr Classifiers:	
Connecting-rod brackets	3
Connecting-rod bracket caps	4
Angles, ½x2½x2½	262
Bell cranks	3
Cam rollers	7
Cams	2
For Morgan crane:	
F. S. worm	1
F. S. pinion	2
C. S. gear	1
Bronze friction disk	1
Lot of iron work for furnace	1
Dust flue, complete	1
30-in. by 30-ft. stack	1
Cover for Steele-Harvey furnace	1
Liners for Steele-Harvey furnace, sets	2
Test car	1
Litharge cars	4
Blast piping, set	1
Briquetting press	1
Spider-arm castings	4
Lathe chucks	2
Chuck plates	7
Boiler arch abutments	2
Dead plates	2
Cast-iron melting pots	2
Chain drive, ft.	17.5
Chain-drive studs and washers	108
Chain-drive guide links	97
Chain-drive liners	204
Trommel screen plates	10
Roller bearings for trommel	1
For Merrill pipe cutter:	
Power gears	6
Dies, sets	4
Grease cups	260
Lubricators	51
Injectors	9
Large steel gears	5
Maple cogs, set	1
Miter steel gears, pair	1
Boiler arch castings	8
Pet cocks	73
Pressure gauges	17
Oil cups	62
Oil cadgers	120
Solid collars	59
Shaft hangers	18
Cast-iron bevel gears, pair	4
Bevel mortise gears, pair	4
Pressure-reducing valves	4
Steam traps	3
Standard rigid hollow blocks	43
Keyless shaft couplings	27
Trommel screens	20

(To be concluded)

Zinc Corporation's Condition

The Zinc Corporation issued the following circular to its shareholders, dated Sept. 17: In consequence of the war the contract for sale of zinc concentrates to the smelters in Germany is void, the market for lead is disorganized and restricted, and the Broken Hill Proprietary Co., to whom the lead concentrates are sold, has availed itself of the war clause in its contract, and is not operating its smelting plants. Under these circumstances the directors regret that it is not possible to earn dividends. At the commencement of the war the zinc concentrator was at once shut down, but as there was temporarily a rise in the price of lead, and the demand for this metal seemed likely to be maintained, the lead concentrator was continued in operation, mainly in order that the labor on the field should suffer as little as possible through unemployment. It was, however, plainly impossible that this could be long continued unless the concentrates could be sold. The cost of running the lead department is over £10,000 a month, and at this juncture the company's cash resources are limited in consequence of capital expenditure in the enlargement of the plant, and the recent acquisition of the interest in the Broken Hill South Extended property.

Negotiations for combination between the leading companies were commenced at an early period in order that the mines might continue in limited operation on joint account, but the probable demand for lead is not large enough to justify the belief that on any equivalent scale of operation the companies could even pay expenses. Nothing has been yet agreed. The directors are engaged in investigating the conditions of zinc smelting throughout the world. Hitherto the largest part of the production of spelter for European consumption has come from Germany and Belgium. It is believed that the Germans will have taken good care to demolish the Belgian smelting plants, and it is reasonable to suppose that the German works will not escape intact. Even after the close of the war, which may be long, it will probably require a lengthy period before the smelters will be able to cope with the supply of concentrates or the demand for spelter. The conclusion appears to be that the company should erect its own smelting plant with the double object of increasing its profits and the removal of this business from Germany to England. The chief difficulty is the size of the works required and the corresponding amount of capital which would be necessary for their construction and operation. This problem is under careful consideration.

* * *

De Beque Petroleum Field in Colorado

By G. R. De Beque*

The recent discovery of oil in paying quantity, at De Beque, Mesa County, Colo., opens up an oil field that gives promise of considerable importance. A general resumé of the geology and history of the oil development in that vicinity may be of interest. I am indebted to a report published by the U. S. G. S. in 1913 for much of the information contained herein but am likewise personally familiar with the region.

The district embraces about four townships in Garfield and Mesa Counties. The main line of the Denver & Rio Grande crosses the southern part of the field. The town of De Beque, on this railroad, is an important supply point for the territory to the north, east and south. The area is traversed, also, by the Grand River, one of the largest streams in Colorado, the town of De Beque being at the junction of Roan Creek with this river.

In recent geological time, the surface of this area extended from the plateau region on the north to Battlement Mesa on the south. Through this plateau the Grand River has cut a valley 3600 ft. deep. The rocks exposed and underlying the surface in the area are sandstone and shale of Tertiary and Cretaceous ages. The rocks close to the surface are assigned to the Green River and Wahsatch formations of Tertiary age, while the Mesaverde formation of Cretaceous age is not far below. The important oil strata are found in the Mesaverde formation. There are numerous anticlines, the principal one having an east-west course across the southern part of the field and a maximum throw of 35 ft.

Petroleum was first discovered in 1902, at a depth of 614 ft. in De Beque well No. 1. Excitement followed this discovery and ten wells were drilled in two years, the deepest attaining a depth of but 1000 ft. Difficulties with caving grounds and fresh-water sands made so much casing necessary that, by the time bores reached any great depths, they were generally so reduced in size that continuation of operations was impossible. Oil was developed in all but two of these wells and some of them would have proved profitable producers had they been pumped. A strong flow of natural gas was encountered in every bore but this gas has never been commercially utilized and has been flowing to waste for 12 years.

Prospecting for oil was discontinued in 1903 through lack of financial backing to carry on the work; but, in 1911, the work was resumed by local people and a well, started with a 14-in. bore at the surface, was drilled to a depth of 1365 ft. Here the casing collapsed from pressure of gas and water and it was found impossible either to repair or to remove the injured casing. The gas flow from this well has been estimated at 250,000 cu.ft. per 24 hours.

A second well was drilled near the dome of the east-west anticline in the southern part of the field. The depth and thickness of the different oil sands encountered in this hole are:

At 785 ft., 1.5 ft.
At 1130 ft., 5 ft.
At 1435 ft., 20 ft.
At 1550 ft., 50 ft.
At 1807 ft., 50 ft.
At 2010 ft., thickness as yet not determined.

The sand encountered at 1550 ft. was so compact that it did not permit a free flow of oil. An attempt was made to shoot the well but the charge exploded before reaching the bottom. This resulted in ruining a section of the casing, admitting a flow of fresh water that congealed the paraffin and stopped the flow completely. At a depth of 1807 ft., another sand gave a steady flow of high-grade oil but the drillers, desirous of making a big showing, drilled too far, penetrated this sand, entered a fresh-water sand directly beneath, and the flow of oil was thereby again stopped. After casing off the oil and water, drilling was resumed. At 2010 ft. the drill penetrated a hard capping and entered another oil sand. The immediate rush of oil and gas produced an explosion that

Night Picture of the Well That Was Drilled and Collapsed in 1911 was plainly heard in the town one mile away. Oil shot into the air to a height of 75 ft. and, igniting from the forge-fire near-by, consumed the entire rig. After quenching the flame, a new derrick was erected, the drill was run down 7 ft. into the oil sand and a pump was installed. The first pumping record showed a flow of 20 bbl. per day. The flow increased during the first week to 100 bbl. per day and the indications are that the well will soon be pumping a still larger quantity of oil alone.

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*Mining engineer, Denver, Colo.

This oil is golden brown in color, has a 32% paraffin base, is extremely viscous and solidifies quickly upon exposure to the air. Due to the possible recovery of numerous valuable byproducts in the refining process, this oil has a commercial value of $1.50 to $2.50 per barrel.

Further development of this oil field will be accompanied by the installation of a local refinery and the construction of a pipe line to the Rangely field that lies about 50 miles to the north.

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Cottrell Plant for Converter Gases at Garfield, Utah

A commercial-size plant for the electrostatic treatment of converter gases by the Cottrell method has just been placed in operation at the Garfield Smelting Co.'s works at Garfield, Utah. The new Cottrell plant was described by Supt. W. H. Howard in a paper[1] before the American Instute of Mining Engineers.

The converter gases which are destined for Cottrell treatment for recovery of lead fumes, etc., pass through a long steel flue of 210-sq.ft. cross-sectional area and about 1000 ft. long, precipitating the cupreous materials from the smoke and cooling the gases for delivery to the electrical precipitator.

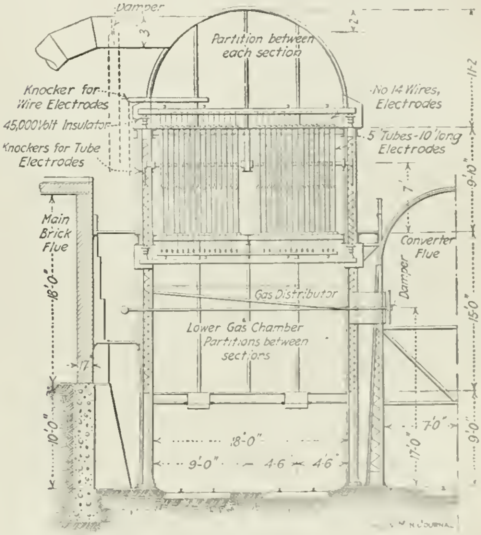
Seven-Unit Electrical Precipitator

The electrical precipitator consists of seven units, containing 360 5-in. pipes 10 ft. long per unit, and a total of 2520 pipes for the whole installation; the other electrodes are No. 14 steel wires hung in the center of the pipes. Six units will ordinarily be operated while one is being cleaned. On the basis of seven operating, with an output of 250,000 cu.ft. of gas, a velocity of 12 ft. per sec. will be obtained; on the basis of 200,000 cu.ft. a velocity of 9.6 ft. per sec., and with six units on the same volume, 11.2 ft. per sec., all within the required velocity for the special treatment of converter smoke. Certain changes contemplated in converter hoods will further reduce the volume of gas delivered to the treater. Gases from the converter flue will be delivered to the lowest chambers of the treater through 36-in. pipes, there being three pipes per unit; each pipe has a deflector extending across to insure the best possible distribution. The gases on reaching the upper chambers pass through 36-in. pipes to the main flue leading to the chimney, there being three pipes per unit, again tending to the maintenance of an even flow through the electrodes.

Transformer and Rectifier House

With the apparatus used in an experimental converter-gas plant of 608 pipes, it was estimated that the maximum power required was 25 hp. In determining the size of transformers necessary for the new installation, this figure was used as a basis. As the units consist of 360 pipes each, and as it may be necessary at times to connect two on the same transformer, it was decided that 20-kw. transformers would have liberal capacity for any condition that might arise. The power necessary for the treatment of 250,000 cu.ft. of gas per min. will probably amount to 100 hp. The electrical apparatus includes seven complete motor-generator-rectifier sets and transformers, and switchboard panels to control these.

A set consists of a 30-hp., 250-volt, direct-current motor, direct connected to a 20-kw., 4-pole, 60-cycle, 220-volt single-phase alternating-current generator. The 220-volt current is stepped up to 20,000 to 30,000 volts by means of a 20-kw. transformer, and then led back to the rectifier, which is on the same shaft with the motor-generator. Here it is rectified before going to the treater. The voltage before going to the transformer may be regulated to any desired value by varying the field excitation with a rheostat on the switchboard.



Cross-Section of 360-Tube Cottrell Unit at Garfield

On the switchboard are located the necessary switches and instruments for the motor-generator sets. Each generator circuit is supplied with an automatic circuit-breaker switch which can be set to carry a short circuit for a definite length of time before opening. The new commercial-size plant has not been in commission long enough to justify any conclusions other than those already worked out in the experimental plants.

Early Experiments at Garfield

Besides describing the commercial plant, Mr. Howard discussed the general features of the precipitation problem at Garfield. Some of the experimental data are given below and the fractional-precipitation tests made on the lead gases at Murray will be of special interest to lead metallurgists.

When experiments were begun at Garfield to determine if the lead fumes in the copper converter gases could be recovered at reasonable expense, two methods suggested themselves: (1) Filtration through bags, (2) electrical precipitation of the condensed fume by a Cottrell plant.

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[1] "Electrical Fume Precipitation at Garfield," "Bull." A. I. M. E., August, 1914.

Tests in filtering the converter gases through the ordinary woolen bag developed that the converter gases at Garfield did not contain in themselves sufficient neutralizing elements for the purposes of direct-bag filtration. While blowing on white metal only, the fabric was usually destroyed in from 10 to 14 hr.; when blowing on matte, the bag in one instance lasted 60.5 hr. Owing to the constantly changing quantities of SO_3, it was considered impracticable to feed the necessary amount of neutralizer without great waste, and hence baghouse treatment of these gases was considered impracticable.

The Cottrell process was next considered. Under existing conditions at Garfield, it was not imperative to effect a complete elimination of SO_3, and a method was sought that would recover the valuable constituents of the gases.

The Cottrell process described in its simplest terms consists in the conversion of a high-tension alternating current of 30,000 to 60,000 volts into a direct, intermittent current of the same potential, and the application of this current to certain electrodes suspended in a flue conveying the gases to be treated. The electrodes in their simplest form consist of narrow suspended plates spaced from 5 to 12 in. apart, depending on voltage; between adjacent plates, parallel and equidistant from them, is stretched a fine wire to every space, the wires forming the discharge electrodes and the plates the collecting electrodes. There is thus maintained through a silent or glow discharge an electrically-charged field through which the gases travel and all dust or condensed fume or moisture becoming electrified is deposited on the plates.

At Garfield, the volume of gas including entrained air at the converter hood produced from each Pierce-Smith converter, calculated at standard temperature and pressure, was found to approximate 25,000 cu.ft. per min., equivalent to over double that volume at flue temperature. An average of four to five converters is operated under normal plant conditions, and practically there are never over four blowing simultaneously, equivalent to a production of 200,000 cu.ft. of gas per minute at flue temperature for the whole department.

The ratio of SO_3 to SO_2 has been variable, depending on the character of the matte treated and on the period of the blow; the average of several determinations showed 1 to 18, but the ratio was as high as 1 to 8 at times.

The Cottrell precipitating plant used by the Balaklala Consolidated Copper Co. at Coram, Calif., was studied with a view to profiting from that experience. There the apparatus worked best with gases between 120° and 140° C. A temperature approaching but not less than 120° seemed most desirable, though in the light of later knowledge this was not deemed sufficiently low to condense all smoke-forming elements, which on being discharged into the atmosphere became visible as smoke. At the Coram plant, the collecting electrodes used were suspended sheet-iron plates, 6 in. wide by 10 ft. long, spaced 5 in. apart. The discharge electrodes consisted of two iron-wire strands in which were twisted pieces of asbestos fiber forming numerous points for the discharge of the high-tension direct-intermittent current of 28,000 to 30,000 volts. The recovery of solids from the smoke was usually from 80 to 90 per cent.

As the result of experimentation at Garfield by Messrs. Rathbun & Barker, a 50,000-cu.ft. converter-gas treater was erected, using pipe electrodes instead of plates as a collecting electrode, and substituting a single wire for the pubescent discharge electrodes used at Balaklala. This preliminary plant was equipped with 608 five-in. pipes, so that on the assumption of the treatment of 50,000 cu.ft. of gas per min., the average velocity through the pipes would be about 10 ft. per sec., or the gases would be under treatment for one second in a 10-ft. pipe. Gases from the blast furnaces, from McDougal roasters and from reverberator furnaces were tested in a smaller plant, and it was found that to obtain "perfect clearance," the velocity had to be reduced to about 3.5 ft. per sec. in the pipes. In special experiments with gases diluted with air, perfect clearances were obtained with a velocity of 7 ft. per sec. in the electrodes; this was equivalent to reducing the particles per unit of volume, and such a condition would be obtained by passing gases through a proper settling chamber preparatory to Cottrell treatment. It was found that mixed gases from the various furnaces could be treated with results equally as good as for the blast-furnace and roaster gases separately.

RESULTS OF GARFIELD EXPERIMENTS

The results of the tests at Garfield from December, 1912, to April, 1913, were:

(1) The establishment of the pipe electrodes, now generally being adopted in Cottrell installations.

(2) The replacement of the pubescent electrode by a single wire.

(3) Proof that from 95% to practically complete clearance of Garfield gases can be accomplished if temperatures be maintained under 100° C.

(4) That by the treatment of gases at different temperatures by feeders in series with the necessary drop in temperature between feeders, fractional precipitation may be possible. For example, collecting the bulk of the lead in one treater and then by the further cooling of gases collecting most of the arsenic, sulphuric acid, etc., in a second treater.

The method of fractional precipitation has since been experimentally tried on the roaster gases at the Murray plant of the American Smelting & Refining Co. Dust, acid and moisture carried by the gases produce a sticky, muddy deposit on the electrodes when tried in one treater, and the difficulty of removing this mud became a problem. Two small treaters were then placed in series. The temperature of the gases entering the first treater averaged 125° C., and in the second treater at 70° C. In the first as high as 95% of the total precipitate was collected in a comparatively dry condition. In the second treater, most of the remaining dust, acid and water, approximating 4%, was collected, sometimes sufficiently moist to drip from the pipe. It is too early to state that this problem has yet been completely solved, as the maintenance of proper temperatures is of critical importance to the work. While experimental results have warranted trying the process on a large scale at Garfield, there is as yet no definite assurance that the element of time may not develop difficulties not now apparent. The Garfield and Murray gases were considered particularly favorable to treatment by the Cottrell process.

Details of Practical Mining

Cutting Up a Boiler with Dynamite

By Arthur O. Christensen*

The accompanying illustrations show how a boiler, which had been sold for scrap iron, was broken up by means of dynamite. Being too heavy to move intact except at considerable expense, it was broken into three pieces and the dome taken off at an expenditure of about three hours' labor by two men and a box of ⅞-in., 50% dynamite. Another boiler broken up at this time by cutting the rivets, required the time of two men for the greater part of a week.

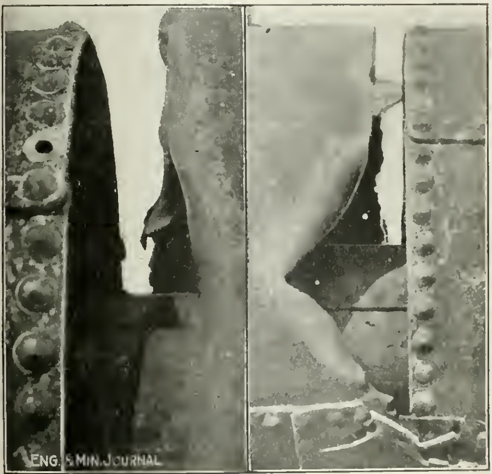

Fig. 1. Fig. 2.
The Two Cuts Made in the Boiler Shell

The dynamite was removed from its wrapper and plastered snugly against the boiler close to the lap joint, a belt of sticks end to end being carried all the way around the boiler. The lower half of this belt was formed by stringing the sticks on a piece of wire like beads and holding them against the boiler by tightening the wire.

The cut shown in Fig. 1 was made thus; the iron was bent down where torn. Fig. 2 shows the other cut; in this case the dynamite was tamped by covering with clay. The boiler plate is shown cut off sharp. Evidently the force of the explosion was exerted more quickly or at least was more concentrated.

Both figures show the two inner tubes of the boiler still unbroken. They were cut in the same way that the shell was. The dome was similarly removed. Firing was done electrically and only two blasts were necessary for the job.

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*Mining engineer, Franklin, N. J.

Canvas Pipe for Blowers

By Edward P. Scallon*

The underground mines of the Mesabi Range secure their air supply through systems of natural ventilation. Most of the mines are amply supplied by currents between the hoisting shafts and openings made for lowering timber into the workings, while others make connection into adjoining openpits or underground mines.

In some of the older mines, however, difficulty is experienced at times in distributing sufficient fresh air to working places situated on dead end drifts. This is especially true in drifting or slicing under the timber mat.

These conditions have been successfully overcome at the Lincoln mine, Virginia, Minn., by the installation of small portable blower fans on drifts or crosscuts carrying the main air currents at the nearest points to the areas to be ventilated. The air is carried from the fans to the working places by means of canvas pipe from 8 to 12 in. in diameter; this is either run along the floor of the drifts or hung from the timbers by means of wires attached to ordinary nail-keg hoops slipped over the pipe. This piping was purchased from George B. Carpenter & Co., Chicago, and is not expensive as compared to metallic tubing. It serves all the purposes for which it is intended and has a distinct advantage over rigid pipes in the rapidity with which it can be installed, especially where curves in the line are required. Galvanized iron nipples and elbows are used to make connections and branches. The pipe at the Lincoln has been in service for 18 months and is still in good condition. It has been found, however, that the life of the canvas can be prolonged by one or two treatments with linseed oil previous to its installation in the mine. In one of the neighboring mines the canvas treated in this way was completely ruined by rats and it was necessary to discontinue this practice. Damage results also from neglecting to remove the free end a sufficient distance from the breast before blasting.

The blowers are No. 4 Buffalo, belt-connected to Crocker-Wheeler motors, the set mounted on a base made of two 2x6-in. planks. An ordinary timber truck is used to move the set from place to place in the mine. The fans are run at a speed of 2610 r.p.m. and each unit is capable of ventilating two or three working places and when used as a booster in an air-way often gives the impetus necessary to properly ventilate a large area. In addition to the installations at the Lincoln there are several other blower fans on the Mesabi range, one mine at Chisholm receiving its full supply of air from a fan at the shaft collar.

Natural ventilation at the Lincoln is aided also by chimneys over up-cast shafts, and steam pipes within them, by doors and brattices underground and by doors over the down-cast shaft which open toward the [illegible] points of the compass, so as to take advantage of the momentum of the various winds in assisting the motive column underground.

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*Mining captain, Lincoln mine, Virginia, Minn.

Resuscitation

The Bureau of Mines in *Technical Paper 77*, gives the report of the committee on resuscitation from mine gases. The committee was composed of doctors. After reviewing the committee report, the Bureau engineers make the following recommendations in cases of gassing or shock:

In case of gassing, remove victim at once from gaseous atmosphere. Carry him quickly to fresh air and immediately give manual artificial respiration. Do not stop to loosen clothing. Every moment of delay is serious.

In case of electric shock, break electric current instantly. Free the patient from the current with a single quick motion, using any dry nonconductor, such as clothing, rope, or board, to move patient or wire. Beware of using any metal or moist material. Meantime have every effort made to shut off current.

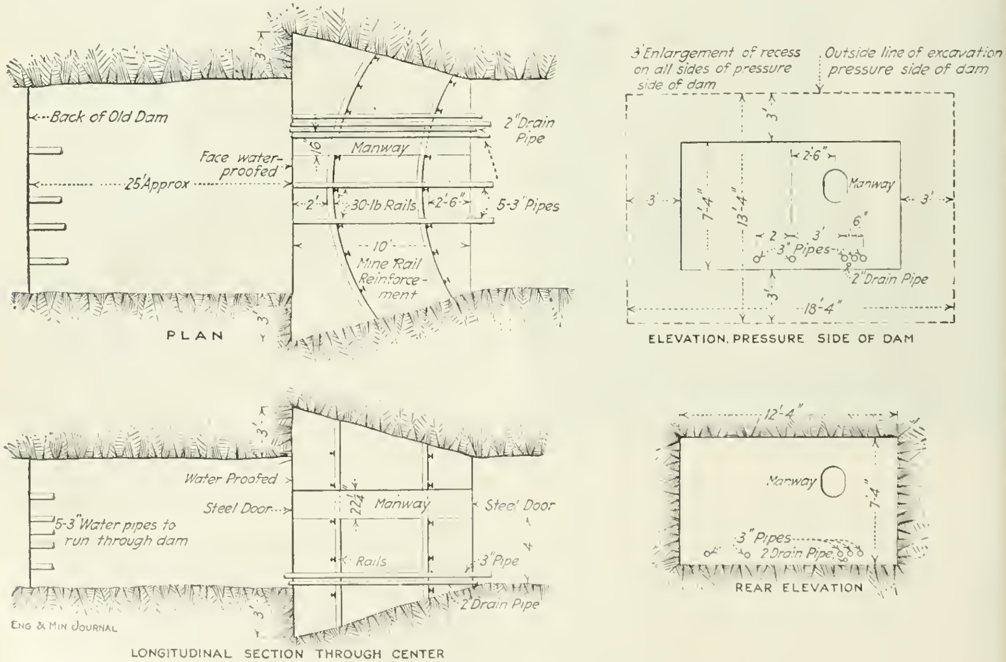

Fig. 1. Plan and Longitudinal Section and End Elevations

Attend instantly to the victim's breathing. If the victim is not breathing, he should be given manual artificial respiration at once. If the patient is breathing slowly and regularly, do not give artificial respiration but let nature restore breathing unaided.

In gas cases, give oxygen. If the patient has been gassed, give him pure oxygen, with manual artificial respiration.

The oxygen may be given through a breathing bag from a cylinder having a reducing valve, with connecting tubes and face mask, and with an inspiratory and an expiratory valve, of which the latter communicates directly with the atmosphere.

No mechanical artificial resuscitating device should be used unless one operated by hand that has no suction effect on the lungs.

Use the Schaefer or prone pressure method of artificial respiration. Begin at once. A moment's delay is serious.

Continue the artificial respiration. If necessary, continue two hours or longer without interruption until natural breathing is restored. If natural breathing stops after being restored, use artificial respiration again.

Do not give the patient any liquid by mouth until he is fully conscious. Give him fresh air, but keep his body warm.

Send for the nearest doctor as soon as the accident is discovered.

Concrete Bulkhead under 200-lb. Head*

At the Hibernia magnetite mine in New Jersey, it was found desirable to separate the old workings from the new and to allow the former to fill to the 850-ft. level. There was a temporary bulkhead on the 10th level and a rock bulkhead of indeterminate thickness on the 16th level. The water pressure on the 16th-level bulkhead would be 200 lb. per sq.in., with the old workings filled. It became necessary to design and install new bulkheads. For the 16th level, the truncated-wedge design of dam was adopted. The pressure side of the dam is of greater area than the back, so that the resultant action is similar to driving the wedge. By cutting generous skewbacks in the walls, roof and floor, this becomes in reality an invisible arch. The wedge feature tends to compress the materials in the bulkhead, thereby adding to its imperviousness.

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*Taken from an article by Sidney L. Wise and Walter Strache in the A. I. M. E. "Bulletin," August, 1914.

Concrete was chosen as the material. To lessen the labor and simplify form construction, straight forms were placed on both the front and back of the dam, making the arch invisible.

As ordinary concrete is not impervious under a head of 200 lb., it was decided to waterproof the concrete by facing the entire pressure side with a 3-in. layer of "Impervite," a waterproofing compound. This facing was carried up with the concrete to insure a perfect bond. A manway through the dam was provided to permit inspection or repairs.

The relative positions of the old and new bulkheads are shown in Fig. 1. The old bulkhead leaked to the extent of about 16 gal. per min. The five pipes through it permitted pumping to the surface the water from behind it. The new bulkhead was designed to continue this function of drainage if it were necessary, and hence prolongations of the pipes were carried through it.

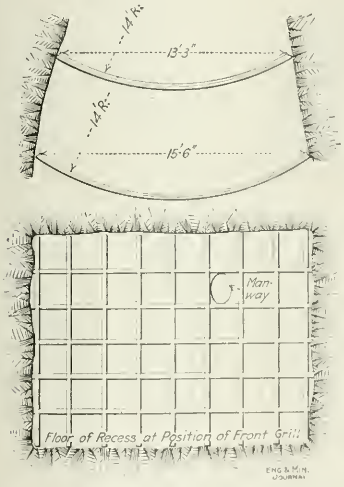


FIG. 2. THE STEEL RAIL REINFORCEMENT

The details of the steel reinforcement are shown in Fig. 2, the horizontal rails being curved to the radius of the invisible arch. Great care was taken thoroughly to coat all metal surfaces with mortar. The design of the manway is shown in detail in Fig. 3.

It was decided to use a 1 : 2 : 4 mixture. The cement was Atlas portland; a local sand, carrying less than 3% of foreign matter, was obtained; the broken stone was a gneiss, the result of former milling operations.

In drilling the recesses for the bulkhead, care was taken to point the holes so that the excavation would coincide with the design in form and dimensions. At a distance of 25 ft. from the old dam, holes 36 to 39 in. in length and spaced 1 ft. apart were drilled in the sides, roof and floor, at right angles to the course of the drift, using stoping and hand drills. Thirty-five feet from the old bulkhead, a series of holes 1 ft. in length and from 1 to 1½ ft. apart were placed slanting to conform approximately with the inclinations of the skewbacks. These holes were burdened with only about 1 ft. of ground. Under ordinary conditions, longer holes would have been drilled, but the proximity of operating pumps made extraordinary precautions necessary for their protection during the shooting. A group of six holes was shot at a time. A third series of holes was drilled slanting to conform with the deeper portions of the recesses. When blasted, this series broke evenly at the line of the 3-ft. hole first drilled, and the resultant recess conformed almost exactly to the figure determined upon, while the total excavation agreed with the original estimate of 60 yards.

The materials required were stored close to the shaft collar. Due to the lack of space on the level, the matter of delivering the materials without interrupting work was troublesome. Sand and stone were sacked on the surface. The empty bags produced as the cement was used augmented the 200 old cement bags purchased for the sacking. A small night crew lowered much of the material required for the next day's work.

The 10 curved rails were bent on the surface over a 14-ft. radius. The bulkhead forms were built of 2-in. undressed lumber, with 6- to 10-in. round posts for studding and braces. The forms were thoroughly braced and were wired to stiffen them. The interior faces of the forms were covered with tar paper, and the junction of the forms with the rock was plastered with a 1 : 1 cement mortar on all sides. The pressure-side forms were carried to the roof of the level at once, but did not extend into the recess.

The recess was thoroughly cleaned of loose rock and washed down, and all the reinforcing material, the pipes and the manway were placed in position before the concreting was started. The floor and sides of the recess were plastered with a 1 : 1 cement mortar before placing the concrete.

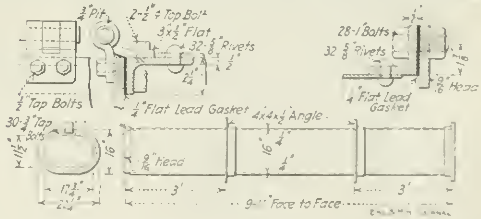


FIG. 3. MANWAY TUBE THROUGH THE CONCRETE

A batch of concrete contained ⅔ cu.yd. The sand was first placed on the mixing platform and the heaps flattened down. On this was emptied the cement, and these two materials were thoroughly mixed and flattened out before receiving the stone. This mixing took place about 12 ft. from the front form of the bulkhead. Enough water was used to make a wet mixture. Two men did the first mixing and turned the mass, then passed it on to the next two, who again turned it, passing the finished concrete to the last two men at the mixing board. These men shoveled directly into the form. In this manner, while each two men received a short rest of a few minutes between batches, fresh material was being [illegible] on the starting end of the mixing platform while the men nearest the form were still disposing of the [illegible] mixture. This also insured a thorough mixing. One man remained in the form to level off each batch. The best day's work consisted of placing 12 yd. of concrete.

The waterproofing compound was carried up as a 3-in. facing, level with the concrete. An even thickness of the waterproof layer was maintained by the use of three forms of 3/64-in. plate, 6 ft. long by 6 in. wide, fitted at the upper corner with 3-in. spreading bolts. These forms, placed across the entire width of the face, were raised 3 to 4 in. at a time, and enough concrete was then shoveled against them to keep them in place. The almost semi-liquid waterproofing compound was mixed on the level and was carried to the forms in buckets.

Before leaving at night, sharp stones of about 100 lb. weight were set at least 6 in. apart in the concrete mass. This made a strong bond, and before concreting the next day, this rough surface was freshly plastered with a thin 1:1 mortar. As the roof was reached, false forms were placed, and the work was finally finished in tightly bonded dovetailed blocks. Thoughout the work, the leakage from the old dam passed through the 2-in. drain pipe of the bulkhead.

Seven 2-in. grout pipes, four on the pressure side and three on the opposite side, were placed in the concrete as the work neared completion. They were all placed near the roof and directed to the places most difficult to fill with concrete. As the work had to be hurried, but a day and a half elapsed after completion of the cement work before grouting was begun. The grout consisted of one and one-half parts of sand to one part of cement made fluid with water-dissolved "Impervite." A mine-made grout gun was used and the grout was forced successively into the several pipes by means of air under the pressure of 85 lb. per sq.in. When the grout was forced through the different pipes, its ejection through the other pipes indicated that the greater voids were filled. As the gun connections were changed, those pipes giving the greatest discharge were plugged, and the discharge was finally limited to one pipe. This, too, was filled and plugged. The first day's grouting was allowed to set over night, and the following day all the pipes were again tested. This time there was no communication between the pipes, and as little or no grout could be forced into any one of the pipes, the grouting was considered most satisfactory.

For three weeks the new bulkhead did not receive any load. During this time the 2-in. drain pipe was left open. The bulkhead was tested by pumping water up to the pressure of 160 lb. into the space between the old and the new bulkheads through the 2-in. drain pipe. The results were entirely satisfactory; the total seepage amounted to only 1/2 gal. per min. at first, and this small leakage subsequently stopped almost completely.

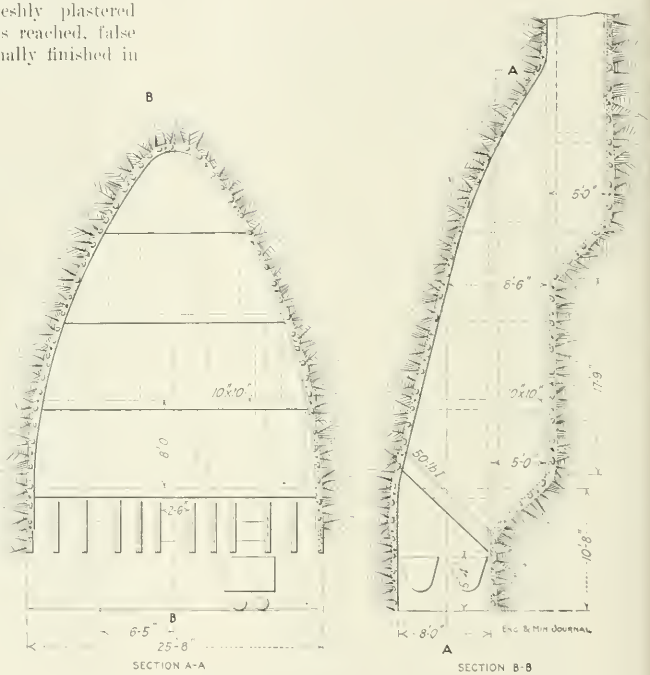
A cheap class of labor was employed exclusively, the men receiving $2 per 10-hr. shift. Following is a table showing the cost of the work. The interference caused by the necessity of keeping two large pumps in operation within 50 ft. of the bulkhead was perhaps the greatest cause for the apparent high cost. The labor cost of lowering materials was also high.

SUMMARY OF COSTS

	Total	Per Cu.Yd
Labor	$790.00	$13.17
Superintendence	130.00	2.17
Transportation	50.46	0.84
Materials	503.88	8.38
Totals	$1474.34	$24.56

Concrete Storage Chutes in Stopes*

It has been found economical at the Copper Queen for certain kinds of ore, to put in concrete pockets and cylindrical raises to be used as storage chutes, since the upkeep cost is practically nothing, whereas with timber chutes this is high.



Vertical Sections of a Concrete-Lined Pocket in a Copper Queen Stope

The drawing shows a concrete pocket built particularly to handle sticky ores from the Dividend slice. It has the shape of a funnel, with the large end downward. About 30 ft. above the sill, in the top of this funnel a 45° offset or baffle was put in, and from this point the raise was continued to a level 200 ft. above the sill. This raise is circular and lined with concrete, and, while it has not yet been proved that this type of pocket will be successful, it is confidently believed that it will materially lower the cost of handling the ore.

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*From A. I. M. E. "Bulletin," August, 1914.

Details of Milling and Smelting

A Simple Solution Meter

Operation of the counter-current decantation process at the Tom Reed mill, Oatman, Ariz., necessitated some method of accurately measuring, and regulating, the amount of solution drawn off for precipitation. The problem was solved by S. S. Jones, superintendent in charge of the property, by arranging a 6x6-ft. tank into which all solution precipitated is collected. The tank has two discharge nozzles, one 1 in. diameter and one 1¾ in. in diameter. They have taper of 12½% from the axis of the nozzle, with a coefficient of discharge practically equal to unity. The flow has been calibrated by measurement over stated periods of time, finding that the ratio of actual to theoretical discharge varies from 99.8 to 100, and 100.03 to 100. A Bristol water-level gage allows the head to be averaged for any period.

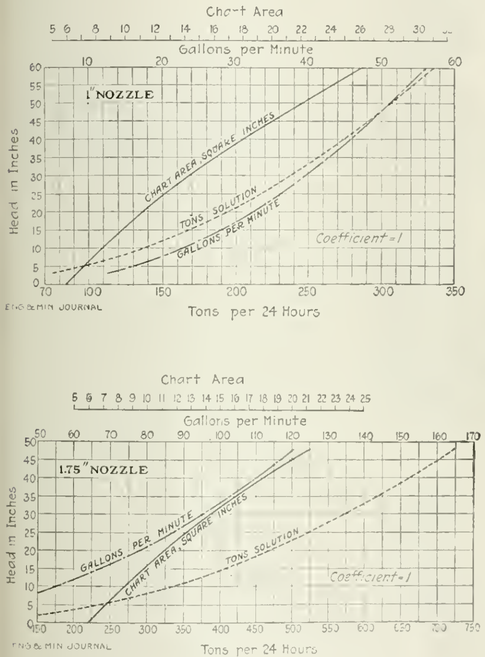

Chart of Solution Flow through Different Nozzles

Solution measurement is based on the equation in which the discharge in cubic feet per second equals

$$AC\sqrt{2gh}$$

where C is the coefficient of discharge, A the area of nozzle in cubic feet, g the acceleration due to gravity, and h the head of solution in the tank in feet. Charts were plotted from this equation for each nozzle, and are shown in the accompanying illustration. The arrangement is entirely satisfactory. There is but one moving part, the dial of the gage. The whole system was worked out and designed at the Tom Reed plant, with the single exception of the water-level gage.

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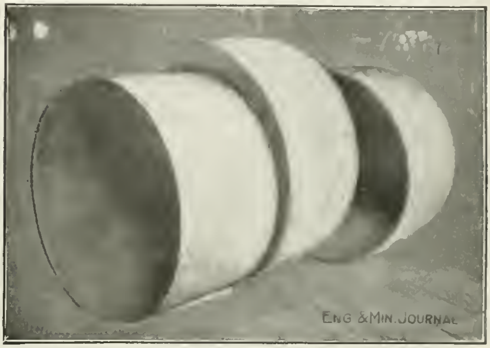
Roll Shells

The accompanying photograph shows how thoroughly modern roll shells are worn down before they are discarded. The picture is of some 54x24-in. shells used by the Anaconda Copper Mining Co. When put on the rolls they are 5 in. thick, as shown by the shell in the center; when discarded they are only ¾ in. thick.



54x24-In. Roll Shell

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Electro-Deposition of Lead from Lactate and Formate Solutions*

The attempt to get smooth coherent deposits of lead from lead lactate and lead formate solutions has been made by Frank C. Mathers and Barrett W. Cockrum. The addition of glue and free acid did not give good results, such as are obtained with hydro-fluosilicic and perchloric electrolytes. The conclusions of the authors are:

The baths that give the best deposits contain 1% of lead as lactate or 2% as formate, 1 to 5% of lactic or formic acid, 1% of ammonium perchlorate, and 0.25% of Barbados aloes. The mixture was warmed and then filtered in order to remove the insoluble gum in the aloes.

Other addition agents than Barbados aloes were tried, but of these peptone was the only one of marked value. A current density of 3.6 amp. per sq.ft. was found to be best. With higher current densities, the deposit became rougher. These deposits were obtained without difficulty. The specific gravity of this electro-deposited lead was 11.25 and 11.28 for lactate and formate baths, respectively. Sodium naphthalene sulphonate can be used instead of ammonium chlorate. Other salts of strong acids did not give as good results as the perchlorate.

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*An abstract of a paper presented at the Niagara Falls meeting of the American Electrochemical Society, Oct. 1-3, 1914.

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Arrangement of Reverberatory Waste-Heat Boilers

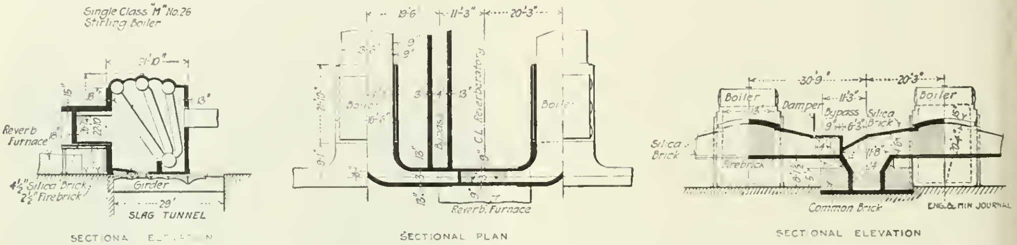
By Percy E. Barbour*

When waste-heat boilers were first applied to utilize hot furnace gases, it was general custom to use two boilers in tandem. It was soon discovered that the second boiler was little more than an economizer and was an expensive unit as such and therefore two boilers in parallel were tried instead of the tandem arrangement. This is universal practice now where more than one boiler is used.

The flue arrangements from reverberatory furnaces to boilers vary according to local conditions and the personal equation of the designing engineer. In the accompanying illustrations are shown the installations at three important plants, the International Smelting Co., at Tooele, Utah, the Steptoe Valley Smelting & Mining Co., at McGill, Nev., and the Garfield Smelting Co., at Garfield, Utah. Stirling boilers are used more than any other type for reasons hard to explain, probably. The Steptoe plant has some Babcock & Wilcox boilers, the installation of which is shown, as well as the Steptoe layout for its Stirling installation of two Class S, No. 19 boilers. The installation of the single Class M, No. 26 Stirling at the Tooele plant, and the layout of two Class K, No. 19 Stirlings at the Garfield plant, are interesting.

Although local conditions often control features of design, it may be noted, without being critical, that Steptoe is the only plant, of the three mentioned, to introduce the incandescent gases at a point corresponding to the firebox of an ordinary installation. This is a necessity with the Babcock & Wilcox boiler, but is it not also an advantage with the Stirling?

Provision for bypassing the gases is necessary, and while the periods of bypassing, and thus wasting them, are comparatively of short duration and at more or less rare intervals, right-angle turns in the flues necessarily reduce the draft more than the easy angles of the Garfield arrangement.

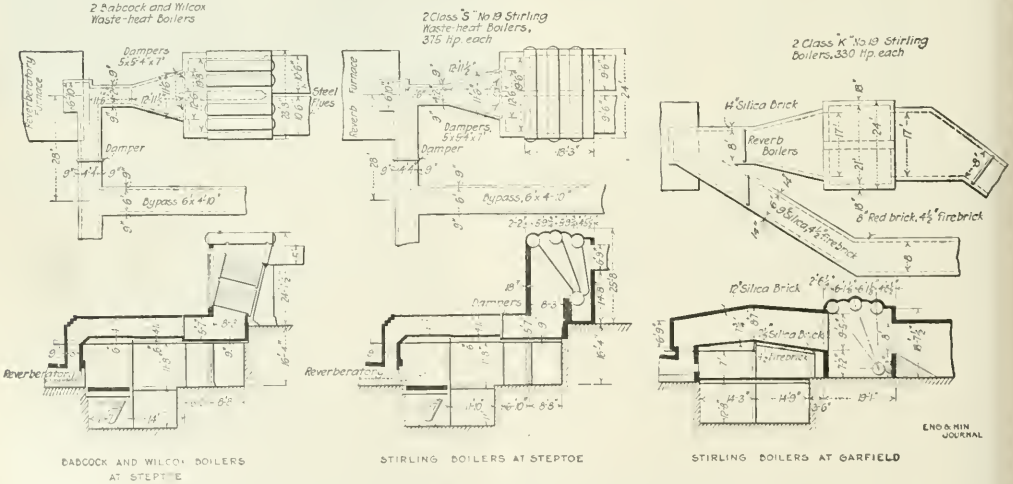


SECTIONAL ELEVATION

SECTIONAL PLAN

SECTIONAL ELEVATION

Arrangement of Stirling Waste-Heat Boilers at the International Works, Tooele, Utah



BABCOCK AND WILCOX BOILERS AT STEPTOE

STIRLING BOILERS AT STEPTOE

STIRLING BOILERS AT GARFIELD

Arrangement of Waste-Heat Boilers at Various Smelting Works

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*Mining engineer, 887 Middle St., Bath, Me.

The Cost of Doing Things

Study of Hoisting Costs in a Small Mine

By H. S. Knowlton*

The investigation of hoisting costs described in some detail in the following paragraphs, is interesting as showing the method of attacking the problem. At the mine, where the investigation was made, a railroad spur runs to the property and the ore is trammed about 200 ft. from the shaft before being dumped into the cars. The mine was operated by both steam and electricity at the time of the test, the compressor being driven by a motor and the hoisting and ore-drying done by steam.

The steam plant has been long in service and was somewhat the worse for wear. The rear grate of the boiler was in poor condition, necessitating carrying the main part of the fire on the front grate. The engine was in fair condition, although steam leaks at its joints were noted. Its movement was reasonably smooth and balanced, but due to the fact that a trip up the shaft was made about every seven minutes, the cylinder cooled off between trips and condensed a large quantity of steam. When the engine was started, this condensed water tended to force out between the joints, since the drains were closed, and this kept the engine constantly in a leaky condition. It was not known how evenly the work of the engine was divided between the head and crank ends of the piston, as no cards could be taken. The engine was never bored for indicating, and when an attempt was made to obtain a card by means of the drain cocks, so much condensation water was encountered that no results were obtained.

The mine runs two shifts of eight hours each, and operates on a seven-day basis. The first day-shift cage goes down at 7 a.m.; at the noon hour, the first cage comes up at 11:50 a.m., and the first cage goes down again at 12:30 p.m.; at the end of the shift, the first cage comes up at 3:50 p.m. The first night-shift cage goes down at 4:30 p.m.; for the lunch hour the first cage comes up at 8:50 p.m. and the first cage goes down again at 9:30 p.m.; at the end of the shift, the first cage comes up at 12:50 a.m. The engineer fires up his boiler at about 6:30 a.m., and maintains full steam until 1 a.m., when the fire is banked until the next morning. The boiler is an 80-hp. Fairbanks-Morse outfit, fired to a steam pressure of about 90 lb. The water is heated to 120° F. before admittance to the boiler. The hoist is a Davis machine of the slide-valve, simple, noncondensing type, with 10x12-in. cylinders run at 250 r.p.m., and exhausting into the air. The drum is 4 ft. in diameter, friction driven. The shaft is 620 ft. deep, and the time of a hoisting trip is about 60 sec. In addition to the steam required by the hoist, some is used in ore drying, the lead being of 1-in. pipe, 100 ft. long, run in the open and covered with 3/8 in. of canvas; the estimated steam consumption of the drier is 10% of the total generated. The coal used comes from Crested Butte, showing on test a heating value of 13,728 B.t.u., is dry and contains only 1% of ash. Its cost, delivered at the mine on a spur track, is $4.50 per ton, and as the spur is 300 ft. from the bins and 30 ft. lower than the latter, the estimated cost delivered at the bins is $5 per ton.

The mine has six levels, of which only the fourth and sixth are worked at present. Ore was being taken only from the fourth at the time of the test, and waste from the sixth, where drifting and sinking were being carried on. The depth from the collar to the fourth level is 468 ft., and to the sixth, 620 ft. The distance from the collar to the sheave wheel is 30 ft. The test was run on two days. On the first day a test of only 10 hr. was obtained on account of an accident to the hoist. On the second trial a full day's test was run, all data being taken from the time the first cage went down the shaft in the morning until the last cage came up on the midnight shift. The test included the two shifts when work was under way, i.e., from 7 a.m. until 1 a.m. No data were obtained during the remaining six hours, the boiler being banked and no ore hoisted.

An observer with a stop-watch was stationed in the engine room; he noted the exact time required for each hoisting trip, the time of day at which the cage was [illegible] on its chair, and the level from which the cage was hoisted. Another man at the top of the shaft obtained the [illegible]

CONDENSED TABLE OF RESULTS

From Fourth Level to Top, 468 Ft

Handling Ore	No. of Trips	Seconds of Hoisting	Rope Speed, Ft. per Min.	Net Weight, Lb.	Gross Weight, Lb.	Ton-Ft.	Average Hp. Rate
1st period....	31	1513		57,084	122,184	28,591	91.0
2nd period....	36	1846		69,903	145,503	34,048	88.9
3rd period....	33	1661		58,990	128,190	29,996	87.0
Total...	100	5020		185,977	395,877	92,635	
Average..		50.2	560	1,860	3,959	926,355	88.9
Handling Men and Empty Cage							
1st period.	14	700		6,773	27,031	6,325	43.6
2nd period.	15	808		8,960	30,665	7,176	42.8
3rd period.	14	693		4,760	25,018	5,854	40.7
Total	43	2201		20,493	82,714	19,355	
Average		51.2	548	476	1,925	451	42.4
All Trips							
Total	143	7221		206,470	478,591	111,990	
Average.		50.6	555	1,445	3,350	783	75.0

From Sixth Level to Top, 620 Ft.

Handling Waste	No. of Trips	Seconds of Hoisting	Rope Speed, Ft. per Min.	Net Weight, Lb.	Gross Weight, Lb.	Ton-Ft.	Average Hp. Rate
1st period	19	1103		25,715	67,344	20,877	91.2
2nd period	15	899		20,361	53,226	16,500	88.4
3rd period	21	1265		28,746	74,757	23,175	88.1
Total	55	3267		74,822	195,327	60,552	
Average.		59.1	626	1,362	3,550	1,100	89.3
Handling Men and Empty Cage							
1st period.	10	637		2,496	17,676	5,84[illegible]	42.0
2nd period	5	306		340	8,030	2,18[illegible]	39.1
3rd period	3	197		1,530	6,144	1,905	46.6
Total	18	1140		4,366	31,850	9,935	
Average		63.1	587	242	1,725	535	42.0
All Trips							
Total.	73	4407		79,188	227,377	70,487	
Average		60.4	516	1,085	3,118	966	77.1

Total Work Done

	No. of Trips	Seconds of Hoisting	Distance per Trip	Gross Weight Lb.	Ton-Ft.	Average Hp. Rate
Ore	100	5,020	468	395,877	92,635	88.9
Waste	55	3,267	620	195,327	60,552	89.3
Men and empty	43	2,201	468	82,714	19,355	42.4
Men and empty	18	1,140	620	32,050	9,935	42.0
Total and average	216	11,628		705,968	182,477	75.6

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*138 Lexington Ave., Cambridge, Mass.

time at which each trip ended, noted the material lifted and the cubic contents of each car. Other men were employed to weigh as many cars of ore as possible, and so obtain for each class of ore raised the average weight of ore per cubic foot. Enough cars of each grade were weighed to give a fair average, the differences lying mainly in the moisture content. But two grades of ore were lifted, one marked "1-hole" and one "2-hole;" the ore contained a large amount of iron sulphide. A good deal of waste was hoisted from the sixth level. The average weight of 1-hole ore was 160 lb.; of 2-hole ore, 145.5 lb.; and of waste, 105 lb. per cu.ft. In the boiler room a man weighed all the coal, read the boiler pressure and the feed-water temperature every 15 min., and noted the amount of water fed into the boiler. At the end of the test, the weight of ash from the coal was obtained.

In the tabulation of data summarized below, the gross weight is made up of one-half the weight of the rope corresponding to the length of the hoisting trip, plus the full weight of the rope from the landing point to the sheave pulley, plus the weight of the car and cage. These weights were as follows: Cage, 1130 lb.; car, 653 lb.; half weight of 7/8-in. rope, fourth level to top landing, 281 lb.; weight of rope, top landing to sheave, 36 lb.; half weight of rope, sixth level to top landing, 372 lb. The weight of the cage was obtained by actually weighing it free from any support due to bearing on the guide rods or to the cable. The weight of the car was the average of all empty cars weighed while weighing the ore and the weight of a man in mining clothes was assumed as 170 lb.

The average rate of work was 914 ton-ft. per min. The total time consumed in hoisting was 193.8 min., or 3.23 hr. The average horsepower rate was 75, hence a total of 242 hp.-hr. of work was performed. Knowing the quantity of coal used, the consumption per horsepower-hour is 10.3 pounds.

In these calculations, one horsepower is assumed as equivalent to 415 ft.-lb. per sec. This allows 24.6% for mechanical friction and other losses and is sufficiently close for approximation. The average time consumed in lowering the cage to the fourth level was 46.3 sec. and to the sixth level, 67.2 seconds.

The steam-plant test showed that in the two runs, the coal consumption was 2482 lb., or 4.6 lb. per sq.ft. of grate surface per hour. The boiler evaporated 7.36 lb. water per pound of coal, and the ash was 6%. The data secured indicated that about 1700 lb. of coal is required for an ordinary day's run of the plant. A monthly fuel consumption average of 26 tons was indicated. The monthly cost of coal for hoisting operation was figured at $177, not including the 10% for the drier. A fixed charge of $15 per month is paid for water, regardless of the amount used.

During the first test, 61,334 foot-tons of work was performed with a coal consumption of 902 lb. Deducting 10% for the drier, 85 foot-tons was performed per pound of coal as fired. In the second test during the first shift a total of 60,213 foot-tons of work was performed with a net coal consumption of 630 lb., giving 69.1 foot-tons per pound of coal. The total work per shift was practically the same for each of the three shifts of the test. The average amount of useful work performed by the hoist per day was estimated at 122,000 foot-tons. The actual working time of the hoist was found to be 126.25 min. per day, giving an average rate of work of 58.6 hp., or an output of 123.29 hp.-hr. useful work per day. Tests upon a hoist of the electric type similar to the equipment at the mine showed 68% overall efficiency, controller to cage, so that it was calculated that the service at the mine under test could be handled by a supply of 181.5 hp.-hr. per day, equivalent to 4115 kw.-hr. per month.

At present the steam hoist operates at a rope speed, varying from 500 to 600 ft. per min. As but about 75 trips are made per shift, this speed could easily be cut down. The time for lowering the cage is 46.3 sec. to the fourth level, and 67.2 sec. to the sixth level and about three-quarters of the load is hoisted from the fourth level. Thus one minute is ample time for lowering the cage. Allowing one minute at the top and bottom, respectively, for changing cars, it appears that a total of 225 min. out of a possible 480 are required for lowering the cage and changing the cars. This leaves 255 min. for hoisting proper. With a rope speed of 300 ft., about two minutes would be necessary for the average lift, taking in all from 150 to 200 min. per shift. Thus it is seen that 300 ft. is a sufficiently high rope speed. The maximum demand will be calculated on both a 500- and 300-ft. per min. rope speed.

The maximum load weighed 4180 lb. gross. With a rope speed of 500 ft. per min., this would require $\frac{4200 \times 500}{33,000}$, or 63.6 hp. of useful work. Applying the efficiency of 68% for this class of hoist, we find the maximum demand to be 93.6 hp. With a rope speed of 300 ft. per min., there would be required $\frac{4200 \times 300}{33,000}$, or 35.15 hp. useful, or 51.7 hp. actual.

Applying a rate of 5c. per kw.-hr. for the first 20 kw.-hr. per horsepower demand, plus $2\frac{1}{4}$c. per kw.-hr. for the balance, with a maximum guarantee of $1 per month for each horsepower of the maximum demand, the following obtains:

For the 500-ft. rope speed, with a maximum demand of 96.3 hp.:

93.6 × 20 × $0.05	$93.6
(4115 kw.-hr. — 1872 kw.-hr.) $0.0225	50.47
Total	$144.07

Load factor, 8.3%.

For the 300-ft. rope speed, with a maximum demand of 52 hp.:

20 × 52 × $0.05	$52.00
(4115 — 1040) × $0.225	69.19
Total	$121.19

Load factor, 14.75%.

Inasmuch as there is ample time during the shift to make over 90 trips at the rope speed of 300 ft. per min., while only 75 trips are necessary, it is undoubtedly the best plan to install an electric hoist operating at a rope speed of 300 ft. per minute.

The cost of steam operation per month worked out at $177; the cost of electrical operation at 300-ft. rope speed, $121; the cost of electrical operation at 500-ft. rope speed, $144. The cost of the steam operation does not include the repairs to the boiler, etc., upon which no data could be obtained.

A comparison of costs shows that it is advisable t install an electrical hoist with a rope speed of 300 ft per min. While the costs of operation with steam or elec tricity are about the same, the convenience and simplicit of the motor operation give a decided advantage in favo of the electrical installation.

The Ajo Copper District, Ariz.

SYNOPSIS—Geographical position, history, geology and development of the New Cornelia copper property in southern Arizona, controlled by the Calumet & Arizona. No overburden; upper carbonate zone with sharp change to chalcopyrite and bornite zone. Grade uniform, about 1½% monzonite intrusion in rhyolite. By drilling, test-pitting and drifting about 40,000,000 tons developed. Larger part will be handled with steam shovel. Problems of treatment, railroad connections and water supply in a fair way to be settled.

The Ajo copper mining district lies in southwestern Arizona, about 30 miles north of the Mexican line, 125 miles west of Tucson and 43 miles south of Gila Bend, the nearest railroad point. The Little Ajo Mountains rise a few hundred feet above wide desert valleys, and the camp itself lies in a small basin on the east side of the range, separated from the open desert by low hills. Its elevation above sea level is about 1900 ft. In the center of the basin the brilliantly stained rocks of Copper Mountain rise 150 ft. above the village. The scanty supply of water is obtained from wells in the desert and from prospect pits in the camp. The nearest abundant source of water is the Gila River, 50 miles north.

HISTORY OF THE DISTRICT

Next to Santa Rita, N. M., the Ajo district is said to be the first southwestern copper district worked by Americans, high-grade material having been hauled out in the early '60s. A good many stock companies at one time or another have been organized on the strength of the surface showings. In the fall of 1911, the Calumet & Arizona took an option on all available stock of the New Cornelia Copper Co., one of the reorganized companies that had attempted to work the district. The C. & A. started prospecting by diamond drilling, following this with test pitting, and with drifting in the sulphide zone. The work resulted in the outlining under the iron- and copper-stained outcrop of a low-grade copper orebody covering an area of about 55 acres, and reaching a known maximum depth of over 600 ft. below the surface. Following this development, James Phillips, Utley Wedge and others, under the name of the Ajo Copper Co., took an option on the property of the Rendall Ore Reduction Co., and the U. S. Smelting, Refining & Mining Co. took an option on the Childs group of claims between the New Cornelia and the Rendall properties. The United States company gave up its option after sinking a few churn-drill holes; the Phillips interests, however, still hold their property, but without doing any development work.

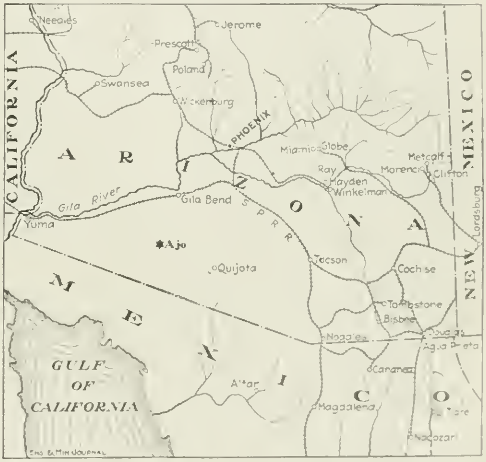
GEOLOGY

Except for a conglomerate, the regional rocks are igneous. The earliest formation exposed consists of rhyolite, breccia and tuff. An intrusion of monzonite porphyry cuts and uplifts the rhyolite. This porphyry, in the character of its minerals and its crystallization, varies a good deal locally. Following the monzonite are dikes of diorite or diabase, probably allied with the Tertiary flows, which cover much of the surrounding desert region. The more recent conglomerate is a coarse aggregate of rhyolite and monzonite fragments, which may be earlier or later than the Tertiary flows just mentioned. It is evidently the result of rapid erosion of the mineralized rhyolite and monzonite of Copper Mountain.

The only great alteration of the rock other than that accompanying the mineralization is found along the rhyolite-monzonite contact, where fine-grained monzonite and recrystallized rhyolite are difficult to distinguish.

STRUCTURE

The monzonite laccolith or batholith uplifted the rhyolite bed into a dome which was eroded in fairly recent times. The intrusion is eight to 10 miles long and one to four miles wide with its long axis extending N 20° W. The northern part forms high hills north of the basin; the southern end forms Copper Mountain. The copper orebody is found at the southern end of the intrusion, where the monzonite plunges beneath the rhyolite. On the top of Copper Mountain, small remnants of the rhyolite lie flat; on the west the rhyolite dips to the southwest and on the east to the southeast at about 20°. The southerly pitch of the rhyolite beds is fairly steep; all contacts are irregular. There are many inclusions of rhyolite within the monzonite and irregular intrusions of monzonite break up through the rhyolite, especially to the east of Copper Mountain. The diorite and diabase dikes cutting both monzonite and rhyolite seem to have little effect on structure or mineralization.



KEY MAP, SHOWING SITUATION OF AJO CAMP AND RAILROAD FACILITIES

Both the monzonite and the rhyolite near it are thoroughly shattered by fracturing in all directions. Although some fractures are accompanied by considerable gouge and may be faults of importance, most of them can be traced only a short distance and are probably contraction fissures. While in any one portion of the periphery there is generally a well marked direction of st[illegible]

Condensed from a paper prepared for the Salt Lake meeting of the A. I. M. E. by Ira A. Joralemon, geologist of the Calumet & Arizona Mining Co., Bisbee, Ariz.

fracturing, in the mass as a whole no such generalization can be made. The somewhat idealized east-west sections show the most important points in the geologic structure.

THE DISSEMINATED OREBODY

The mineralization has formed a low-grade disseminated copper deposit, together with higher-grade veins in the monzonite and narrow rich veins in the adjoining rhyolite. The disseminated orebody is roughly pear-shaped in outline, with its neck toward the south; its outline agrees almost exactly with that of Copper Mountain and the silicified iron-stained hills to the north of the mountain. While the area of the orebody is about 55 acres, its depth varies from less than 50 ft. below the surface on the outskirts to an unknown depth of more than 600 ft. in the center. In vertical section the deposit would resemble a mushroom.

The disseminated sulphide is chalcopyrite and bornite. Within the limits of the orebody the monzonite is shattered by a network of fractures; of these the larger often run about N 20° W parallel with the axis of the intrusion, but others have all possible directions. Along many of these there exist quartz veins running from ¼ in. to 1 ft. in width, and between the veins much silicification has taken place. The sulphides were introduced with the quartz in seams or films along the fractures and in small flakes disseminated in the porphyry. In general, a mixture of vein and disseminated material is required to bring the ore up to grade. In the main part of the orebody, pyrite is present in small quantities only. Chalcocite is rarely found except in thin films just below the water level. A small and variable amount of magnetite disseminated through the ore is apparently earlier than the copper minerals and may be an original rock constituent.

Along some of the larger fractures sulphide seams widen to an inch or more, and several of these close together will form a band of ore 10 to over 100 ft. wide, running from 3 to 5% in copper. In general, the grade of ore is subject to abrupt changes, the richer portions being found in the more thoroughly fractured part of the monzonite. The bands of rich and lean material follow in general the fracturing in the vicinity. The rich bands are so narrow and irregular as to prohibit economical sorting, and the whole mass has to be considered as low-grade ore.

SULPHIDE PRIMARY

It seems clear that the sulphide ore is primary and not the result of enrichment by descending solutions. Variations in grades are due to differences in the intensity of the original mineralization, a fundamental distinction between this orebody and most of the other disseminated copper deposits that are being mined.

BOUNDARIES

The boundaries of the orebody are commercial. Toward the southwest it extends to the rhyolite contact, and in some places the rhyolite is mineralized sufficiently to form commercial ore, but it is generally under 1% and not commercial. To the east the change from ore to lean material is not so much the result of a decrease in mineralization as it is of a change from copper sulphide to pyrite, together with a decrease in the amount of silicification and an increasing prevalence of the dioritic type of monzonite. To the west and northwest, the change from ore to lean material is caused by a decrease in mineralization all around. Where the bottom has been found, the ore gives place to less fractured and less silicified monzonite containing little copper sulphide. Occasionally, a sudden change to a more acid and a more basic variation of porphyry is accompanied by a drop from ore to lean material. The association of ore with coarse-grained monzonite is noticeable, but it seems probable that these are coördinate results rather than cause and effect and depend on conditions existing at the top of the intrusion.

SURFACE ALTERATIONS

The result of alteration by surface waters, unlike those in other low-grade copper districts, has resulted in the formation of malachite, limonite, hematite and a little chrysocolla. The rock is still hard, although the feldspar is somewhat kaolinized. The prevailing color is a deep red-brown, due to staining by iron oxide, although brilliant copper staining can be seen in places. Probably over 85% of the copper in this oxidized zone is in the form of malachite. Some disseminated sulphides are found in hard ores between fractures, but these are relatively unimportant. As in the sulphide zone, values vary greatly and rich and lean bands alternate. Along large fractures some softening and leaching is found, with less copper in the adjoining harder rock. But more usually, the variation in value is not accompanied by any change in the degree of alteration of the rock. The general copper content from top to bottom of the oxidized zone is constant, and is almost exactly the same as that of the underlying sulphide zone.

SHARP DEMARCATION

The bottom of the oxidized zone is almost a horizontal plane lying about 20 ft. below the deepest arroyos and 150 ft. below the highest hills, and this plane of demarcation agrees almost exactly with the present ground-water level. The transition from carbonate to sulphide is abrupt; less than 5 ft. of material whose classification is doubtful, is usually shown by the drill cores, although along large fractures bands of carbonate and sulphide ore may alternate over a distance varying from 15 to 20 ft. vertically. Nor is there any appreciable enrichment at the top of the sulphide zone except for a few local exceptions. This abrupt change on a horizontal plane will greatly simplify both mining and treatment of the ore.

RICH VEINS IN RHYOLITE

The low-grade orebody just described was not what first attracted attention to the district; this was rather the existence of rich veins in the surrounding rhyolite. These vary in width up to 6 ft. and carry malachite, cuprite, chalcocite and bornite. They are associated usually with dikes of monzonite, which themselves are frequently mineralized up to 2 or 3%. In one or two places, lenses of this disseminated ore in monzonite dikes accompanying veins reach a width of over 50 ft. and promise to yield a good tonnage. The development has not yet been carried far enough to show their ultimate importance.

PROVING THE OREBODY

To develop the New Cornelia property, the ground considered as probably ore-bearing was coördinated with east-west and north-south lines at 200-ft. intervals and drill holes were sunk at the intersections; the actual drilling was conducted by the E. J. Longyear Co., of Minneapolis, Minn., and the sampling was done under the direction of Calumet & Arizona representatives. Not a great deal of core was obtained, and both the core and the sludge were therefore assayed and the results combined in the proper ratio by the use of a chart furnished by the Longyear Co.[1]

TEST-PITTING AND DRIFTING

After six months of drilling, test-pitting was begun for the sake of checking the drilling results. The pits were about 4x6 ft. in size, sunk with windlass and hand drills, Mexican and Papago Indian miners being employed. The work was done on contract, and after practice, the men became so efficient that up to a depth of 50 ft., test-pitting was cheaper than diamond drilling. During the last year of development, test pits were sunk 50 ft. deep on the coördinate points in advance of the drilling, in order both to expedite the work and to decrease the drilling cost.

SAMPLES

Every tenth bucket hoisted from each hole was taken for a sample and large samples were thus obtained for every round shot. Then after the pit was completed, it was resampled in 5-ft. sections by cutting a rectangular vertical groove 3 in. deep by 6 in. wide, so as to give about a 500-lb. sample for each 5-ft. section. These channel samples averaged about 0.15% lower than the bucket samples, and were taken for the final samples of the pit.

In the sulphide ore the pits encountered water, which made sinking so slow that only a few hundred feet was done in the sulphide zone. However, to check more thoroughly the drilling results in the sulphide and prove a constant grade of ore between drill holes, drifts were run on coördinate lines from the bottoms of two of the deepest test pits and raises were put up from these drifts to check the drill holes. For the sake of giving accurate samples the material broken in each round was hoisted separately, dumped on an iron plate, and every tenth shovelful taken out for the large sample to be cut down later.

EXTENT OF WORK DONE

Up to September, 1913, when development work was stopped, 81 diamond-drill holes had been bored, varying in depth from 200 to 1000 ft., and giving a total footage of 23,097. Of these 19 were stopped in ore. In all, 77 test pits were sunk with a total footage of 3955; of this, 3606 ft. was in carbonate ore and 349 in sulphide; 1059 ft. of the test-pitting checked drill holes in carbonate ore; 175 ft. checked drill holes in sulphide, and 2721 was done in advance of drilling. The drifting in the sulphide ore amounted to 1513 ft. and the combined sinking and raising on drill holes in sulphide ore was 317 ft.

RESULTS OF DEVELOPMENT

The sinking, drifting and raising checked the drilling accurately. The channel samples of the test pits in carbonate averaged 0.005% lower than the corresponding diamond-drill samples; the test pits and raises in sulphide averaged 0.05% lower than the diamond-drill samples; and the drifts in sulphide averaged 0.26% higher than the assay value of the blocks through which they were run, as indicated by the drill holes at the corners of the blocks. In calculating the ore, drill samples were used wherever drilling was done, and channel samples of test pits were used where sinking was done in advance of drilling. The estimate of the ore developed is as follows:

	Tons	Copper, Per Cent
Ore estimate:		
Carbonate	11,954,400	1.54
Sulphide	28,303,600	1.50
Total	40,258,000	1.51
Available by steam shovel:		
Carbonate	11,954,400	1.54
Sulphide	20,526,800	1.54
Total	32,481,200	1.54
Not available by steam shovel:		
Sulphide	7,776,800	1.40
Rock which must be removed to make steam-shovel tonnage available:		
Rock in carbonate zone	708,400	0.65
Rock in sulphide zone	2,600,000	0.63
Total rock	3,308,400	0.63

The gold and silver content is low, generally amounting to less than 15c. per ton. In computing the tonnage no material running under 1% in copper was included. The estimate of ore available for steam shoveling depends on the assumed maximum grade of track in approaches and pits, and on amount of lean rock in the sides and bottom of the pit which it will pay to remove in order to get access to the ore. It is likely that the proportion removed by steam shovel will be greater than that indicated in the table. Not only will there be no stripping expense, but the absence of overburden precludes the possibility of lowering grades by the admixture of barren material. Both tonnage and content of copper, therefore, should come out closely to the estimate.

PLANS AND PROBLEMS

Three problems will arise in connection with the exploitation of the New Cornelia copper property. These are the questions of treatment, water supply and railroad communication. The question of treatment has been pretty well worked out.

As for water, two deep wells were drilled in the large valley northeast of Ajo, and water was found in both at a depth ranging from 550 to 750 ft. By means of a boiler plant and compressor, the water was raised from one of these drill holes with an air lift having a capacity of about 175 gal. per min. Pumping at this rate did not exhaust the water in two weeks. In view of such a flow from an 8-in. drill hole, it seems reasonably sure that a shaft with a little drifting will furnish an ample supply, and such a shaft has been started.

As for the railroad, preliminary surveys have been made both from Gila Bend, on the Southern Pacific, and from Tucson, the junction point of the Southern Pacific and the El Paso & Southwestern systems. The respective distances are 44 and 130 miles. Both lines would lead through a gently sloping desert country and should be constructed at a cost of less than $20,000 per mile. The route has not yet been selected.

The orebody already developed will supply a 4000-ton mill for over 26 years, or a 6000-ton mill for over 18 years. Indications are that the life of the mine will be greatly lengthened by the development of a large tonnage of deep ore along the fracture zone in the center of the orebody. For the next quarter of a century, the Ajo will be one of the greatest copper districts of the Southwest.

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[1] See "Eng. and Min. Journ.," Mar. 21, 1914.

Holcomb Valley Mining District

SPECIAL CORRESPONDENCE

The old but interesting mining district of Holcomb Valley, in California, has been more active than in several years. The Gold Mountain mine, at Doble, is running its 10-stamp mill with a newly constructed cyanide plant. It is operated by a group of young men, ex-departmental officials of the Chino Copper Co., under a lease and option of purchase. The title is vested, I believe, in Captain J. R. De Lamar and T. H. Oxnam; Mr. Oxnam's son is exercising general supervision of the property on behalf of the owners and is also superintending the extraction of ore.

GOLD MOUNTAIN MINE

This mine has had many vicissitudes. It was owned in early days by E. J. (Lucky) Baldwin, who built a 30-stamp mill on the property, which was destroyed by fire before it had run any great length of time. Prof. John A. Church held it under option for some time. During this period, Charles Rolker built and operated a 5-stamp prospecting battery below the present mill.

Many years later, Captain J. R. De Lamar purchased the property, erected the mill previously spoken of and ran for some little time, suspending operations in 1902. Since that period several mill runs were made, the last of which, about three years ago, was carried out by T. H. Oxnam, to determine definitely if plate amalgamation would alone answer. This question was answered in the negative.

THE MINE AND THE DEPOSIT

At the present time the mine is worked principally from a series of three gloryholes or opencuts, connected by mill holes with one of the tunnel levels. A comparatively small force of men can keep the mill supplied with ore now, but as the top of the ore bins in the mill is only 7 ft. lower than the mouth of the tunnel, and as there are about 1000 ft. of track, delivery of ore to the mill when the upper reserves are exhausted, will prove somewhat more expensive or inconvenient. For this reason, the choice of this mill site, where the hill side is practically all mill site, is open to criticism. The assay plan of the mine shows the ore to be somewhat spotted, but in large sections the value, low-grade at the best, is fairly well maintained. T. H. Oxnam, in his mill run, confined his work to a paystreak of quartz on the foot-wall side. This was of higher grade than the mass itself. Occasionally in this, I am informed, free gold could be seen, which is a rare occurrence in the mass of iron stained "quartzite," forming the main body of ore and said to be 500 ft. wide at the apex of the formation, where work is now going on.

I inclose "quartzite" in quotation marks, for I have some reason to believe that the rock is a highly acid rhyolite. It was classified as quartzite, however, by Professor Church and the miners who came here from Delamar, Nev., noted a great similarity to the quartzite ore of that mine and dubbed it accordingly. This rock covers a large area south and west of Gold Mountain. At Hollonet and Bear Valleys, the sheetings have been thin and are now represented by débris. At several points, this rock has been found to lie upon shale. At the Gold Mountain mine, there are shales and intrusive rocks of porphyritic texture on the foot wall, but the true foot is considered to be a mica schist. This I have not observed in the workings of any other prospects.

The concentration of values at Gold Mountain seems to be in a region of faulting, shearing and shattering. The value is in the cleavage planes largely, which are stained or coated with iron oxides. The gold in the mass is probably derived from the decomposition of pyrite, which I have not seen in an undecomposed state. Promising looking specimens from another section of the field containing pyrrohotite, were found to carry no gold. The ore seems a typically good cyaniding ore, and the double process of cyaniding and plate amalgamation should give a fairly high percentage of extraction. While the surface ore contains an iron-stained clay, the mass itself should produce little true slime; at the present time, however, there is considerable colloidal matter in the battery pulp.

THE MILL

At the mill a pronounced innovation consists of the use of a Janney classifier, the several products of which are delivered directly to separate tanks. The sand tanks are equipped with Butters distributors. For the slimes there are two mechanical agitators and one settler. It is stated that frequent shutdowns have occurred from the limited settling capacity.

The cost of mining ore is estimated at 50c. per ton and the total cost of operations at $2. As the assay value seems to be considerably in excess of this latter figure, a reasonably high extraction should return a working profit, when the disadvantages of working a plant which is in part old and in bad condition and in part new and untried, are overcome. As the orebody is large, a success by the present lessors will mean future working on a much larger scale with a more modern plant.

Water for steam and milling purposes is obtained from Baldwin Lake, a shallow sheet of water one-half mile from the mine and several hundred feet lower than the mill supply tanks. Twelve years ago this lake went completely dry, but as Bear Lake Reservoir is only four miles distant from the west end of Baldwin Lake, and as Holcomb Valley, three miles away, at no great difference of elevation, is itself a natural reservoir, there will probably be no great difficulty at any time in extending operations.

PLACER OPERATIONS

Wood for fuel is abundant. Cedar is commonly used. There is also good pine on the neighboring forest reserve for what mine timber is required. A sawmill is running in Holcomb Valley. Holcomb Valley was one of the last large placer camps in California. It was discovered by Holcomb, a hunter, at the outbreak of the Civil war, and attracted many miners from the Kern River district, and indeed from camps further north. The field of operations was over three miles long and a maximum of one mile wide. The rim of the main channel and tributary gulches were mainly worked. The great quantity of water to contend with and the rough nature of the bedrock, consisting of great boulders of granite, effectually prevented work on bedrock, while every indication was that the channel would be exceedingly rich if ever worked. I am informed by a placer miner who has had considerable experience in working the rim gravel in the last few years, that this will run in specially good places from 50c. to 75c. per cu.yd. The aggregate of production in early days was large, but almost entirely from shallow rim diggings.

It was the dream of the early placer miners that a bedrock tunnel to drain the valley should be undertaken. Captain De Lamar was the first, however, actually to begin work on a tunnel from the Mojave River side of the valley. It was not completed by him, but by an English company, managed and promoted by a mining man named Pedley. Owing to faulty surveys, however, the tunnel, when completed, with the perversity common to bedrock tunnels, was 18 ft. above bed, although the grade had been cut down from 2% to 1% in the latter half of its 1½ miles of length. As the bedrock was rarely more than 20 ft. below the surface, the work was entirely useless and the tunnel is now caved and abandoned. The company then began dredging in a crude way, but was again unable to realize from the bedrock pay, owing to the massive character of the boulders on it, its irregularity and the great body of water in which it is submerged. Work was finally suspended and the valley lay practically dormant, except for pocket hunters, until three years ago, when H. W. Larssen, a mechanic, began experimenting with a dredging apparatus of his own invention. This, in its improved form, is now successfully working on the rim gravel of the main channel, below Osborn Flat.

New Dredging Machine

Without attempting any accurately detailed description of his ingenious apparatus, it consists of a dredging ladder, screen elevator and sluice box with riffles mounted on trucks, of which there are three, the latter two being auto-driven. The driving engine, when the machine is stationary, furnishes the power for the dredging. The buckets are two in number, skip-shaped, driven by endless wire rope from drums. The buckets are of 3-cu.ft. capacity and supplied with a cutting edge; the gravel which is mainly fine on the rim is dumped from the buckets into a revolving screen, the fine is elevated by a bucket elevator to the sluice box, which extends over the dredging piles, so that the tailings are stacked behind the work. The cut of the buckets is on the upward incline, which varies in pitch with the depth of working and the inclination of the ladder. The entire construction is of steel and the buckets run on roller wheels guided by the channel steel of the ladder framework. Water is supplied from a well, but the suction of the pump, a small centrifugal, is placed also in the dredging pit, and the suction can be thrown one way or the other by means of a valve. In this way the amount of water pumped from a distance can be reduced to a minimum. The ladder itself can be lowered by winches to attain a depth of 21 ft. For light gravels, the machine would appear to be excellent, but, of course, the buckets are not capable of handling large boulders or cutting hard bedrock. In flat valleys, the auto drive permits of rapid shifting of the dredging site. Its mobility is, therefore, attractive. Its economy in the use of water should promote its use in semi-arid regions. It will not compete with modern gold dredges where these can be used, for it would seem like an ingenious toy alongside of one of the Natomas boats, but it can be said to be the modern mechanical evolution of the long tom and sluice box, with manual labor reduced to a minimum.

Although this machine with its forerunners has been in successful operation for three summers, it does not solve the working of the main channel, which must be left to a drainage tunnel, such as previously planned, but so badly executed. This three miles or more of channel is certainly an attractive field for speculation, although much of the ground is patented and the divers interests would no doubt be difficult to harmonize. Mr. Larssen is working on patented ground of his own.

Origin of Placer Gold

The origin of this gold is an interesting question. I am inclined to believe that the greater part of it has come from the rhyolite (quartzite), which has entirely disappeared in places in the valley proper, though the gravel handled consists largely of waterworn specimens of this rock. The gold is generally fine, though at Coarse Gold Gulch, in the lower part of the valley, as the name would indicate, the gold was all coarse, from wheat grains up, in size. The area of this quartzite bed or rhyolite flow has been large and it is natural to suppose that there have been other points like Gold Mountain, where conditions have permitted local enrichment. There are areas which now seem to me to be good ground for systematic surface prospecting. On part of the country there is extensive sub-aërial degradation now going on, the acid rock shattering like glass under the combined influence of frost and thaw. On the hill slopes there are great slides of talus.

This contemporaneous action, together with more extensive erosion of earlier periods, will account for the disappearance of the sheeting from some granitic and limestone areas. In the granite itself, seams of rich quartz have been found, but they are without permanency. These are insufficient to account for the gold extracted from the valley. Therefore, I prefer to attribute the source of the auriferous gravel to this capping rock, admitting the hypothesis that there have been places of local enrichment equal, if not superior, to Gold Mountain. As to the rock itself, a purely microscopic examination of many specimens leads me to the belief that it is an acid crystalline rock instead of a metamorphosed mechanical aggregate.

The Old Rose mine, or an extension of it, on Tiptop Mountain, about 15 miles from Bear Valley, it is rumored, will be worked again. The ore is gold-silver with enough copper to interfere with cyaniding, though a cyanide plant was erected.

In this vicinity several minerals of economic value have been found, notably graphite on Sugarloaf Mountain, asbestos, and a sporadic occurrence of scheelite.

Cement

The president of the Universal Portland Cement Co. reports that the sales of that company are running about 10% less than at the same time last year, but that shipments are still about the same. Prices are slightly lower but are satisfactory. The company is operating at more than 80% of its capacity.

An important factor in sustaining the cement business is the large amount of road building that is going on in this country, which more than offsets the loss of railroad business and in building in the cities.

The effect of the war on the cement business is uncertain. Germany, Belgium and England have been the exporting countries heretofore. There is now a great opportunity ahead of the United States in South America and other markets previously supplied by Europe.

Photographs from the Field

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THREE NATIONS' MINE AND MILL, PORCUPINE, ONT.

WRECK OF A MINER'S CABIN CAUSED BY A SNOW SLIDE IN MONTANA

Iola Mill, Candor, N. C.

Coggins Mill, Eldorado, N. C.

Old Abe Hoist

Star Hoist

Two of the Homestake Mining Co.'s hoists, in the Black Hills, S. D.

The Mexican Situation

Special Correspondence

The action of the several chiefs of the Constitutionalist army is looked forward to with a great deal of interest here, and on that action will depend whether or not Mexico is to have a period of peace. The popularity of Villa throughout the country is much greater than that of Carranza. It is recognized that Villa has not had the training that would qualify him for the presidency, but the man selected and supported by him would probably meet with greater degree of approval than would anyone else.

At present fighting with the Zapatistas is going on to as great an extent as in the past, and until recently the Zapatistas had carried the struggle to within a few miles of Mexico City and had taken possession of part of the water-works at Xochimilco. It would appear that the Constitutionalists are making the mistake of waging war on the rich rather than on the revolutionists or bandits still at large. Many executions have taken place, part of which are merely the expression of hatred toward his former employer by some peon who has risen to power. Among the more notable executions were those of Señores Espinoza y Cuevas, a former governor of San Luis Potosi, and Barrenechea, also of San Luis Potosi. In the large cities the houses of many of the prominent people have been seized and turned into barracks for the soldiers and others have been occupied by officers. Much valuable furniture and other personal property has been taken from these private residences and shipped to other points by these officers. A decree of guarantees for life and property was issued in Mexico City and later withdrawn, and no one allowed to leave the city without a passport.

On the other hand, large bands headed by Argumedo, Orozco and others have been pillaging and devastating part of the country through which they have passed and no serious attempts made to capture or annihilate their forces. However, hopes rise high in the minds of many that these conditions will be remedied in time, and that the present authorities will gradually dominate the situation in a manner that will be fair to all and will stamp out all pillage and brigandage.

The people are tired of revolutions and want to be allowed to work; and it is believed that Orozco, Argumedo and the various juntas in the States and in Mexico will receive no moral or financial support for further revolutions from the majority of people in the country. As a matter of fact, it is safe to say that 90 per cent. of the people in Mexico have never wanted a revolution and scarcely know what it is all about. There have been great abuses of the lower classes, which should have been remedied and could have been remedied only by a revolution, but they had not been roused to the point where as a whole they realized that fact.

Decrees have lately been issued in several states by the present military authorities regarding minimum rate of wages and maximum number of hours. In Aguascalientes the minimum wage is placed at one peso per day for eight hours; in San Luis Potosi a maximum day's work is nine hours with minimum pay of 75 centavos for all kinds of work with the exception of mines, where a minimum of one peso and 25 centavos per day is to be paid. Tiendas de raya have been abolished. If these decrees become permanent laws great hardship will, for a time, result to the haciendas, and will inevitably result in higher prices for the necessities of life. In the end it may prove of benefit to the Mexican people, for it will probably result in increased wants with increased efforts necessary to satisfy those wants. Thus it may happen that the very low efficiency of the labor may be raised to a higher point.

Business of all kinds, industrial and mining, is as yet, practically at a standstill. Very few banks are open in Mexico City and practically none outside of Mexico City.

A few of the smelters are operating on much reduced schedule, and will probably be unable to increase the scale of operations until the war in Europe is ended and there arises a market for copper and silver.

Railroad travel is attended with considerable discomfort. Few first-class coaches are available, and no Pullman cars at all are in use except those used by the Constitutionalist officers, the others having been ordered to the States for repairs. Locomotives and rolling stock are scarce, even for the small amount of freight being handled at present. Many of the locomotives are in the shops at Aguascalientes, Mexico City, San Luis Potosi and other points, for much needed repairs. Great numbers of freight cars and passenger coaches have been destroyed and it is likely that the railroads in the States will not permit more of their cars to enter Mexico until they have positive guarantees that these cars will not be destroyed during further revolutionary movements. The Constitutionalists have taken possession temporarily of the National Lines of Mexico and deserve considerable credit for the activity they have shown in repairing the roadbeds and in endeavoring to reëstablish traffic conditions. It is feared, however, that no extensive resumption of business will be undertaken until positive guarantees for protection of property can be offered, and until the European troubles are settled.

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September Mining Dividends

Dividends paid by 22 United States mining companies in September amounted to $3,280,058; payments by metallurgical and holding companies to $10,995,380; and

United States Mining Companies	Situation	Per Share	Total
Alaska Treadwell, g	Alas.	$0.75	$150,000
Argonaut, g.	Calif.	0.20	40,000
Bunker Hill & Sullivan, l.s.	Ida.	0.25	81,750
Bunker Hill Con., g	Calif.	0.01	5,000
Butte & Superior, g.	Mont.	0.75	406,703
Center Creek, z	Mo.	0.05	5,000
Chino, c	N. M.	0.50	432,410
Colo. Gold Dredging, g	Colo.	1.00	100,000
Federal M. & S. pfd., l	Ida.	1.00	119,861
Fremont, g	Calif.	0.02	1,000
Golden Cycle, g	Colo.	0.03	15,000
Grand Central, g	Utah	0.05	25,000
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g	S. D.	0.65	163,254
North Star, g	Calif.	0.40	100,000
St. Joseph, l	Mo.	0.05	70,470
Utah, c	Utah	0.75	1,201,710
Wasp No. 2, g	S. D.	0.01	5,000
Yak, g	Colo.	0.02	20,000
Yellow Pine, l. s.	Nev.	0.02	20,000
Yukon Gold, g	Alas.	0.07½	262,500
Yosemite, g	Calif.	0.10	2,400

Iron, Industrial and Holding Companies	Situation	Per Share	Total
American Sm. & Ref. Co. com	U. S.	$1.00	$500,000
American Sm. & Ref. Co. pfd.	Mex.	1.75	875,000
International Nickel, com	N. J.	2.50	918,133
Lackawanna Steel, pfd	N. Y.	1.75	612,115
National Lead, pfd	U. S.	1.75	426,136
National Lead, com	U. S.	0.75	154,915
Phelps Dodge, c	U. S., Mex.	2.50	1,125,000
United States Steel, com	U. S.	1.25	6,353,781

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Caribou Cobalt, s	Ont.	$0.02½	$25,000
Crown Reserve, s	Ont.	0.02	35,376
Hedley, g	B. C.	0.50	60,000
Hollinger, g	Ont.	0.15	90,000
Kerr Lake, s	Ont.	0.25	150,000
Lucky Tiger, g	Mex.	0.09	64,380
Peterson Lake, s	Ont.	0.01½	63,000
Standard, s.l.	B. C.	0.02½	50,000

by Canadian mining companies to $537,756, compared with $6,475,567, $12,435,518, and $1,612,801 for the same three classes, respectively, in 1913.

Totals for the first nine months of the year are: 1914, United States mining companies, $45,690,640, against $54,015,894 in 1913; 1914, metallurgical and holding companies, $67,647,473, against $68,603,024 in 1913; 1914, Canadian and Central American companies, $12,602,124, against $16,654,423 in 1913.

The general effects of the European war are shown in the reduction in the September payments of Federal Mining & Smelting, Phelps Dodge, and Chino and in the omitted dividends of Calumet & Arizona, Calumet & Hecla, Crucible Steel, Green-Cananea, Granby, Nevada Con., Nova Scotia Steel & Coal, Ray, and Superior & Pittsburgh, so that large as are the month's totals, when considered only by themselves, it cannot be concealed that the war has put American mining in an uncomfortable position.

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The Davey Mine Cave

Special Correspondence

What might have been the greatest mine tragedy in the Joplin district or in Missouri occurred at the American Davey mines near Carterville at six p.m., Oct. 1. Fortunately, only two men were seriously injured, while six others received minor injuries. The cause of the near tragedy was the caving of Nos. 1 and 2 mines on what is known as Davey Hill.

The cave-in covered 8 to 10 acres of ground lying directly east and southeast of the company power plant and No. 3 mill. The area of caved ground extended south about 500 ft. and came close to taking in No. 2 mill. Singularly enough the surface of most of the caved ground was covered by the mill ponds. The superficial showing was simply the lowering of the ground in a dish-shaped manner a distance of 12 to 20 ft. Around the margin of the caved area great cracks appear showing where the ground broke, the various buildings are tipped at an angle and there is no water in the ponds. The group is owned by the American Zinc, Lead & Smelting Co. About 100 acres of ground was mined out, the surface standing upon small pillars. Besides this there are adjoining tracts, held and mined by other companies that have a large acreage cut out. The caved ground was under sublease to a company that was cleaning up the ground, as the miners term it, "skinning the pillars," and in some cases taking them out entirely. The supports were weakened until finally the roof broke down.

The ground worked had a face 12 to 20 ft. high in what is known as sheet ground. The lessees had about cleaned it up. For a number of days terrible popping sounds had been giving warning that there would soon be a fall and no miners were directly under the caving area. In adjoining drifts at No. 3 mine there were 50 men at work. It was this group that was threatened with injury and death. When the fall came, the concussion of the air was sufficient to hurl the men off their feet as though they were feathers. Some of them were thrown 20 ft. and none succeeded in staying on their feet. They brought up usually against a wall or pillar and suffered a good deal of bruising.

The worst accident was that of a tub hooker who was thrown into the bottom of No. 3 shaft where some shaft lining torn loose by the air fell upon him and broke his arm. A carman had some heavy bruises on his back which may develop into a serious injury. Others were merely stunned or scratched. The air of the mine was so filled with dust that it was stifling and was difficult to see through. All hat lamps were blown from the men's heads and all were put out. It was necessary to grope in the darkness with only the aid of matches till some of the lamps were found. Part of the men escaped by climbing a 200-ft. ladder at No. 7 shaft, 400 ft. north of the caved ground. The gas and electric lines at No. 3 shaft were broken so that hoisting was interfered with at that point. Immediate steps were taken to repair these breaks and hoist the men. Those who waited till the repairs were made were hoisted out. Every man was out three hours after the cave took place and not a single fatality was reported.

In the little town of Johnstown which surrounds the mines at this point, everyone felt the shock as though it were an earthquake. The expulsion of the air from the shafts threw great clouds of rock dust into the air over the town. Roofs and siding were torn off a number of the derrick houses over shafts nearest the caving area. When the real reason of the disturbance was made known the whole district responded and from every camp hurried ambulances and miner volunteers expecting a great loss in life. Beyond all question there was the greatest crowd around the mine that has ever been seen in this field. When foreman Newton Keithly notified the office by telephone that his men were all alive and safe, there was great relief felt on top by the surface watchers, among whom were the men's families and friends.

The work of rescue was taken up immediately under the supervision of general superintendent H. I. Young who hurried to the mine from his home. Keithly's telephone message allayed anxiety for the moment but every effort was made to hurry repairs on the hoisting apparatus so the men could be got out. There were fears that more ground would cave before the rescue could be made.

While the cave covers a greater area than any previous, its damage so far is not so great, either in loss of life or property. It is estimated that the loss will not be over $15,000 for the oil, powder and sludge-mill buildings that will have to be moved and reërected. It will be necessary to relay the broken water and gas lines over the caved ground. All of the main buildings are unaffected thus far. The operators were expecting the trouble and had taken out all machines and underground equipment two days before.

Contrasted with this is the old Troupe cave-in which took down a mill and a huge pile of valuable concentrates and in which five men were buried while only two bodies were ever recovered. Another cave which caused heavy financial loss occurred at Oronogo when the old Aurora Circle went down carrying the mill and several carloads of ore already on board of cars and ready to ship. It was only recently that in mining this ground, the Oronogo Circle company took out the trucks of some of these buried cars.

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Outcrops in Page and Rockingham County, Virginia, indicate the probable existence of deposits of manganese ore similar to the one which has been successfully worked at Crimora in Augusta County So far as explored these deposits seem to be wad found in a stiff, heavy clay, says M. A. Rowan, of Lowmoor, Va., in the Baltimore "Manufacturers Record."

Editorials

Selling to Bolivia

The market for American mining machinery and mining supplies in South America has always existed; it was receiving increased attention at the hands of our manufacturers when the outburst of the European war attracted public attention to our opportunity there. It seems now as if we might take over South American trade to the exclusion of practically all other nations. For this reason some notes from a correspondent upon the tin-mining fields in that country are of timely interest.

Tin mining is one of the greatest, if not the greatest, industry in Bolivia. If the United States could supply all the materials consumed by this business, that itself would be a tidy addition to our foreign trade. The native Indian is the only laborer available in the country for mine work, but he is far from satisfactory. The demands of economical mining should see this poor labor largely replaced by good American machinery.

According to Prof. Francis Church Lincoln, who has recently returned from Bolivia, machine drills have been recently introduced, and their use is rapidly spreading. The Llallagua mine is using 60 Ingersoll-Rand stopers and is drifting with piston machines and Temple-Ingersoll electric air drills. Señor S. I. Patiño is using Siemens-Schuchert electric drills and the Temple-Ingersoll machines. Messrs. Harrison and Böttiger are using the Siemens-Schuchert electric drills at Araca. The Avicaya mine is using Stephens "Climax" drills for drifting. The Compañia Minera de Oruro and M. Louis Soux, of Potosi, are using Ingersoll-Rand air hammer machines for all purposes. Aramayo, Francke & Co. have been driving with Temple-Ingersoll machines, and are beginning to sink and drive with air-hammer drills. The Totoral mine has ordered an electric plant and is going to install Temple-Ingersoll machines.

Power is a serious question with the Bolivian miners. Steam, being expensive, is used only on a small scale and for auxiliary purposes. Coal, charcoal, llama dung, called *taquia*, and a resinous plant known as *yareta*, are the principal fuels. High freight charges from the coast make coal cost about three times as much inland as at tidewater. Anthracite gas-producer installations have proved economical and oil engines have found a wide application, the oil coming from the Lobitas field in Peru. The low efficiency of power plants at the high elevations of the Bolivian mines is a factor not to be left out of consideration in estimating power requirements. In some places water power is available and the development of hydro-electric plants should consume a good deal of electrical generating machinery and transmission supplies.

The explosive most commonly used in the Bolivian mines is 50% gelignite, although several mines employ 62% gelignite, and 90% gelatin is required to do the work in the Totoral district.

The high prices of timber have almost eliminated its use underground, except for lining important shafts; while the ground usually is hard enough to stand well, in many cases dry-walling is resorted to, and pillars of waste are built in the stopes. It would seem as if cement and structural steel could be sold for purposes of ground support.

Most of the mine haulage is performed by men or by mules, but electric haulage is employed in the Huanchaca mine, and an electric locomotive has been installed in the Avicaya tunnel.

In general, illumination is carried on by means of a miner's lamp consisting of a wick which burns tallow in an open iron vessel. Candles are also in wide use, and acetylene is being tried at Potosi, while at the Huanchaca, San José, and Compañia Minera de Oruro mines, the passages are lighted by electricity.

While most of the drainage takes place through tunnels, at the Huanchaca mine hot water is handled with electric pumps, at the San José and Compañia Minera de Oruro there are large steam pumps, and the Morococalla mine is equipped with a newly installed cornish pump.

Preparation of the ore for shipment or smelting consists largely of hand picking; by far the greater part of Bolivian tin is exported in the form of concentrates running from 55 to 70% metallic tin, and known locally as *barrilla*. Milling ores from the oxidized zone, where sulphides are not in large proportion, is relatively simple; while the ores from the sulphide zone require rather complex treatment. When concentration alone will not effect a good separation on account of the presence of sulphides, roasting is resorted to to free the tin. The ores are subjected to preliminary concentration, roasting, regrinding and reconcentration, either on wet concentrators, as in the first instance, or upon magnetic separators. Tin ores containing silver are given a chloridizing roast and leached, to remove the silver content before concentration for the tin.

Primitive methods are still in use in many cases, such as crushing with rocking stones and with old-fashioned Chilean mills, screening by hand, and concentrating by hand jigs, on circular buddles and moss-bottomed launders.

A good many foreign companies have installed modern mills with machinery from Europe or this country, but in many cases this has been improperly selected. It is not uncommon to see the native millmen sweeping down the Wilfley tables with brooms, as if they were some kind of buddle, and in some mills the Wilfleys will be found discharging all their products over the end, perhaps with a board nailed to the lower side to prevent any material from escaping by its proper channel. Naturally, the tailings from such concentration are re-treated profitably by native methods.

As a result of the European war, the shipment of tin ores to Europe has been interrupted. This is particularly serious because she depends mainly upon the taxes on tin exports for her revenues. The United States consumes $2\frac{1}{2}$ times Bolivia's present tin production, and yet smelts no tin.

There is a lot of talk nowadays about developing a South American export business, but there is not going to be any such business of a one-sided nature. If we sell to South American countries, we must buy from them. In the case of Bolivia it would be an ideal trade if we might sell her mining supplies and take payment in tin.

It would seem the opportunity of the ages for some American smelter to secure control of the Bolivian supply and erect a reduction plant in the United States, if ever that is to be done, but the inauguration of such a business is not the simple matter that some persons have assumed. We have in mind Mr. Burrage's misadventure with the International Tin Co., which years ago erected a smeltery (now dismantled) at Bayonne, N. J., to inaugurate tin production in this country. Mr. Burrage intended to import black tin from Malaya, but just when his works were ready the Straits government put a prohibitive export tax on the ore. Mr. Burrage then naturally scouted for an ore supply from Bolivia, without succeeding in developing such a business for his smelting works.

Since then the output of tin concentrates in Bolivia has grown a good deal, and its exports have lately been sufficient to supply a smelting works of good size. On the other hand, these ores have gone from Bolivia to Great Britain and Germany on long-time contracts, and in some cases, certain people have interests in both mines and smelting works. The diversion of an adequate part of the Bolivian supply to the United States would be a matter of hard work and would hardly be possible until exchange banking facilities are provided. However, our financiers are working to provide such and if Bolivia has to buy from us, arrangements for her to pay will have to be devised. The inauguration of tin smelting in the United States may be a hard job, but until this country, which is the largest consumer of tin, achieves a larger part in providing its supply, it will be a reflection upon our business enterprise.

Mechanical Ventilation of Metal Mines

Progress in methods of winning ore is less spectacular and slower than progress in methods of treating the ore won. The miner finds his possible field of development much more restricted than does the metallurgist and encounters a further obstacle in the passive but resolute resistance of the always conservative miner. Progress is made, nevertheless, to some extent in the method of stoping, but more especially in the mechanical work of pumping, hoisting, drilling, tramming, etc. Illumination and ventilation have never received the attention they deserve. Metal mining in these respects is far behind coal mining. There has, however, been a marked change in the attitude of operators toward these points of practice in the last few years. It is beginning to be realized how important in their effect on the efficiency of the underground men are adequate illumination and fresh air.

Most metal mines still depend principally on what is styled "natural" ventilation for the conveyance into the mine of outside air. Natural ventilation depends on a difference of pressure of the air columns in two or more openings. In most mines, this differential pressure carries in sufficient air. For the further control of the air underground, however, almost every mine has been compelled to adopt some supplementary means, such as compressed air, small blowers or exhausters, brattices and doors, etc.

The natural ventilating current is usually more cheaply obtained and maintained than one set up mechanically. But although it may be adequate in the quantity of air it conveys underground, so long as the air is left to follow the easiest course, when the current is forced into the remote workings and dead ends where it is most needed, the added resistance reduces appreciably the volume of flow. Furthermore, since natural ventilation is largely dependent on unstable atmospheric conditions for its operation, it will vary with the seasons, the prevailing weather, and the time of day. There are recorded cases in the Southwest where the ventilation has reversed its direction every day toward noon. It is not our present intention to discuss the whole question of natural versus artificial ventilation. But it is a fact that these two characteristics of natural ventilation, namely, its unreliability and its frequent insufficiency, are operating strongly at present toward the wider use of fans in metal mines.

In heavily timbered mines, in sulphide mines, in regions of dying vulcanism, and in the vicinity of underground fires, the ventilation problem is particularly difficult. And it is in such mines as these that fan ventilation is most commonly seen.

Unquestionably the fan is superior to other means of forced ventilation. Compressed air in itself is absurdly inefficient; used with an injector to entrain and propel other fresh air, it becomes more efficient, but is admittedly inferior to the fan system.

The toughest ventilating problem in metal mines of this country, if not of the world, exists on the Comstock Lode. High temperatures and high humidity have here put the operators to their utmost ingenuity in order to keep the working places endurable. An account of the Comstock ventilation by George J. Young, complete to date of writing, can be found in Vol. 61 of the A. I. M. E. *Transactions*. Fans are installed in great number in these mine workings, but they are chiefly used for boosting and diverting the air current and are small, being driven by 5- to 20-hp. motors and handling up to 12,000 cu. ft. of air per min.

On the top of the Ward shaft, according to Mr. Young, a 50-hp. fan, rated at 75,750 cu.ft. per min., exhausted from the pump compartment during sinking. A fan was also being installed at the collar of the Ophir shaft, rated at 140,000 cu.ft., to be driven by a 100-hp. motor.

At the Newport mine on the Gogebic iron range, a fan system provides positive ventilation in the workings of the mine otherwise hard to reach with fresh air. This proved a great relief to almost intolerable conditions.

The JOURNAL of Aug. 15, contained a short article quoted from an A. I. M. E. Bulletin, where is noted the fact that fans have been installed by the Copper Queen for parts of the Gardner mine with excellent results. Two Sirocco blowers are used to force in 70,000 cu.ft. of air.

One of the most striking instances of the advantage of the ventilating fan is found in the Miami mine, where the installation of the system for stopes in which the ventilation had been poor, increased the efficiency of the miners working there by, we believe, 35%, the same number of men getting out one-third as much tonnage again as previously. Furthermore, there was a distinct saving in power charges. The ventilating air did away with the use of compressed air solely for ventilating and cooling, cutting the monthly consumption for the mine from 9,000,000 cu.ft. to 5,000,000 cu.ft., and the saving on the compressors was not only greater than the cost of running the fan, but was so much greater as to pay for the fan in a short time.

Fan ventilation not only contributes to the comfort and efficiency of the men; a further advantage consists of the positive control which it provides of the direction of ventilation. The records of mine accidents are filled with accounts of mine fires in which the unexpected reversal of the ventilating current threw the noxious products of combustion into parts of the mine considered safe and caused many deaths. This is a point greatly insisted upon by the Bureau of Mines and rightly so.

We cannot but feel that in the next few years metal-mine ventilation will see great changes in practice and fans will be used in increasing number. Work up under the timber mats of Lake Superior and in the sulphide stopes of Butte and Bisbee will become less arduous to the miners and more profitable to the company.

BY THE WAY

The JOURNAL readers are no doubt familiar with the status of the journal *Economic Geology*, started in 1905 by a small group of earnest workers, and now advanced to the position of the principal exponent of applied geology. They are probably less familiar with the sacrifices which have been made that this goal should be reached—how the free services of the editors have been given in the spare hours of professional duties, and often to work which should have been done by clerical assistance—and how every device has been utilized to bring the expenditures within the slender annual income of $3000 or $3500. They hope the time has come when they may apply for assistance to those who are directly or indirectly interested in applied geology. The plan of a small endowment fund based on the sale of preferred stock at $25 par value has been authorized by the Economic Geology Publishing Co. In case of dissolution of the company the par value of preferred stock is to be returned to the stockholders. Waldemar Lindgren, of the Massachusetts Institute of Technology, will be glad to answer any inquiries and receive such subscriptions as may be offered by those interested in the cause.

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The Eureka-Nevada railway, which used to be the Eureka & Palisade, has written a caustic letter to President Wilson upon the question of railway mail service, the motive being the award of a contract to a carrier using a mule team at a higher price than the railway offered for the business. The Eureka & Palisade railway—we cannot forget the old name—needs every cent's worth of business it can get. It is the most interesting survivor of early railroading in the region west of the Rocky Mountains that we have. It is a narrow-gage line, about 84 miles long, operated with the old equipment, including the toy locomotives with balloon smokestacks, of 40 years ago. Once there was a daily service between Eureka and Palisade where connection is made with the Union Pacific. This was in the days when Eureka was a great mining camp. With the wane of Eureka the railway service became every other day, and finally but twice a week as at present. A few years ago the line was washed out in some places and then there were no trains at all for several months. The trip up to Eureka on the crawling, jerking, puffing little train is not a thing of joy, but it is infinitely superior to a mule-team or stage-coach trip. Certainly the postoffice department ought not to discriminate against the old Eureka & Palisade, excuse us, the Eureka-Nevada.

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From the Philippine Islands comes a plaintive letter from a man who says there are many mining engineers "in the bush" who would like to know occasionally how the home team stands. Therefore, while those readers who get a daily paper look the other way, we are going to give the standing of the four principal leagues after the games of Oct. 5, 1914.

NATIONAL LEAGUE

	W.	L.	P.C.
Boston	93	58	.616
New York....	83	69	.547
St. Louis......	81	72	.530*
Chicago	78	76	.507*
Brooklyn	74	78	.487
Philadelphia .	73	79	.480
Pittsburgh ...	69	85	.448*
Cincinnati ...	60	94	.390*

AMERICAN LEAGUE

	W.	L.	P.C.
Philadelphia .	98	52	.653
Boston	90	61	.596
Washington ..	80	72	.527
Detroit	80	73	.523*
St. Louis......	71	82	.464*
New York.....	69	83	.454
Chicago	70	84	.455*
Cleveland	51	102	.333*

INTERNATIONAL*

	W.	L.	P.C.
Providence ...	95	59	.617*
Buffalo	89	61	.593*
Rochester	91	63	.591*
Toronto	74	70	.514*
Newark	73	77	.487*
Baltimore	72	77	.483*
Montreal	60	89	.403*
Jersey City...	48	106	.312*

FEDERAL LEAGUE

	W.	L.	P.C.
Chicago	86	65	.563
Indianapolis ..	85	65	.560
Baltimore	79	68	.538
Buffalo	77	68	.531
Brooklyn	74	74	.500
Kansas City...	65	83	.439
Pittsburgh ...	62	81	.434
St. Louis.....	62	86	.419

*Final score.

For the further information of the wanderers, the first two games of the World's Series will be played in Philadelphia on Oct. 9 and 10, the third and fourth in Boston on Oct. 12 and 13.

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Engineering News thus comments upon the dangerous nail: To step on the point of a nail causes a direct loss of money. Somebody has to pay for the resulting injury, which is often a serious one. Unfortunately, the man who leaves the nail sticking up is seldom the one to step on it. But in the long run, if A steps on the nail that B left, and B steps on C's nail, C on A's, or otherwise around the circle of events, the situation is much the same as if every man that left a projecting nail point where somebody could step on it or catch on it was likely to suffer the injury himself. This is a clear argument for more care in dealing with projecting nails. Two concerns state that injuries from nails form 3 to 6 per cent of their total casualties, according to George Gilmore, Chief Engineer of the Travelers Insurance Co. *The Travelers' Standard* in an article on the nail hazard points out further that clinching a nail may make it more dangerous than the straight projecting point, if the clinching is not thorough. A nail point bent over so that it is nearly flat on the face of the board but yet clear of it a few sixteenths of an inch may catch the foot or hand to worse effect than an unclinched point, while at the same time it seems safe and thus invites the accident. The safe clinch is one in which the point is buried in wood, as shown on p. 437 of the JOURNAL of Sept. 5, 1914.

PERSONALS

D. J. Williams, manager of the Montana-Continental Development Co., was in Victoria, B. C., last week.

T. Walter Beam, of Denver, Colo., has been examining mining properties near Hedley, British Columbia.

Fred H. Nye has returned to Denver after making two examinations in the Black Hills region, South Dakota.

G. C. Bateman of Toronto, Ont., has been appointed consulting engineer to the Long Lake Gold Mines near Sudbury.

M. J. O'Boyle, late of Morenci, Ariz., has joined the forces of the Socorro Mining & Milling Co., at Mogollon, New Mexico.

Cutler B. Whitwell is at Forbestown, Butte County, Calif., where he will be engaged in examination work for the next six weeks.

Judge E. H. Gary has resigned his directorships in all companies except the Steel Corporation and its immediate subsidiaries.

Otho E. Youtsey, of Denver, has undertaken permanent duties as electrical engineer for the Portland Gold Mining Co., Victoria, Colorado.

Carl A Allen and C. L. Colburn, of Denver, have gone to Breckenridge, Colo., to unwater and examine the Juniata and Country Boy mines.

Louis M. Richard, of Colorado Springs, Colo., examined property owned by Milwaukee capitalists at White Signal, N. M., during September.

Alfred Ross, who formerly operated in the Central mining district in Grant County, N. M., has gone to the Organ region in Don Ana County to engage in leasing.

Edwin E. Chase has returned to Denver, Colo., after a prolonged vacation in California, and has reopened his office there and is ready for active work in mine examination.

S. H. Brockunier, of Nevada City, Calif., has just completed an examination of the cement materials on the property of the Yellowstone Cement Co., near Gardiner, Montana.

J. M. Jones, for some years connected with the Lalance & Grosjean Mfg. Co., Harrisburg, Penn., has been appointed general manager of the Massillon Rolling Mill Co., Massillon, Ohio.

D. Brewer Gehly, heretofore secretary of the Cambria Steel Co., has been elected treasurer in place of Alex. P. Robinson, who resigned on account of ill health, but remains vice-president.

Frank H. Sistermans has retired from Batopilas, Chihuahua, Mexico, having completed some examinations in that district. He is at present with the Mines Management Co. at No. 60 Broadway, New York.

John R. Stanton has been elected president of the Michigan Copper Mining Co., succeeding the late Joseph E. Gay. Frank McM. Stanton succeeds his brother as treasurer, and George W. Drucker becomes secretary.

Dean William R. Appleby, of the Minnesota School of Mines, has returned to the University after a trip through the Canadian Rockies and the mining districts around Vancouver, B. C. He visited the chief coal fields of British Columbia, the Marble Bay Copper Mining Co.'s mine and the Britannia Mill.

William H. Davey has resigned as vice-president and general manager of the Massillon Rolling Mill Co., Massillon, Ohio, to become general manager of a new company that will operate the plant of the National Rolling Mill Co., Mansfield, Ohio. He is one of the best known men in the sheet-making industry.

Dr. Edward Ewing Pratt, for some time manager of the Industrial Bureau of the Merchants' Association of New York, has been appointed by President Wilson chief of the Bureau of Foreign and Domestic Commerce, Department of Commerce, succeeding A. H Baldwin who has resigned to become commercial attaché of the American mission at London.

Adolph Greiner, president of the Iron & Steel Institute, who is general manager of the Cockerill steel works at Seraing, Belgium, near Liége, has been released by the German military authorities. The Germans placed M. Greiner under arrest because he refused to run the plant on behalf of the German authorities. The Germans then endeavored to work the establishment themselves, accompanying the substantial increase in wages which they offered with warnings to employees who neglected their duties or who impeded the output in any way.

OBITUARY

Philander R. Jennings, senior partner in the historic tin plate and metal firm of Bruce & Cook, which has been doing business at 190 Water St., New York, since 1812, died on Sept. 21 at his summer home at Merrick, Long Island. Mr. Jennings was 63 years of age. He had a wide circle of friends in the metal business, and was also connected with many other interests. He began his work with Bruce & Cook when a boy and worked his way up until he was admitted as a member in 1885, becoming senior partner in 1904.

Horace A. Hutchins died at Madison, N. J., Sept. 30, aged 76 years. He was born at Warren, Ohio, and at an early age went to work in a store at Cleveland. He served as a paymaster during the Civil War and later entered the oil business, forming the firm of Westlake, Hutchins & Co. In 1870 the firm sold out to the Standard Oil Co. and Col. Hutchins entered the employ of the company. From 1874 until he retired 10 years ago, he had entire charge of the domestic business of the company. Since his retirement he has spent his time in yachting, travel and the care of his country estate.

Joseph Fawell died at Pittsburgh, Oct. 2, aged 60 years. He was born in England and came to this country in 1878. In 1879 he entered the employ of Mackintosh, Hemphill & Co., of the Fort Pitt Foundry, Pittsburgh, as draftsman. He was promoted to be chief draftsman and later chief engineer, holding that position till 1902, when he was chosen president of the company, to succeed N. A. Hemphill, retired. Mr. Fawell was regarded as one of the foremost authorities on rolling mill practice, and probably was more closely identified with the progress of that industry than any other individual in this country. Few rolling mills of prominence in this country have not some machinery which has been designed under his supervision. He leaves a widow, two daughters and a son.

SOCIETIES

American Iron & Steel Institute—Arrangements are completed for the fall meeting, to be held at Birmingham, Ala., Oct. 29-31. The sessions for the reading and discussion of papers will be held at the Hotel Tutwiler on Thursday and the banquet will be held there Thursday evening. On Friday and Saturday the members of the institute will be the guests of the Tennessee Coal, Iron & Railroad Co. which has arranged a two-day tour by special train to the coal mines, iron mines and iron and steel plants of the Birmingham district. A feature of the trip will be a barbecue on Friday at Bay View. In case a party of 100 members can be organized in the East, a special train will be run from New York and Philadelphia.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT CIRCULATION, ETC., OCT. 1, 1914,

of The Engineering and Mining Journal, published weekly at New York, N. Y., required by the Act of August 24, 1912.

Editor, Walter Renton Ingalls, 10th Ave. at 36th St., New York, N. Y.

Managing Editor, Donald M. Liddell, 10th Ave. at 36th St New York, N. Y.

Business Manager, Guy C. Townsend, 10th Ave. at 36th St., New York, N. Y.

Publisher, Hill Publishing Company, 10th Ave. at 36th St. New York, N. Y.

Owner, Hill Publishing Company, 10th Ave. at 36th St., New York, N. Y.

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Emma B. Hill, 80 Munn Ave., E. Orange, N. J.

The balance of the stock issued (less than 1% each) is owned by 70 employees, 3 ex-employees, and 14 others who are wives, daughters or relatives of employees.

Known bondholders, mortgagees, and other security holders holding 1 per cent. or more of total amount of bonds, mortgages or other securities. Mortgage on building held by Dime Savings Bank, Brooklyn, N. Y.

C W. Dibble, Vice-President
HILL PUBLISHING COMPANY

Sworn to and subscribed before me this 30th day of September, 1914

RICHARD L. MURPHY,
Notary Public
(My commission expires March 30, 1915)

Editorial Correspondence

SAN FRANCISCO—Sept. 30

The Permanent Oil Land Lease Amendment to the general leasing bill which was passed by the House, and which is expected to be passed by the Senate, lends encouragement to oil operators in California who are in contention with the Government withdrawal orders. The amendment provides for leasing by the Secretary of the Interior of oil or gas lands included in orders of withdrawal upon which work was in progress on Jan. 1, 1914, and claim to which was made prior to July 3, 1910. The lessee is to pay as royalty to the Government one-eighth of the oil or gas produced. Leases will run for 20 years with renewal privileges thereafter for periods of 10 years. Leases are to include gas or oil lands not to exceed 640 acres.

Production of Crude Petroleum in California Fields in August exceeded the July production by 65,000 bbl., in spite of the warning of the big marketing concerns that production should be curtailed. Sales for August were 300,000 bbl. less than for July. Total production in August was 9,034,853 bbl.; total shipments, 7,971,224 bbl., leaving a surplus of 1,063,629 bbl. added to the stocks on hand, which increased the total stocks at Sept. 1 to 15,018,481 bbl. Notwithstanding the increased production the number of wells drilling in August was 15 less than in July, or a total of 207. Four wells were abandoned in July and 13 abandoned in August. But the number of new rigs completed increased from 16 in July to 19 in August. The number of producing wells decreased from 5988 in July to 5984 in August. Large refiners are declining to take oil from small producers in excess of contract requirements, although the market for refined goods is said to be improving. Owners of gusher wells are obliged to make large expenditures for necessary storage to meet uncontrollable output.

DENVER—Oct. 1

A 160-Acre Sulphur Tract a short distance north of Cody, Wyo., is being developed and equipped by Fred Berger, mining engineer, and George B. and William B. Berger, bankers, all of Denver. They are constructing a 50-ton refinery, as the first unit. Crude sulphur, as quarried, will be hauled two miles to the plant by rail and there dumped into a hopper which, in turn, will deliver into small steel cars having perforated sides and bottoms. These cars will be run into closed retorts where heat will melt the sulphur and permit it to flow from the gangue and collect in a drain leading to collecting vats, where it will solidify.

BUTTE—Oct. 1

In the Ouster Proceedings against Mayor Duncan, the hearings for which were completed Sept. 26, the testimony of witnesses called by the defense did not bring to light anything new. After the conclusion of testimony, attorneys for both sides agreed to submit the matter without argument. Judge Ayers will take the matter under advisement. It is probable that a decision will not be rendered until the ouster proceedings against Sheriff Driscoll are disposed of. Hearing of his case was begun Sept. 28, also before Judge Ayers. Several of the leaders of the mine workers, including Muckie McDonald, will have a hearing before the military court within a short time.

At the Montana State Fair, held in Helena Sept. 21 to 26, the Butte Mine Workers' union widely circulated a pamphlet, entitled "The Truth about Butte," in which the military regime as well as the mining companies, business men and private citizens came in for a good deal of adverse criticism. Among many incorrect and misleading statements the circular contained the charge that Pinkerton detectives were enlisted in the companies of the military command at Butte. To this statement Maj. Dan J. Donohue objected and ordered the members of the executive board of the Butte Mine Workers' union to write and circulate a denial of their charge. This order was promptly complied with in a statement signed by President [illegible] and the committee.

With the proposed citizens' organization available in case of emergency it was agreed at a recent conference between the Governor, the military authorities and Butte citizens that a reduction of the present military force could be made with perfect safety. Probably one half of the militia now in Butte will be sent home in a few days. The rest will remain until certain work commenced by them is completed and as long as the city requires their protection. [Late dispatches report Duncan ousted Oct. 5.—Editor.]

SALT LAKE CITY—Oct. 1

Receivers for Ohio Copper, M. J. Hirsch and G. C. Austin appointed by the New York court, have been confirmed by Judge John A. Marshall, of the Federal court here. Local creditors appointed M. H. Sowles chairman of a committee, which petitioned the court for the appointment of a local man as sole receiver, the petitioners objecting to the appointment of the New York receivers. Judge Marshall held that, as there was no apparent reason for having an additional receiver, the receivers appointed by the New York court would be confirmed, upon their giving bond for $10,000 and filing the required oath. A meeting was held recently in the company offices by the local creditors. Labor liens, amounting to about $35,000, it is understood ,are the first to be disposed of.

TONOPAH—Sept. 30

I. W. W. Activity in Tonopah was shown by the attempt to dynamite the office of the Tonopah "Daily Bonanza," Sept. 22. The I. W. W. is suspected on account of the activity of the "Bonanza" in the arrest and conviction of an organizer of the order for shooting a miner recently. On the afternoon following the explosion the following call was circulated: "A mass meeting of the citizens of Tonopah who believe in law and order and admire fair play is called for Wednesday evening at eight o'clock, at the Nevada Theater, to protest against the dynamiting of the 'Bonanza' printing establishment as an outrage that should meet with condign punishment. If you want to live in peace and happiness under the American flag, you are urged to attend." This was signed by the leading business men of Tonopah. Long before the appointed hour the theater was filled to the doors and as soon as called, the meeting was turned into a campaign demonstration for the Socialist ticket. At the conclusion of speeches by the leaders of the I. W. W. and socialist organizations, the meeting adjourned, not a business man having spoken. About three weeks ago, it is stated, threats of violence were circulated and "stickers" posted in public places, reading:

> **MOB RULE IN TONOPAH, NEVADA**
>
> Don't come to Tonopah, because if you defend your life and property here you will be sent to prison.
>
> Protest to the county and state officials against the imprisonment of John Pansner who defended his life and property. (Stockwitz Press, 1212 Turk Street.)

These placards are similar to those issued by the San Francisco headquarters of the I. W. W. while that organization was operating against the hop ranches of California a year ago. Further developments are waited with interest.

SEATTLE—Sept. 30

Construction of the Government Railroad in Alaska—at least from the coast to the Matanuska coal fields—could begin before the close of the year, according to the latest reports of the government commission of engineers now on the final stages of their surveys. This report has been given out following instructions to survey a route for a road which could be constructed to the coal fields in the shortest time for the purpose of bringing out coal in case it should be needed for emergency naval purposes. The survey is being run from the Copper River & Northwestern at mile 38 to Trout Creek in the Bering River field and the commission states that the road could be completed in six months. The length of the proposed extension would be 38 miles and the total length from the coal fields to the coast about 76 miles. The estimated cost of the road is placed at $2,054,000 including rolling stock and other equipment. Between Mile 18 and 25 there would be a maximum grade of 1.7% against the expected coal traffic. There is little doubt in the minds of Alaskans that if any of the claims in the Bering River field are opened under the leasing bill this route will be used.

W. C. Edes, chairman of the government railroad commission, is making an inspection of the Portage Bay terminal, and Commissioner Frederick Mears and Thomas C. Riggs are making the survey to the Bering Field and checking up the railroad company's surveys on the present line. Before presenting their final report the commissioners will have figures not alone upon the cost of construction over the various routes proposed, but of the amount of tonnage which may be developed along them. Chambers of commerce and commercial organizations all over the territory are gathering data on the amount of development work done along the various routes suggested, together with information as to the amount of ore tonnage that might be expected.

ISHPEMING—Oct. 2

Curtailment on the Marquette Range has begun even thus early in a marked degree. Several mines have been closed, others are working only four days a week. The Cleveland-Cliffs has closed its Maas mine at Negaunee, where 250 miners were employed, and the Mackinaw and Gardner mines in the Gwinn district, and has reduced the force at the Salisbury in Ishpeming from 160 men to 26. Every employee of this company from the president down has had his salary cut 10%. A number of the young men employed in the geological and mining engineering departments will have to look elsewhere for work after Oct. 15. The forces at most of the shops and other surface plants have also been reduced. Expenses must be cut whenever possible, says the president. The Mary Charlotte, a Breitung mine, has shut down at Negaunee. The Republic Iron & Steel will operate its Hartford mine for only four days a week until business conditions improve. The Oliver Iron Mining Co. reduced its force on the range two months ago. In closing mines the operators have done everything possible for the old hands and the men with families depending upon them for support; many young men at mines that continue to operate were laid off and their places given to the older men. Few of the companies on the Marquette have been successful in disposing of a large ore tonnage this year, and some of those who have sold part of their product did not receive cash. The Cleveland-Cliffs has about 1,000,000 tons of ore in stock at its Stephenson, Maas and Salisbury mines. Most of the companies are well supplied with ore in stock and do not feel that they should be mining when they do not know when there will be a market. All feel certain, however, that when the European war is ended there will be a big demand for iron and steel and that the ore will command a fair price.

HOUGHTON—Sept. 19

Mass Continues to Operate at the Rate of 1000 Tons Daily and the rock is showing satisfactory results. The company was fortunate in making a substantial sale just as the war broke, and in contracting for other lots for later delivery. The management is desirous of maintaining operations if it is possible to do so without loss.

Keweenaw Will Find It Necessary to Suspend Operations if the general business situation does not look brighter within a few months. Operations have been most encouraging. The loading station at the fifth level has been completed and the two drifts are well under way. Drift openings on the third and fourth levels continue satisfactory. Shaft sinking will resume this week.

Quincy Is Maintaining Its Production at about 4000 tons daily and is keeping six stamps running at the mills. This is not a normal output, but it is the best that has been attained since the strike. Greatest economy in operation is exercised and every effort is made to keep costs down to a figure which will show a profit even on the present low price of copper. No. 7 shaft remains closed.

Houghton Copper Is Planning to Mill a considerable tonnage of rock which can be turned into copper and later into cash, if the proper arrangements can be made. Proposals have been made to two different interests to mill the rock. A short railway spur could be built to connect up with the Isle Royale's railway extension to the Superior, and thus find an outlet to any one of the various Calumet & Hecla subsidiary mills. And a short spur might be built to connect with the old Atlantic railway, and thus find an outlet to the Michigan Smelting Co.'s plant—the Copper Range plant. The shareholders in Houghton Copper should know what the mill test shows. The Houghton is supposed to be working the same formation as the Superior. Superior's stockpile to all appearances looked like poor rock. Yet it made a sensation when milled. Local miners all claim the Houghton rock will make a good mill showing.

Plans to Resume Operations at the Winona on a limited scale are on foot. This work will not be undertaken by the company as an organization, but by some of the best miners that worked for the Winona when it was operating. The details of the plans are not ready for publication as yet. Superintendent Rex Beeber is interested in the scheme as much for the benefit of the miners as for the good of the company. The plan is to put about 30 good men at work in the upper levels, having the men work the property on tribute. In this way, the company would be assured of an income, although limited. The miners are anxious to make the arrangements. They are comfortably housed at the Winona, like the location and their jobs, and do not want to pull up stakes and move away. Most of them are married men. The Winona company has more than $125,000 in the treasury, as the last assessment was practically all paid.

Superior's Opening in Lower Levels continues up to average. The main producing shaft is at the 20th level. From the 18th level the drift over to the second half has attained half of the distance. This drift is in the best commercial copper the mine has opened at any time. General underground conditions remain satisfactory and rock shipments are up to standard. The suspension of operations at the Houghton, immediately adjoining, is greatly regretted. This mine has a showing of copper for fully 450 ft. of drift openings, in what is supposed to be the Superior lode. In fact, out of a total of 650 ft. two-thirds is in good copper and the remainder fair. All work has stopped and the mine will fill with water. There remains unpaid a large proportion of the last assessment. Most of the stock is in the hands of Houghton people who originally owned the lands that went into the company. They continue to have every faith in the value of the property but are pinched so that ready funds are not easily secured. The forced sale of stock, for nonpayment of assessments, was postponed.

GALENA, KAN.—Sept. 25

The Walter King Mining Co., on the Schmidt Bros.' land, has been sinking a new shaft for several days, and a few days ago struck a body of zinc ore at 30 ft. This was 8 ft. thick. There are now eight good mines in operation on this tract.

The Durston Mining Co., on the McElroy and Luscomb land, has started its pumps, after a shutdown of several weeks on account of the low price of spelter. It expects to have the ground unwatered within a few days, when full operation of the mines and mill will be commenced.

Hale Baugh and Associates are making arrangements to sink a new shaft on their lease on the Schermerhorn land south of Galena, where they drilled recently and made a strike of both lead and zinc. They discovered the run of ore while drilling for other parties on another tract of land joining the Schermerhorn tract, and immediately secured a lease for the Schermerhorn tract and commenced drilling. The run extends from 70 ft. to 90 ft. It is a sheet formation.

At Baxter Springs, the Lennan people are sinking a shaft to the 270 level and expect to strike ore soon. They are also developing the Miami mill shaft in good ore, while good lead is being secured in the opening up of the Lennan mill shaft. Last week, the company turned out 147,350 lb. of lead ore and 107,325 lb. of zinc ore. The Haymarket Mining Co. expects to erect a new mill within a short time. The company has two shafts down to the 200-ft. level, with about 23 ft. of good ore in each shaft.

At Cave Springs, the Hoosier Mining Co. on the Hartley land is preparing to sink its shaft deeper to encounter another run of ore that was found in drilling. Dr. J. A. Cotton, H. Mays and H. Conley are sinking a shaft on their lease on the Hackett land and have struck an 18-ft. face of ore at the 130-ft. level. Warren Sparks and P. J. Demereth have found a good run of ore on the Brownie lease at 24 ft.; others have struck paying ore at the remarkable depth of 8 ft.; these are the shallowest mines in the district.

TORONTO—Oct. 3

The Decision of the Directors of La Rose to prospect their ground more thoroughly, has imbued that company with new life. For the past few months, pessimistic utterances by some of the directors foreshadowed an early cessation of operations, but this event has now been indefinitely postponed. Fifty men have been put to work on surface trenching and underground work has been resumed on the University, which in the early days of the camp was considered one of the most promising properties of La Rose consolidation. On La Rose Extension, a new deep exploration shaft will be sunk, and the territory in the vicinity, thoroughly prospected.

The Profits of the Cobalt Mining Companies will show decreases for 1914 on account of the prices now obtaining for silver. The present price is 6c. under the high record for 1914 and 10c. below the high record for last year. The fluctuations in price and the uncertain condition of the market also prevent the shippers from taking advantage of the best prices. With the resumption of operations by the Beaver, the Timiskaming and the Drummond Fraction, the camp is again back to normal. Most of the companies are economizing as far as possible, cutting down on development and other work which is not at present essential. Labor conditions are good, and while there are about 800 fewer men employed than at the commencement of the war, there are few idle men in the camp

The Mining News

ALASKA

THE BOYLE CENTRAL GENERATING STATION project abandoned. Intended to generate power on Upper Yukon and distribute to Eagle, Circle, Dawson, Fairbanks, etc. Joe Boyle at head of Canadian company backing undertaking. Financial conditions forced abandonment. Entrance of railroad may revive project. Greatly desired by Fairbanks lode miners.

SEA LEVEL (Ketchikan)—This gold mine taken over by B. T. Spalding, who is making plans to start operations at once.

GOLDEN EAGLE (Port Wells)—Five-stamp mill and Pelton water wheel installed. Expected to have plant in operation soon.

TREADWELL GROUP (Treadwell)—Treadwell milled 81,596 tons in August producing $155,636 free gold, $157,158 gold in concentrates; Mexican figures, 20,202 tons, $16,013 and $16,971; United figures, 39,585 tons, $43,875 and $39,145.

ARIZONA

Gila County

MIAMI (Miami)—Directors deferred action on regular quarterly dividend. Last one in July was 50c.

INSPIRATION (Miami)—Reported from Boston will start producing first of February. Originally intended to have mill ready this fall and full 10,000-ton capacity by first of 1915. Plan modified to meet existing market conditions. At first mill will treat 5000 tons. No efforts made of late to push underground development, mine opened far ahead of milling demands.

Mohave County

GOLDEN GEM (Cerbat)—Mine unwatered and being sampled. Old workings being cleaned out and mill put in shape for test run.

YUCCA MINING CO. (Yucca)—Mill started Oct. 1. In adit level 3 ft. of mill ore developed. In raise from 600 to 700 level 4 ft. of good ore found.

WHALE (Kingman)—J. H. Conway who has bond on property opened up 6 ft. of copper ore. Preparations being made to mine molybdenite, which will be shipped east.

RAINBOW (Chloride)—In adit level 250-ft. from portal, several feet of milling ore opened up. Chief value lies in gold though there is small amount of lead with no silver. Milling plant is under consideration.

COPPER GIANT (Hackberry)—Final payment made by United Verde. During past 18 months Verde did about 1500 ft. of work, blocking out large amount of ore. Property originally owned by W. K. Ridenour and associates.

CYCLOPIC (Kingman)—Mill continues to operate steadily. In mine 30-in. vein almost vertical opened up. Carries $40 in gold. New hoist being installed and sinking will be carried to 200-ft. level. Previous work done on flat vein about 40 ft. thick.

Pinal County

RAY CONSOLIDATED (Ray)—Suspension foot-bridge to be built across Mineral Creek from general offices to mines, replacing smaller structure torn out in recent storm.

KELVIN-SULTANA (Kelvin)—Work resumed on 300-ft. level. Connection to be made between 305 raise and bottom of old No. 2 incline recently retimbered. Drifting will be continued on No. 1 vein, 500-ft. level, which shows small amount of silicate ore. Concentrator expected to be running by Oct. 10.

Yavapai County

UNITED VERDE EXTENSION (Jerome)—In 1200-ft. crosscut 3 ft. of 11% copper ore reported recently encountered. Ore drifted on for 150 ft. with same width and richness. In crosscut 1202, 300 ft. to east, orebody struck 21 ft. wide, assaying 7.8% copper, $1 to $2 gold and silver.

WHITE CLOUD CONSOLIDATED (Harqua Hala)—Work to be resumed at Bonanza and Golden Eagle mines. Company succeeds Yuma-Warrior company. Camp to be rehabilitated and several contracts for development work in zones recently explored will be let. H. W. Stevens in charge.

CALIFORNIA

Butte County

INDIAN SPRINGS (De Sabla)—Old tunnel being reopened and expected operations will resume shortly.

Calaveras County

CALAVERAS COPPER CO. (Copperopolis)—Reported will resume operations. Oil-flotation process may be installed.

Eldorado County

CALIFORNIA JACK (Georgetown)—Surface improvements, including 10-stamp mill, boarding house and blacksmith shop destroyed by fire.

PACIFIC (Placerville)—Property, closed down since war started, leased to P. D. Burtt and J. H. Santo. Development work in progress on 500-ft. level.

Inyo County

MINNIETTA (Trona)—Tramway being built to facilitate development.

Mariposa County

ORO RICO (Coulterville)—Mine, closed down pending litigation, may resume operations. J. C. Wilson, San Francisco stock broker, who held option on property, sold half-interest to A. E. Tower of New York for $175,000. Tower later brought suit, alleging fraudulent representations. Wilson filed cross-suit, claiming he had put up development expenses amounting to more than $60,000. Wilson is awarded judgment for $35,000.

Nevada County

MAJOR (Nevada City)—J. B. Proctor is interested in the erection of stamp mill.

San Benito County

BRADFORD (Emmett)—Operations resumed at this quicksilver mine.

San Bernardino

NEW ELDORADO (Dale)—Shut down from shortage of water. Good rain should permit resumption.

SUPPLY (Dale)—Property operated by United Greenwater Co., employing 80 men, treating 100 tons daily, crushing with rolls for cyanide. Rumored will sink winze 400 ft., giving total depth 1500 ft. John McGee, general manager.

Shasta County

MAMMOTH COPPER (Kennett)—Operations resumed following shutdown for repairs. Two furnaces blown in. New air-cooling plant will double capacity of baghouse.

Siskiyou County

BIG CLIFF (Etna Mills)—H. B. Wintering interested in installation of stamp mill.

SISKIYOU MINES CO. (Happy Camp)—New boxes and flumes will be installed for next winter's work.

CONNELL (La Grange)—Reported large orebody disclosed by recent development work, said to carry gold, silver and copper.

Tuolumne County

STAR (Columbia)—Ore dump purchased; sulphurets to be worked.

SCHINDLER (Sonora)—Gasoline engine installed to furnish power for pumps and hoisting.

COLORADO

Clear Creek County

GEM (Idaho Springs)—Large body of ore opened on 1400-ft. level east heading.

CENTENNIAL (Georgetown)—New raise has opened 30-in. quartz vein, assaying 2.4 oz. gold and 30 oz. silver.

CAPITAL (Georgetown)—Lessees Masters & Oldfield have opened 36-in. vein of rich ore. Seventh level, now 800 ft. long, being advanced with two shifts.

JENNY LIND (Idaho Springs)—Leased for two years to John Kuykendall, Denver. Tunnel driven 600 ft. on Jenny Lind vein and 700-ft. drift from Big Five tunnel opens Ogden vein. Property also developed by 200-ft. tunnel from Virginia Cañon. Active development will be resumed about Dec. 1.

Dolores County

PELLINGTON (Rico)—One of company's directors reports opening new shoot of lead carbonate in bottom adit. Operations curtailed months ago by depression in copper market making low-grade stuff nonprofitable; new find may stimulate activity.

Lake County

DOUBLE DECKER (Leadville)—Mine being reopened, after years of inactivity, by W. H. Covey.

NORTH SIDE (Leadville)—Manager W. J. Davis has erected shafthouse and machinery for new shaft now down 60 ft. without reaching bedrock.

TENDERFOOT (Leadville)—After weeks of hard work reopening caved ground, mine again on shipping list. New development makes workings quite safe and larger tonnage than ever can be regularly handled.

Summit County

TONOPAH PLACERS (Breckenridge)—Three boats work full time, combined daily yardage being nearly 10,000. One boat each operates in valleys of Blue River, Swan River and French Creek.

Teller County

FREE COINAGE (Altman)—Operation of Neville mill resumed with daily capacity of 60 tons. Ore mined from Pinto workings and averages about $7 per ton. J. B. Neville, general manager.

VICTOR LEASING CO. (Victor)—New company recently organized by Messrs. Tallon, Kundsen and Wilcox to operate through upper Granite shaft of Granite Gold Mining Co. Development operations in progress.

VINDICATOR—(Independence)—Main shaft has reached total depth of 1942 ft.; sinking operations discontinued. Cutting of 19th level station, at depth of 1907 ft. begun. Development in lower levels satisfactory.

CHRISTMAS GOLD MINING CO. (Victor)—Company defendant in suit brought by C. M. Becker asking judgment for $1,064,265 to cover ore said to have been taken illegally from Christmas property by Golden Cycle Mining Co.

DRAINAGE TUNNEL—Heading now penetrating solid formation and work no longer retarded by caving of dike material. Daily advance a little over 6 ft. Work will be continued another 30 days under management of executive committee, headed by J. F. Burns.

IDAHO

Coeur d'Alenes

COEUR D'ALENE SILVER-LEAD MINING CO. (Mullan)—St. Paul and Milwaukee men have advanced $10,000 to finance immediate development. Property comprises 12 claims six miles east of Mullan. Silver-lead and zinc showings.

HECLA (Gem)—Capacity of mill increased from 300 to 400 tons, and many improvements to reduce operating costs incorporated in plant. The five Wilfley tables moved to space covered by old boiler room and coal sheds; six new jigs now occupy space formerly taken by tables; old boiler room and coal shed torn away and replaced by addition with two whole sides of glass.

MINNESOTA

WITH DEFINITE TONNAGE REPORTS from all but two of ore docks at head of Lake Superior, September figures are about 4,500,000 tons, as against 6,100,000 tons in September, 1913. Total thus far in 1914, about 23,000,000 tons, as against 32,400,000 last season. On this basis, 1914 total ore shipments will be 33,000,000 tons, compared with approximately 50,000,000 tons last season.

Cuyuna Range

THOMPSON (Crosby)—Two shovels continue working in ore of openpit; will try to ship 200,000 tons this season. Underground work being prosecuted vigorously and company plans to remove a portion of its product next season through shaft after milling it down.

INTERSTATE IRON CO. (Crosby)—Company, mining branch of Jones & Laughlin, has withdrawn practically all drills from Cuyuna range and dropped all options except one, where one drill is still retained. Company held under option C. M. Hill Lumber Co. property, controlled by N. P. interests, and Cuyuna Iron & Manganese Ore Co. property, adjoining Pennington on north. These commonly considered the best unopened orebodies on range. Property still under option is 40-acre tract to westward end of North Range, near Rowe mine at Riverton.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT (Elkhorn)—Stockholders' meeting will be held in Butte, Oct. 20, to act on several matters agreed upon at Aug. 5 meeting. Proposed Southern Montana Ry. Co. bond issue of $3,000,000 for 30 years at 6% will be guaranteed by deed of trust, and bonds made convertible into stock of development company. Latter owns all stock of the Southern Montana and will construct the 100 miles of road to connect company's mines in French Gulch and at Elkhorn with Butte. President Allen, of the development company, states belief that railway bonds will soon be taken by English capitalists, notwithstanding war. Surveys for proposed route completed, rights-of-way secured, townsites laid out and everything ready for construction.

Deer Lodge County

BLUE EYED NELLIE (Anaconda)—Some recent development work opened up large body of zinc. Several carloads, shipped to Oklahoma smelter, ran 30% and 40%. Management is contemplating erection of plant for treating ore at mine. Nature will depend on results of tests now being carried on.

Silver Bow County

NORTH BUTTE (Butte)—Quarterly dividend, due in October, will be passed. Intimated directors will take no formal action on matter, merely neglecting to authorize disbursement. Last payment in July was 50c. To date, dividends are $11,905,000; in 1914, $645,000.

BUTTE-BALLAKLAVA AND BUTTE-ZENITH CITY (Butte)—I. Friemuth, of Duluth, president of both companies on recent visit announced that company intends to do some development work at Butte-Ballaklava during winter; how much will depend on general conditions affecting mining industry. Mine shut down some time ago in compliance with general policy of curtailment prevailing in Butte camp. At Butte-Zenith City mine work was carried on without interruption and assays from workings on 460 level indicate presence of extensive copper orebodies.

NEVADA

Churchill County

SODIUM AND POTASSIUM NITRATE in foothills 40 miles east of Fallon discovered, it is stated. Deposit found over area of 200 acres. Ground staked and location work being done.

Esmeralda County

SANDSTORM-KENDALL (Goldfield)—Ore of shipping grade struck in south drift on 350-ft. level. Development work being done on 200- and 350-ft. levels.

Humboldt County

INCENDIARY FIRES AT ROCHESTER damaged buildings of Codd and Big Four leases. Most damage at Codd lease, where office building was destroyed. Shaft houses saved.

Lander County

AUSTIN-MANHATTAN CONSOLIDATED MINING CO. (Austin)—Lessees treating old tailings dumps by cyanidation. In Upper Austin, treatment of dump containing 30,000 tons nearly completed. Plant will then be moved below Austin-Manhattan mill, where dump estimated at 100,000 tons will be re-treated.

Lincoln County

ORE SHIPMENTS FROM PIOCHE are being made by Prince Consolidated, 30 to 40 cars per week; Amalgamated Pioche; McFadden lease on Day Bristol, 70 tons per week; and Vesuvius lease.

Lyon County

NEVADA-DOUGLAS (Ludwig)—Mine closed until better copper market is obtained. Construction of leaching plant will continue. Expected to be in operation by Jan. 1, 1915.

Mineral County

TRUCKEE RIVER GENERAL ELECTRIC CO.—Power line will be extended from Pine Grove to Rockland at once.

ALAMEDA (Luning)—Stated work on this group will be resumed within 30 days; ore carries gold, silver and copper.

GOLD PEN (Bovard)—Stated 25-ton shipment to Selby plant, San Francisco, gave returns of $12,000 in gold and silver.

COMMERCIAL (Manhattan)—Sampling and testing discontinued. Said ore zone too limited to justify 100-stamp mill contemplated. Churn drills are idle.

SILVERADO—Car of high-grade silver ore being hauled to Hudson. Considerable development work under way in district. Strike of gold ore reported from Swagger Cañon.

Nye County

BIG PINE (Manhattan)—Understood Mushett & Wittenberg, operators of property, are intending to install large tube mill. Schist ore is easily crushed and gold content is freed easily, so it is expected that coarse crushing and tube-mill work is all needed.

MONITOR BELMONT (Belmont)—Preliminary survey for electric power line of Nevada California Power Co. from Manhattan to Belmont completed and installation to begin at once. Stated modern mill is to be built. First work will be draining of 500-ft. shaft, which has 300 ft. of water in it.

WHITE CAPS MINING CO. (Manhattan)—Third carload of ore now being shipped to Western Ore Purchasing Co. at Millers. Chutes all installed for oxidized ore above first level in the east orebody. Milling in one of local mills is contemplated as soon as ore bins can be installed at collar of working shaft.

LITIGATION HILL MERGER MINING CO. (Manhattan)—Special stockholders' meeting called to vote on plan of consolidation with adjoining companies, Manhattan Amalgamated and Earl. Planned to purchase milling plant for properties and furnish working capital for development. Estate of the new company would cover area of about 80 acres, and includes the whole of the Litigation Hill section.

Storey County

CHICAGO-NEVADA (Virginia City)—Development work under way at this property in old Flowery district, east of Comstock, in Six Mile Cañon. Upper levels being cleaned out and repaired and new work done. Lower levels filled with water; question of unwatering being discussed. Test run of 50 tons showed ore to be free milling and of good grade.

Washoe County

PLACER GOLD IN RENO found in excavating for Fordonio building, it is stated. Gold was free from quartz and rounded. Other finds of gold made in Reno, but not in such quantity. This part of Reno once bed of Truckee River, and south of Reno, on Truckee River, Mill City placers are worked intermittently.

FRANCO-AMERICAN SYNDICATE (Pyramid)—This company, operating near Pyramid Lake, will make shipment. Stated sufficient ore developed to warrant construction of mill.

NEW MEXICO

Don Ana County

MEMPHIS MINE (Organ)—Reported body of copper, gold and silver ore encountered during sinking of 50-ft. shaft. Smelter report said to show 16.5% copper, 8 oz. silver and $3 gold per ton. Air compressor and drills may be installed.

Grant County

CHINO (Hurley)—Milling operations extended from four days per week to five and a half. Many houses being erected in camp.

BURRO MOUNTAIN (Tyrone)—Experimental mill again in operation. Installation of Deisel engines under way. Many employees affected by curtailment of development secured employment in Mogollon district.

EMPIRE ZINC (Pinos Altos)—Construction of tramway from mines to Silver City, nine miles distant, under consideration. Development work continues on Cleveland and Utter groups. Several miles of roads recently completed.

Lincoln County

YELLOW JACKET MINE (White Oaks)—Property leased by Swoyer & Evans, who have made preparations for shipping iron ore to C. F. & I., Pueblo, Colo.

PARSONS MINING CO. (Parsons & Nogal)—Contract made with Wild Cat Leasing Co., of White Oaks, to supply electrical power for mills. Parsons company agreed to build and maintain adequate power lines, installation to begin at once. Mills will be overhauled.

WILD CAT LEASING CO. (White Oaks)—Order placed for 500-kw. steam turbine generator; will be ready for operation by Jan. 1. Fifteen-stamp mill running 20 hr. per day; North and South Homestake mines being operated.

Luna County

FAULKERSON, DAVIS & DAVIS (Gage)—At 50-ft. depth, silver-lead ore penetrated; occurs in limestone. Property situated in Victoria Mountains, 20 miles west of Deming. Ore transportation facilities good. El Paso smelting plant treats ore.

Socorro County

MOGOLLON MILLS unaffected by cyanide situation, having enough on hand for six months. Companies still need first-class miners.

SOCORRO (Mogollon)—One-mile tram from Pacific mine to Fannie mill under construction; will carry 20 buckets

Taos County

JUNE BUG MILL (Red River)—Concentrating tables will be added to equipment for treatment of newly discovered ores on Silver Queen property. Concentrates will be shipped to Pueblo, Colo.

UTAH

Juab County

TINTIC SHIPMENTS for the week ended Sept. 26 amounted to 1[illegible]4 cars.

UNCLE SAM (Eureka)—One to two cars weekly shipped by lessees, of whom five are working.

OPOHONGO (Mammoth)—Operations resumed and shipments made. Lessees working below 700 level.

SCRANTON (Eureka)—Lead ore 2 to 3 ft. thick developed in the large body of iron ore on the 500-ft. level.

TINTIC ZINC (Eureka)—Tunnel in 550 ft. in mineralized ground; raising done for 85 ft. in rock mineralized with zinc and copper.

TINTIC STANDARD (Eureka)—Work being done on 1000- and 1200-ft. levels. Station being cut on 1200 and heavier hoist installed. Some trouble from gas.

KNIGHT CHRISTENSEN MILL (Silver City)—Some changes and improvements have been in progress; expected to be able soon to treat up to capacity, 100 tons daily.

MAMMOTH (Mammoth)—Mine has resumed production. Week ended Sept. 25, 12 cars of ore carrying silver, gold and copper were shipped. This comes chiefly from new stope on 600.

EAGLE & BLUE BELL (Eureka)—Good progress being made sinking main shaft, now below 1600 level. Ore being shipped from between 1000- and 1600-ft. levels. Output for week ended Sept. 25, 12 cars.

VICTORIA (Eureka)—Silver-lead ore being mined on 1000 and 1200 levels, and occasional shipments of gold ore made. Working forces again normal, one shift working. Present output about 250 tons of ore daily.

IRON BLOSSOM (Silver City)—Ore being mined from east vein parallel to main ore channel, on and above 500-ft. level. Shipments of silver-lead ore in excess of dividend requirements. Development being done on 1900-ft. level.

CHIEF CONSOLIDATED (Eureka)—Arrangements made for diamond drill work on 1400 level. Said to be intention to prospect the ore zone more thoroughly rather than to drill into new ground. Ore being shipped from 1200-, 1400- and 1600-ft. levels. Eighty feet of drifting done on vein recently opened on 1600; work is in shipping ore; no crosscutting done yet. Rails being laid for new spur to mine. May Day doing work in Chief ground under lease, and silver-lead ore opened 25 ft. by 4 or 5 ft. thick. Net smelter returns will be divided equally between companies.

Tooele County

HIDDEN TREASURE (Stockton)—Zinc ore being shipped from this property in Dry Cañon. About 35 men are employed. Mine produced silver-lead ore in past.

GREAT DESERT COPPER (Clive)—Shipments from strike at Wild Cat Mountain, 19 miles south of Clive, will soon be started; 260 tons of ore on dump, carrying silver, copper and gold. Spur and switch being put in by Western Pacific, to which hauling will be done by auto truck. Property is in Cedar Range, on edge of Great Salt Lake desert. J. M. Hamilton, general manager.

WASHINGTON

Douglas County

LUCKY FIND (Waterville)—Col. John Buchan, owner, considering installation of mill for ore treatment.

Pierce County

JARBRIDGE—A 15-ton stamp mill and cyanide plant, to be installed at once at this mine, owned by Jarbridge Consolidated Mining Co., Tacoma, Wash.; 800-ft. tunnel will be driven.

Stevens County

SAN POIL (Republic)—J. L. Harper concerned in new company has bond and lease on San Poil mines and mill for four years, price $185,000, payable in installments through life of bond.

UNITED COPPER CO. (Chewelah)—After idleness of several weeks, due to suspension of operations by Granby Smelting Co., at Grand Forks, B. C., where mine output was being treated, mine was scheduled to resume shipments Oct. 1. President Conrad Wolfle has entered into a two years' contract with Consolidated Mining & Smelting plant at Trail, B. C., for treatment of entire product of mine. Rate said to be about best ever obtained by United Copper; in addition Great Northern has announced freight reduction of 25c. per ton on United Copper ore. During shutdown small force did development work. Drift north from point of intersection of lower tunnel with main vein driven 500 ft., giving approximately 1000 ft. vertical depth; now 9 ft. clean shipping ore showing. Drift in shipping ore all the way, vein ranging from 2 to 9 ft. wide, much of it gray copper. Mine to resume with at least 75 men; superintendent, E. A. Wolfe and foreman, M. D. McIntosh, assembling force. Output to be about 225 tons daily, 100 tons to be shipped and 125 tons to be treated at concentrator. Four-mile wagon road from mine to Chewelah repaired and ballasted and mine should be able to make deliveries all winter.

Whatcom County

EXCELSIOR (Glacier)—New machinery including stamp mill, concentrating table and sawmill are being installed at this gold mine. H[illegible]d & Fry of Seattle, are owners.

CANADA

BRITISH COLUMBIA

BRITISH COLUMBIA COPPER (Greenwood)—According to newspaper report, company [illegible] closed smelting plant and ceased mining. Exploration [illegible] continues on part schedule. Management advises [illegible] tons of ore put in sight on Copper Mountain. Averages about 1.85% copper and carries 72c. in gold and silver. Construction work on proposed new mill not started. Size not definitely determined, but with blocking out of all ore now in sight, initial capacity is expected to be at least 1000 tons daily. Construction will be delayed.

Ontario

TEMISKAMING (Cobalt)—Mine will reopen.

DRUMMOND FRACTION (Cobalt)—Mine has resumed operations.

SCHUMACHER (Schumacher)—Work cut down to one drill underground. Reported mill to be built and vein above 300 level developed.

McINTYRE (Schumacher)—Hitch occurred in negotiations for majority control by Nipissing; deal abandoned.

BEAVER—(Cobalt)—Mine will resume underground operations. Mill kept running but mine closed for five weeks.

TOUGH OAKES (Kirkland Lake)—Most of underground employees discharged due to the inability to raise funds in England. Mill continues running on dump ore.

AT KIRKLAND LAKE, work stopped on several properties recently taken over by new English company, under direction of Harry Cecil.

NORTH THOMPSON (Porcupine)—Property being examined by Porcupine Crown with view to combining. If examination is satisfactory combination will take place on basis of dollar for dollar on actual present value.

HOLLINGER (Timmins)—New six-compartment shaft to be sunk at central point on Acme property, to be used as a main working shaft for all properties of Canadian Mining & Finance Co. One of new 50-drill compressors now ready; as little work is being done on Acme, additional power will be available for Hollinger. Acme has sufficient ore developed to supply 20 stamps of Hollinger mill; therefore cut down development work. Hollinger has uncovered new surface showing near office, one of best discoveries on property.

MEXICO

CARRANZA CANCELS HUERTA MINE TITLES, according to official advices to State Department in Washington. Department states that decree dated Aug. 20 was issued by Mexican central administration, cancels all mining titles obtained during Huerta administration and declares null all proceedings relative to acquirement of mining claims started during Huerta regime. Sixty days from date of decree allowed mining agents to make applications for renewal of all procedure previously taken. Further stipulated that all payments required by mining laws of Mexico in connection with mining titles or mining claims must be made again to present central administration. All rights will be lost by persons who have not complied with abovementioned rules before expiration of stipulated 60 days, and the mining land will thereafter be considered as open to denouncement.

SOUTH AMERICA

Colombia

PATO MINES—Cable to Oroville Dredging in London from mines manager states dredge turned quarter over and sank, middle of September; floated week later; estimated three weeks for repairs.

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Assessments

Company	Delinq.	Sale	Amt.
Best & Belcher, Nev. (post.)	Sept. 25	Oct. 16	$0.05
Black Bear, Ida. (post.)	Oct. 1	Nov. 1	0.01
Black Traveler, Ida.	Sept. 22	Oct. 24	0.005
Bullwhacker, Mont.	....	....	0.15
Cardiff, Utah	Oct. 19	Nov. 9	0.01
Carney Copper, Ida.	Sept. 21	Oct. 21	0.00225
Chalona, Nev.	Oct. 3	Oct. 21	0.0025
Coeur d'Alene Investment, Ida.	Oct. 10	Nov. 14	0.002
Columbine, Colo.	Sept. 15	Oct. 20	0.02
Comstock Copper, Ida.	Oct. 5	Nov. 5	0.001
Continental, Ida	Oct. 6	Nov. 5	0.016
Copper Crown, Ida	Oct. 10	Nov. 14	0.002
Copper King, Ida.	Oct. 1	Nov. 1	0.01
Copper Plate, Ida.	Aug. 29	Nov. 29	0.002
Dalmatia, Ida.	Oct. 1	Nov. 2	0.001
Davis-Daly, Mont	Oct. 15	......	0.25
Diamondfield Black Butte, Nev. (post.)	Oct. 15	Nov. 21	0.01
East Hercules, Ida.	Oct. 1	Nov. 1	0.001
Ely Con., Nev.	Oct. 15	Dec. 2	0.03
Eureka, Ida	Sept. 25	Oct. 26	0.001
Federal Ely, Nev.	Sept. 21	Oct. 21	0.005
Giant, Ida.	Sept. 21	Oct. 23	0.003
Hilarity, Ida.	Oct. 12	Nov. 23	0.003
Honolulu, Ida.	Sept. 15	Oct. 12	0.0025
Jack Waite, Ida. (post.)	...	Oct. 17	0.01
Lead King, Ida	Oct. 1	Oct. 16	0.0005
Lewis & Clark, Ida.	Sept. 15	Nov. 13	0.001
Liquidator, Ida.	Sept. 12	Oct. 12	0.002
Little North Fork, Ida.	Oct. 12	Nov. 12	0.001
Lucky Deposit, Utah	Oct. 12	Nov. 15	0.005
Lucky Swede, Ida	Sept. 19	Oct. 19	0.001
Monarch-Pittsburgh, Nev. (post.)	Sept. 14	Oct. 19	0.01
Nabob, Ida.	Oct. 1	Nov. 2	0.005
National Copper, Ida.	Oct. 5	Nov. 5	0.03
Overman, Nev.	Oct. 8	Oct. 29	0.05
Pacific, Utah	Oct. 5	Oct. 21	0.0025
Reindeer-Queen, Ida.	Sept. 21	Oct. 21	0.002
Rescue Eula, Nev.	Sept. 10	Oct. 15	0.01
Royal Mining, Ida.	Sept. 23	Oct. 19	0.0015
Silver Pick, Nev. (post.)	Sept. 30	Nov. 2	0.01
Snowshoe, Ida.	Sept. 19	Oct. 19	0.005
Sonora, Ida	Sept. 28	Oct. 27	0.002
Sunset, Nev.	Sept. 21	Oct. 26	0.01
Tarbox, Ida.	Sept. 26	Nov. 27	0.0025
Tonopah Gipsy Queen, Nev.	Sept. 2	Oct. 17	0.01
Treasure Vault, Ida.	Sept. 15	Oct. 12	0.02
Union Con., Nev.	Oct. 15	Nov. 5	0.05
United Copper, Wash.	...	...	0.005
Valentine, Ida.	Sept. 12	Oct. 12	0.001

The Market Report

METAL WORKING

NEW YORK—Oct. 7

Pessimism and declining prices have been the characteristics of the markets for copper, lead and spelter during the last week.

Present conditions greatly increase the cost of doing foreign business. Freight rates, insurance, and cable tolls all run high. One international metal house which normally has cable tolls of $1000 to $1500 per month now finds its monthly bills running upward of $3000, largely because coded messages are not now accepted.

Copper, Tin, Lead and Zinc

Copper—The question of the exportation of copper to Holland has been the chief subject of concern during the last week. Great Britain is going to pay for the copper that she has seized, which will be satisfactory to the consignors when the terms have been adjusted, but no copper is henceforth to go to Holland beyond the requirements of that country, which will cut off all possibility of delivering copper to Germany and that is not satisfactory to producers who want to dispose of all the copper they can. The producers have been much disturbed over this situation. However, in well informed quarters it is believed that Great Britain cannot maintain her present position.

At the beginning of our week some copper was sold at 11¾c., regular terms. At the end it was understood to be had at 11½c., regular terms. The business that has been done, however, has been small.

Base price of copper sheets was reduced ½c. per lb. on Oct. 1 and is now 17c. per lb. for hot rolled and 18c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 13¾c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 3245 long tons. Our special correspondent gives the exports from Baltimore at 600 tons copper.

The Granby Consolidated report for the year ended June 30, 1914, shows a production of 23,324,097 lb. copper; an increase of 631,483 lb. over the previous year.

Tin—The market has been quiet but firm. Consumers are buying futures whenever they have offers, but the offers are rather scarce.

DAILY PRICES OF METALS

			NEW YORK					
			Copper	Tin	Lead		Zinc	
Oct	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
1	4.9550	52¾	*	31	3.65 @3.75	3.50 @3.60	4.90 @4.95	4.75 @4.80
2	4.9550	52½	*	31⅛	3.65 @3.75	3.50 @3.55	4.90 @4.95	4.75 @4.80
3	4.9500	52¼	*	31⅛	3.65 @3.75	3.50 @3.55	4.90 @4.95	4.75 @4.80
5	4.9475	52⅝	*	31⅛	3.60	3.45	4.85 @4.90	4.70 @4.75
6	4.9465	52⅜	*	31	3.55 @3.60	3.40 @3.45	4.35 @4.90	4.70 @4.75
7	4.9575	52½	*	31	3.50	3.35	4.85 @4.90	4.70 @4.75

*No quotations.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

Lead—Following the reduction by the A. S. & R. Co. last week further shading of prices was begun by independents and the expectation that the market would sink to a still lower level was general. This proved to be correct. Independents sold at 3.70c., New York, 3.55c. St. Louis, and lower, right from the beginning. Some round lots were turned over at the decline and there were increased sales of domestic lead for export. However, things did not move fast enough and on Oct. 5, the A. S. & R. Co. reduced its price to 3.60c., New York, and having been undercut by independents reduced again, this time to 3.50c., New York, on Oct. 7. These successive cuts have temporarily produced something like demoralization in this market.

The bald fact is that unsold stocks in the hands of producers are bigger than they want to carry in present circumstances and a level of price has got to be found that will move them or curtail production, or both.

Smelter—During the early part of the week there were sales of a moderate tonnage, in lots of 50 tons and over, at 4.75@4.80c., basis St. Louis, including some for export to England. The latter business was, however, for spelter of closely specified grade, e.g. 99½% Zn or 99¼% Zn, and the transactions in each case were matters of special negotiation. The market in London is about £23½@24, or about 5.10@5.20c. at par of exchange. The American equivalent under present conditions cannot be closely figured until business is finally consumated. One exporter reckons roughly 40s., or say 45c., between London and St. Louis. During the latter part of the week spelter was unsalable at 4.75c., at which the metal was offered liberally from numerous quarters. There was a little encouragement, however, in the increasing interest exhibited by British buyers, who signified that £2 might be an attractive figure.

Other Metals

Aluminum—The market is quiet and only a light business is reported. Quotations are rather lower 18@19c. per lb. being named for No. 1 ingots, New York.

Antimony—Business is better, with a fair amount of sales. Ordinary brands—Chinese, Hungarian, etc.—are selling at 11@11½c. per lb. Cookson's is held at 13@14c., with a tendency to higher prices manifest.

Quicksilver—The market has been in fair condition, but has settled down a little. The New York quotation is $55@60 per flask of 75 lb., and the market is steady at that figure. The latest London quotation is £9 per flask.

Gold, Silver and Platinum

Gold—On Oct. 1, the pool made the first shipment of gold to Ottawa, Canada, the amount being $10,000,000. This gold is credited to the Bank of England, and sales of London Exchange are made against it. An additional $15,000,000 will be sent soon.

Iridium—This metal is scarce and prices have advanced Holders are not willing to give any definite quotations.

Platinum—The market is uncertain, owing to the difficulty of predicting future supplies. Prices are nominally $50 per oz., but advances are possible at any time.

Silver—The market has continued very steady; this is owing to the demand from the mint and some outside orders being about sufficient to absorb the offerings.

London quotations for the week are: Oct. 1, 24d., Oct. 2, 24d.; Oct. 3, 23⅞d.; Oct. 5, 24⅛d.; Oct. 6, 24d.; Oct. 7, 24 pence.

Owing to a misprint which was overlooked, the price of silver in London, on Sept. 22, was given in our market report at 24½d.; it should have been 24⅛d. The correct average London price for September was 24.26 pence.

Exports of silver from London to the East, Jan 1 to Sept. 24, as reported by Messrs Pixley & Abell:

	1913	1914	Changes
India	£5,163,500	£4,478,500	D. £685,000
China	652,000	42,000	D. 610,000
Total	£5,815,500	£4,520,500	D. £1,295,000

[illegible]nc and Lead Ore Markets

JOPLIN, Mo.—Oct. 3

[illegible] of blende is $45, the assay base $39@42; m[illegible], [illegible] per ton of 60% zinc; calamine base, $22@2[illegible] zinc; average all grades of zinc, $37.52 per t[illegible] price of lead is $47.95, the base $46 per ton of [illegible]; the average of all grades is $45.70 per ton.

SHIPMENTS WEEK ENDED OCT. 3

	Blende	Calamine	Lead	Value
[illegible] week..	8,662,140	1,142,800	1,567,280	$220,790
[illegible] year..	400,167,920	30,165,100	68,882,020	9,932,760

Blende value, the week, $171,580; 40 weeks, $7,949,990.

Calamine value, the week, $13,350; 40 weeks, $351,430.

Lead value, the week, $35,860; 40 weeks, $1,631,340.

PLATTEVILLE, WIS.—Oct. 3

The base price paid this week for 60% zinc ore was $40@42 per ton. The base price paid for 80% lead ore was $44 per ton.

SHIPMENTS WEEK ENDED OCT. 3

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	4,257,840	118,260	799,240
Year	121,309,600	4,040,760	26,451,870

Shipped during week to separators, 4,272,330 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Oct. 7

Iron and steel exports in August amounted to 86,599 gross tons, against 114,790 tons in July, an average of 141,000 tons a month during the first six months of the year and a record rate of 275,000 tons a month reached for a few months back in 1912. The decrease in August proves to be much less than expected. August iron and steel imports, largely ferromanganese, were 28,768 gross tons, an increase of 11% over July imports, and the heaviest for the year, excepting April. September is not likely to show large exports, as very little fresh tonnage was entered, but export bookings are now at approximately the rate for a few months before the war. In the past fortnight the Steel Corporation has booked about 70,000 tons, its first really large export sales since the war started. Some of the independents have participated in export business, particularly in rods, wire and nails for England. Canada is buying somewhat more freely. South America presents very poor prospects.

The reduction in freight rates on Alabama iron, ordered by the Interstate Commerce Commission, took effect Oct. 1. It is generally about 35c. a ton, but has not been accepted by all the lines north of the Ohio. The chief selling points affected are Cincinnati, St. Louis, Chicago, Cleveland and Buffalo.

United States Foreign Trade in Iron and Steel, including machinery, seven months ended July 31, is valued as follows by the Bureau of Statistics of the Department of Commerce:

	1913	1914	Changes
Exports	$179,703,554	$129,816,916	D. $49,886,638
Imports	20,872,321	18,752,973	D. 2,119,348
Excess, exports ..	$158,831,233	$111,063,943	D. $47,767,290

The decreases shown this year were 27.8% in exports and 10.1% in the imports.

PITTSBURGH—Oct. 6

There has been no noticeable decrease in domestic buying in the past week or two, but the rate is a low one, probably not over one-third of capacity at the outside, while production and shipments are at an average rate of about 50% of [illegible] and further curtailment is to be expected within a few weeks unless buying increases very decidedly. An interesting fact is that the Carnegie Steel Co. has scarcely varied [illegible] rate of about 62%, measured in ingot capacity, [illegible] months.

[illegible] softening tendency in spots, but this is not [illegible]. Sheets have firmed up to an absolute minimum of [illegible], Pittsburgh, for black and galvanized. Tinplate has sold [illegible] week at $3.40 and $3.50, though there are reports [illegible] be done in some instances. The minimum on [illegible] dropped $1 a ton to 1.15c., following a similar [illegible] and plates, but 1.20c. is still quoted on ordinary business by the large mills in the case of all three products.

Pig Iron—The market continues absolutely stagnant, but there are no evidences of any weakness, blast furnacemen representing that they will blow out their furnaces rather than cut prices. Deliveries are scarcely equal to production, even though production is at the lowest level for years. We continue to quote: Bessemer, $14; basic, $13; No. 2 foundry and malleable, $13@13.25; gray forge, $12.50@12.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The English makers have made a further reduction on forward deliveries, amounting to $7 a ton, and now quote $68, Baltimore. There is nothing doing in prompt lots, as supplies are ample. Dunbar furnace which was expected to make an alloy of 30 to 40% manganese has not yet gone in and there is a question whether much of such material could be sold.

Steel—At last there has been some action in unfinished steel, after a period of weeks in which $21 for billets and $22 for sheet bars were quoted as asking prices. Efforts to sell sheet bars resulted in $20.50, maker's mill, Youngstown, being done, but no very large tonnage could be disposed of even at this cut price. We now quote billets at $19.70 and sheet bars at $20.50, maker's mill, Youngstown, and billets at $20 and sheet bars at $21, maker's mill, Pittsburgh. It is understood that a large block of openhearth sheet bars has been offered at $20, delivered Pittsburgh, without finding a taker, but that fractional parts would hardly be sold except at an advance. Rods are $26, Pittsburgh. Export quotations on billets, sheet bars and rods are now at about the domestic level, against premiums formerly asked.

IRON ORE

Imports and Exports of Iron Ore in the United States seven months ended July 31, in long tons:

	1913	1914	Changes
Imports....................	1,108,170	850,883	D. 557,287
Exports..............	521,497	37 ,131	D. 143,366

Of the imports this year 487,563 tons were from Cuba and 222,680 from Sweden. Imports of manganese ore were 227,761 tons in 1913, and 163,390 in 1914; decrease, 64,371 tons.

Imports at Baltimore for the past week included 2571 tons of manganese ore from Liverpool and 6250 tons from Rio Janeiro, Brazil.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 247,221 short tons; shipments, 248,063 tons. Production of Greensburg and upper Connellsville districts, 35,155 tons.

Foreign Fuel Trade of the United States seven months ended July 31, in long tons:

	Exports		Imports	
	1913	1914	1913	1914
Anthracite..............	2,448,913	2,211,604	30	15,902
Bituminous..............	10,008,012	7,090,084	826,184	758,044
Coke....................	550,751	408,441	39,698	61,715
Bunker coal.............	4,409,370	4,525,876	....	.
Total..................	17,417,046	14,236,005	865,912	835,661

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The great bulk of the foreign trade, both exports and imports, is with Canada.

CHEMICALS

NEW YORK—Oct. 7

The general market is still disturbed and unsettled, though there is a better position with regard to supplies.

Arsenic—The market remains extremely dull. In the absence of business, quotations remain at $4.50 per 100 lb., but this price is largely nominal.

Copper Sulphate—The market is quiet, but steady, on a moderate business. Quotations are unchanged at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business continues quiet, with only moderate sales. Quotations are 1.87½c. per lb. for spot and November-December; 1.90@1.92½c. for 1915 deliveries.

PETROLEUM

The monthly statement of the "Oil City Derrick" shows new oil wells completed in September as follows: Pennsylvania grade, 327; Lima-Indiana, 115; Central Ohio, 88; Kentucky, 13; Illinois, 139; Texas-Louisiana, 92; Kansas-Oklahoma, 660. This shows 1434 wells completed, a decrease of 332 from the August report. New production is given as 131,910 bbl., an increase of 6637 bbl., due to large wells in Oklahoma and the Gulf Coast. Among the completions were 234 dry holes, 75 fewer than in August, and 217 gas wells, an increase of 32, due to the work of the gas companies in Ohio and the Mid-Continent.

The Engineering and Mining Journal

VOLUME 98 · OCTOBER 17, 1914 · NUMBER 16

Development of Continuous Counter Current Decantation—I*

By Herbert A. Megraw

SYNOPSIS—Decantation is making headway in displacing or supplementing the filter. Primarily the system is designed to provide economical means for separation of dissolved metals from solids. A secondary advantage is that some additional metal is usually dissolved in passage through the system. Forms of the process are in operation at the Hollinger mill, the McIntyre, Vipond and Porcupine Crown mills, and these are discussed.

*

The process of continuous decanting in slime treatment, to replace or supplement the filter, is making notable headway. New mills are being constructed to use it, and old ones are being rearranged to take advantage of its economies. There is no new principle involved in its application to present-day metallurgy, and while there are new mechanical devices designed to make the most of the conditions which exist, it is still possible to use the older type of apparatus and to get acceptable results. The latter may, however, involve much more trouble and perhaps somewhat more cost than the newer machines.

Preparation of the Ore

Preparation of an ore for treatment by continuous decantation process is a matter of importance, just as it is with any other process. The ore must be properly prepared to take advantage of the highest efficiency obtainable through the methods applied. Perhaps the most important preparation for the ore is to see that it is to the greatest possible extent in the same condition throughout; that is, a pulp which contains a slight percentage of coarse sand is not capable of giving best results by counter-current decantation, not because of the actual size of the sand, but because the larger, heavier grains sink more rapidly through the solution, and have less contact with it than the lighter, slimey portions, and are likely to get through the circuit without very much treatment. Slimes, on the contrary, settle more slowly through solution and is in contact with it for a much greater length of time.

The Hollinger Mine and Mill, Timmins, Ontario

At this point it will be of interest to enlarge upon pulp condition, because there are factors which will modify the statements made in the preceding paragraph. It must be carefully borne in mind that continuous counter-current decantation was not designed to provide means for dissolution of precious metal, but to provide a method for the simple and economical separation of the dissolved metals from the solids. Clearly, for the satisfactory accomplishment of this function, the size of the pulp particle need not be considered. For the best working of counter-current decantation, the pulp under treatment should receive its agitation treatment, the amount calculated to dissolve the economical maximum of precious metal, before going to the decantation system at all. It cannot be too strongly emphasized that counter-current decantation is not designed as an extraction process.

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*This is the fifteenth of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvements. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, 1913; Jan. 31, Mar. 7, Mar. 21, Apr. 25, May 23, June 20, July 25, Aug. 29 and Sept. 12, 1914. The next article will deal with "Development or the Counter-Current Decantation Process—II," and will appear in the issue of Oct. 31, 1914.

Notwithstanding the facts just mentioned, it will be found almost impossible to pass a pulp, whatever its previous agitation, through a continuous counter-current decantation system without accomplishing some additional dissolution of metal, small though it may be. This is so true that some operators, who are concerned in the treatment of clean, free-gold ores of low value, have believed that the decantation system was all that was necessary to dissolve the economically maximum portion of gold. Most of these have discovered that agitation was beneficial after all, but it is still true that the changes of solution incident to continuous decantation tend strongly toward the dissolution of further quantities of metal. To take advantage of this secondary function to the fullest possible extent, it is clearly desirable that the pulp should be of even size, the essential for maximum dissolution in continuous agitation systems.

Sulphide ores may, and usually do, require previous concentration, but it is nevertheless true that by grinding a sulphide fine enough, its values are very likely to be given up in about the same time required in the ordinary slimes treatments. To do this, however, sulphide slimes should be reground until they are in an exceedingly fine state of subdivision. In such case they may go through counter-current decantation treatment along with ordinary slime and have their values satisfactorily extracted. Sulphides are, of course, governed by the same general laws as ores, so that what has already been said as to dissolution in the decantation circuit applies to them as well.

Principle of the Process

The basis for the process is exceedingly simple. It is the fact that slimes may be dewatered by allowing them to settle quietly through the solution, and to decant off the solution. The settled slime is not, of course, thoroughly or entirely dewatered, but retains a percentage of its original solution, the amount depending upon several factors, among which may be mentioned the specific gravity of the slime itself, the specific gravity of the solution from which it is settled, size of the slime particles, temperature, and the acidity or alkalinity of the solution. These factors vary, and their effects upon settlement vary with the different slimes and solutions handled, so that no general rules can be laid down for operation. A slime thus settled may be reduced to some point from 30 to 50% of moisture. When the original pulp contains 4 or 5 tons of solution to one of solids, and is thickened to $\frac{1}{3}$ ton of solution to 1 of solids, it will be seen that the removal of solution has been considerable. If the thickened slime be then mixed with other solution up to the point of original dilution, or less in many cases, the character of the solution is changed, the new solution being affected slightly by the small percentage remaining in the thickened slimes. If this process should be repeated, it will readily be seen that the small quantity of solution remaining in the thickened portion will be quite different from that remaining in the original thickened portion, having been increased or decreased in value, cyanide or whatever the solution may contain, accordingly as the newly added solution differed from the original. If the newly added solution is water, then the solution in the mixture will be of low value. If water were added not only once as a diluent, but two or three times, it may be easily seen that the value of the solution remaining in the finally thickened pulp would approximate nothing, and for practical purposes could be considered as such. Then this pulp could be thrown away without any reference to its contained value, since it is small enough to be disregarded.

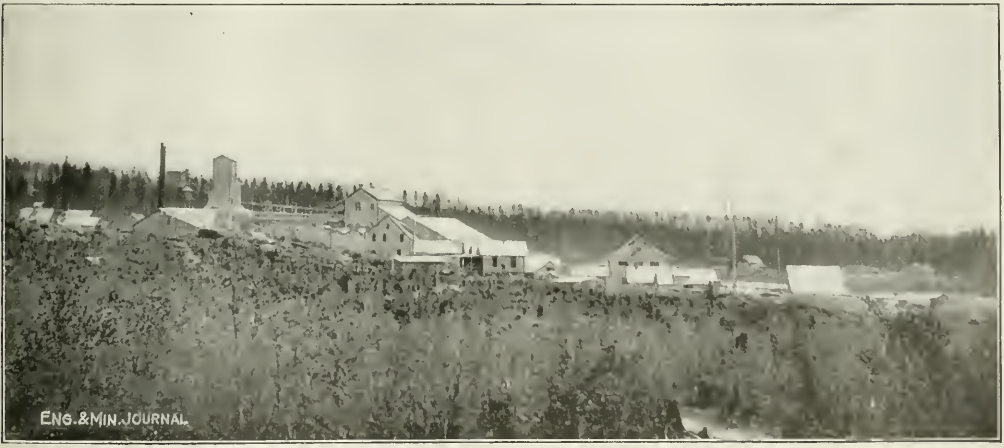
Amount of Water Limited in Practice

In practice it is quite evident, in considering this subject, that it would be impracticable to use water dilution as many times as would be necessary to reduce the value of the solution to an inconsiderable figure, since it would increase the solution in the plant to such an extent that much of it would have to be thrown away. This difficulty is surmounted by using the same solution a number of times, and precipitating it midway of the circuit if desirable. For instance, the water is mixed in previous to a thickening process at the final step, and the decanted solution from that final step is sent to the next step before, thus making use of a weak solution instead of water. The weak solution decanted from the next last step is used in the step previous to that, and so on until it has accumulated sufficient value or cyanide to be used elsewhere. It may then be sent to the precipitation department, or it may be sent to the head of the mill to be used as battery solution, and precipitated after that. Barren solutions and water are thus so manipulated that only in the final step is water received into the system, and even then only in such quantities as can be naturally equalized by the discard at the final end, and such small quantities of the precipitated solution, containing extremely small quantities of cyanide, as may be discarded without danger.

Advent of Continuous Decanting Machines

The advent of continuous decanting machines, in which decantation may be carried on without interruptions of any kind, has assisted to improve the efficiency of the process, and consequently they have been adopted in well designed mills. The Dorr thickener is the machine which has done most to bring about successful treatment, and it is the one most generally used in the new installations. The machine is well known and needs no description here, its characteristics being the receiving of pulp in various stages of dilution, and the discharge of an overflow of clear solution and an underflow of thickened slime, which may contain 30 to 40% of moisture, and which will, in most ordinary cases, give a 30 to 35% product with ease. In any event, it is only necessary to deliver the pulp under treatment, or after agitation treatment, into a series of thickeners, the number depending upon the strength of solution used, its value and upon the amount of barren solution to be produced for washing purposes, in comparison with the material dissolved per ton of ore treated, decanting off the clear solution and discharging the thickened slime to another thickener. The final thickener of the series receives the pulp which has just been mixed with fresh water, the overflow from this passing back to the next thickener in the line, its overflow going back to the next, etc., until the whole series of thickeners have been traversed.

Agitation of slimes to recover the gold or silver, or both, may be performed entirely before the counter-current decantation process is instituted, or it may be a part of the process, or agitation may be omitted altogether, as it is in some mills, depending upon the contact between the slimes and the solution in passing through the thickener series to recover the maximum amount of metal. The latter system is sometimes employed with clean siliceous gold ores, in which the metal is fine, rather readily dissolved in cyanide, and where the solution is not required to be of great strength. In treating silver ores, the solution must be of much higher strength and requires a considerable length of time to accomplish dissolution, consequently an agitation system is usually resorted to before beginning the continuous counter-current decantation series. In many cases this series has to be assisted by a dewatering filter after the decantation has been completed, since the cyanide in the final decantation-thickened product retains sufficient value to be worth saving through a simple filtering process. In this case, of course, the filter need not be an elaborate one, nor one susceptible of washing, a simple dewatering being the only requirement. In non-washing filters, the moisture-reducing efficiency is highly developed, and with them the moisture content may easily be reduced to from 10 to 20%, and often closely approximates the former figure.



THE PORCUPINE CROWN MILL, NEAR TIMMINS, ONTARIO

When filters are used in connection with counter-current decantation, a much more rudimentary plant may serve, for the reasons already mentioned. The sole object is to save the cyanide contained in the water, and the water itself where it is scarce and expensive.

SYSTEM IN USE AT THE HOLLINGER

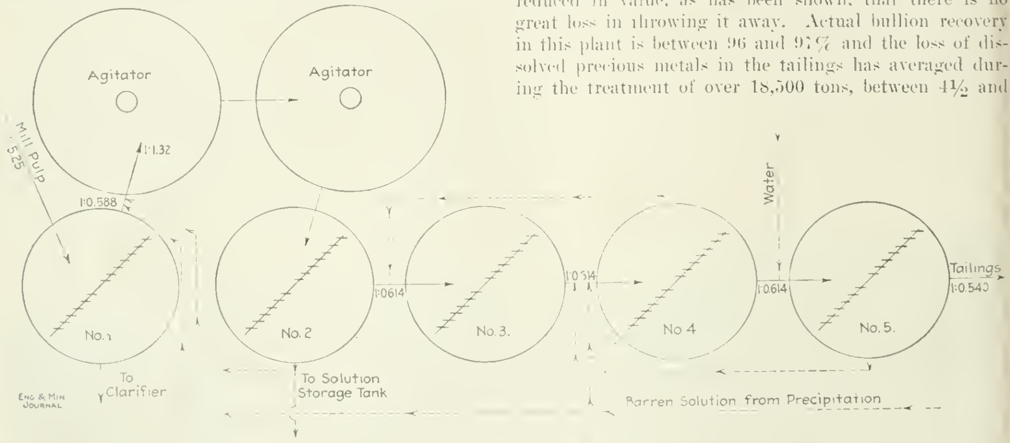
At the present time examples of continuous counter-current decantation in practice are not lacking. One example of its partial use in a plant which was not built to take advantage of it may be cited at the Hollinger Gold Mines, Ltd., at Porcupine, Ont. Theirs is a mill for treating gold ores, the process in general having already been described rather completely. Crushing is by stamps, in cyanide solution, from which the pulp is taken to classifiers, the slime separated and the sand reground in tube mills. The all-slime pulp is received in small primary thickeners, and the thickened slime then passed over concentrating tables. The remaining slime pulp is then thickened in the system, which treats it for recovering the remaining gold by cyanide.

The pulp is distributed, through a distributing box, into four 30x15-ft. Dorr thickeners. Here the solids settle through cyanide solution of such strength that the gold will be readily dissolved. The thickened slime pulp then is mixed with a low-value cyanide solution and goes to a second set of Dorr thickeners, identical in size with the first. On this trip, through the distributing boxes and in the thickeners themselves, there is an efficient agitation treatment, and much of the gold is effectually dissolved. As a matter of fact, it will be seen that there is absolutely no agitation, as such, in the circuit. The only agitation with cyanide solution that the pulp gets is incidental and is obtained in passage through the batteries, tube mills, classifiers, concentrators, distributing boxes and thickeners. Of course, though it is not called agitation, the pulp does get a good deal of stirring and, as a matter of fact, gives up its gold readily to the cyanide solution. The operators at this mill consider, however, that a further amount of agitation would be advantageous to their extraction, and have consequently arranged to interpolate an agitation series consisting of one or two agitating tanks. This may be placed after the first decantation and before the second. The fact that a filter is available makes this location appear preferable. The fact that a Moore filter was originally installed at the Hollinger mill, and is giving satisfactory results, will probably preclude, for the present at least, the adoption of continuous counter-current decantation in its entirety, but its partial use has cut down the dissolved losses to a fraction of what they were before, and requires only a small percentage of the values to be passed through the filters, whereas all of it had to pass when the operations of both washing and dewatering were thrown entirely upon the filter.

Another mill in the Porcupine district, which will probably make use of counter-current decantation in some form in the not very distant future, is the McIntyre. Some study is being given to the question there, and, while the mill has not been designed primarily for the process, it will probably be adapted in one form or another. The new Vipond mill, the cyanide addition of which is now in operation, is taking advantage of continuous counter-current decantation without a filter.

Porcupine Crown System

The most interesting example of counter-current decantation is afforded by the Porcupine Crown mill, near Timmins, Ont. This is an example of a mill, rare at the present time, which has been designed primarily to take advantage of counter-current decantation and for which all facilities have been provided. The cyanide plant consists of five 30x12-ft. Dorr thickeners, working in series, and two 16x16-ft. Dorr agitators. The pulp is delivered to the first thickener at a dilution rate of 5.25 to 1. Overflow from this thickener is taken to precipitation and is the regular pregnant solution, the gold having been taken in solution in the crushing, amalgamating the tube-milling processes which have preceded it. Barren solution from precipitation is led to the first agitator and thickener No. 1. The pulp is, of course, all slime, no sands being treated by leaching. The arrangement is such that not all of the so called pregnant solution must be precipitated, only the amount necessary for keeping down the solution grades being sent to the precipitation system. The rest is sent to the battery storage tanks, whence it goes through the circuit again.



Continuous Counter-Current Decantation System at Porcupine Crown Mill

The thickened pulp from the first Dorr thickener is taken to the first agitation tank and then to the second, in series, the solution meanwhile being built up to the proper strength with cyanide. The greater part of the gold extraction is during agitation. From the second agitator, pulp is taken to No. 2 Dorr thickener, the overflow from which is led to a storage-solution tank, and then is pumped back to dilute the thickened product of the No. 1 thickener going into the first agitation tank. The underflow from No. 2 thickener is taken to the third thickener, which receives, with the thickened pulp from No. 2 thickener, the overflow from No. 4 thickener. Thickener No. 4 receives the thickened underflow from thickener No. 3, and the overflow from thickener No. 5, which later receives, together with the thickened pulp from No. 4, a dilution of water. This is the only water entrance into the plant, and it may be seen that it is applied at the most efficient point, diluting the inflow into the last thickener, reducing the solution value, both in cyanide and in precious metal, and permitting a thickened underflow to go out of the plant which may be discarded without appreciable loss.

The thickened pulp from thickener No. 1 contains only about 35% moisture. As it goes into the agitator, the addition of barren solution is at such a rate that the moisture is brought up to about 60%. About a third of the cyanide is added at this point, the rest of it having been added at the tube-mill feed entrance. The water enters thickener No. 5 about equal in amount to the solution discharged with the thickened pulp as tailings, thus maintaining a constant volume in the solution circuit. The discharge from thickener No. 5 is so arranged that careful control may be given at all times. Its average moisture content is only about 30%, and this solution has been so reduced in value, as has been shown, that there is no great loss in throwing it away. Actual bullion recovery in this plant is between 96 and 97% and the loss of dissolved precious metals in the tailings has averaged during the treatment of over 18,500 tons, between 4½ and 5c. per ton. More recent work has had the effect of reducing the dissolved loss to 3.6c. per ton. The consumption of cyanide in the mill is 0.74 lb. of KCN per ton milled, showing plainly that the loss of cyanide is not high and that, on the whole, the work done by the counter-current decantation system in this example, is at least equal to the best that could be accomplished by the use of a filter.

The study of overflow solutions from the various thickeners is interesting, since it shows the drop in solution grade and the consequent washing out of the pulp as it progresses toward the end of the thickener series. From No. 1 thickener the overflow, which is precipitated, contains $3.17 in dissolved gold; No. 2 thickener, $0.82; No. 3 thickener, $0.26; No. 4 thickener, $0.14; No. 5 thickener, the discharge solution, $0.10. Since the moisture percentage in the discharge is low, the loss in dissolved gold is low, the figure given for April, 1914, being $0.013 per ton of ore milled.

(*To be continued*)

Modern American Rock Drills--I

By L. O. Kellogg

SYNOPSIS—Scope of article. Trend of design. Methods of manufacture; testing; materials. Definitions and classification. The parts of the piston drill. Types of valves.

⁂

Within a few years there have been so many changes, both in general design and in details, of the air-actuated machine drills used in mining, that many operators and engineers may have lost track of development and become somewhat confused as to the characteristics of the many machines offered for their use. This series of articles is designed to describe some of the more important examples, especially those drills which embody interesting improvements. Particular attention is paid to their mechanism, and no attempt is made to give figures on performance or to draw irritating and useless comparisons between the products of various companies. The heavier types of machines, which are in general unsuitable for underground use, electric drills of every type, and machines used principally in foreign countries, are not included.

The trend of latter-day design in rock drills has been toward the hammer type of machine rather than the piston. Only one important change in piston-drill design has been made, namely, the introduction by the Sullivan company of hollow steel for conducting water and air to the bottom of the hole which is being drilled, on the principle made familiar in the Leyner machine. The application by various companies of automatic rotation to plugger machines, and to some extent to stopers, represents on the other hand a change of hammer-drill design of a most radical nature. There have been at the same time a multitude of small improvements made in both types of machine, the effect of which has been to produce lighter, stronger, longer wearing, more convenient, faster drilling and more economical rock drills.

The Manufacture and Testing of Drills

An astonishing degree of care is taken in the manufacturing of machine drills of all types, and by practically all makers. This involves the most careful selection of materials in the first place, skillful handling in the shop, and continual testing of both raw stock and finished products.

The heat treatment of all the important parts is conducted with elaborate precision. The fact that many new alloyed steels have been developed in recent years, and the fact that they are skillfully prepared for the drill user, has contributed as much as any other single thing to the longer life of the modern machine.

It is not widely realized how much testing of drills is carried out by the best factories. It begins with tests on purchased stock material, and includes tests on various finished individual parts, especially after heat treatment has taken place; further tests to destruction on finished machines by subjecting them to hard service, and finally tests on performance in mines or quarries belonging to the factories.

There is in progress an increasing tendency to use drop forgings instead of castings for all but the largest pieces. The shells and cylinders of piston drills are still cast; all other important parts may be made of drop forgings, although they are not always so made. This, of course, excepts parts that can be made from standard stock, such as tubing, pipe fittings, etc. There is also an increasing tendency to use steels of various compositions and eliminate cast iron.

Let the difference between the piston and the hammer drill be well understood. The former consists essentially of a reciprocating piston, to which the bit which drills the hole is firmly attached so as to reciprocate with it. The latter consists of a more rapidly reciprocating piston, which strikes the top or shank end of the drill bit directly or indirectly, while the latter presses always on the bottom of the hole or remains near it. The former is always mounted in a guide shell and adjusted for position by a hand-actuated screw; the latter, except for the Leyner type, is never so mounted or set. The former may be considered to correspond to the old hand-actuated churn drill, whose marks may yet be seen in Mexican tunnels, while the latter corresponds to the modern hammer-and-steel system of hand drilling. As the hammer-and-steel supplanted the churn drill, the modern hammer machine-drill seems destined to supplant the piston.

Something in the way of definition may not be out of place. "Rock drill" and "machine drill" are the terms usually used to denote a drilling machine for putting holes in rocks which are to be subsequently blasted. Any complete designation must differentiate such a machine from the churn or well drill, the core drill, the hand drill and the various tools and machines used for drilling in wood and metals in the shop. Obviously, neither "machine drill," nor the "rock drill" is at all definite in this respect, but the term "rock drill" is most commonly used, and will be here so used as including both hammer and piston machines.

"Hammer drill" is about the only term applied to that type of machine, while the other type is variously known as "rock drill," "reciprocating drill" and "piston drill." Why it should be designated as a rock drill is not at all clear. The term "reciprocating drill" is equally applicable to both types, since both involve reciprocating motion. A somewhat similar objection might be taken to the use of the term "piston drill," but in the type to which we shall limit the term here, the piston rod projecting through the front head bears more resemblance to the piston of an engine than does the free-floating hammer. Rock drills may then be classed either as piston drills or hammer drills.

Hammer drills are further divided into pluggers, stopers and Leyners. The first is held in the hand and fed by the operator; the second has a telescopic air feed; the Leyner has a screw feed and uses hollow steel with water and air to clean the hole.

For convenience, the end of the machine toward the drilling bit will be known as the front in the case of all drills, and also as the top in the case of the stoper, and the bottom in the case of the plugger, while the other end will be similarly known as the back, bottom or top.

Essential Parts of Piston Drill

The piston drill consists of a cylinder in which a piston reciprocates. A rod projects through the front of the piston and passes through an airtight end of the cylinder, called the front-head. The end of this rod outside the cylinder is enlarged and bored to hold the shank or head end of the drill steel or bit. This shank is held in by friction against either rotation or longitudinal motion. The hole in which it fits is lined with a removable and replaceable bushing, usually open on the top; through this opening in the top a key is pressed against the shank by the means of a U-bolt, which is tightened either by screwing up the threaded end, or by a wedge between the key and the bolt; such a wedge is usually self-tightening, as it is inserted with its thin end toward the front of the machine, and the forward stroke of the machine with the sudden stopping tends to urge the wedge forward more strongly than the return stroke urges it backward.

Various methods are used to make the front head of the cylinder tight, and at the same time permit the reciprocation of the piston rod. The cylinder has various openings into it to permit the entrance and exhaust of the actuating air. The back of the cylinder is closed by a back-head, and this with the front-head is held to the cylinder by two through-bolts on the sides, the holding nuts working against a spring so as to permit the absorption of a blow delivered by the piston on the front-head, and thus avoid breaking some part of the machine.

The piston is hollow for part or all of its length, and sometimes the piston rod next to the piston is also hollow. In this bore there is inserted a nut with inclined flutes on the inside, known as the rifle nut. This nut in the reciprocation of the piston works on a rifle bar fluted to correspond to the fluting of the nut. The bar is so held at the back end by a system of ratchets and pawls in the back-head that it is free to turn in one direction and not in the other. Thus, on the forward stroke, the rifle bar turns, and the piston and the bit, which is rigidly connected to it, do not turn; on the return stroke, the rifle bar is held against turning, and the nut having to follow the twisted fluting of the bar, turns also the piston and bit a certain amount.

The fact that the piston of the piston drill is rigidly connected to the drill bit subjects the piston to a good deal of side bending. It is therefore necessary to keep it tight in the cylinder by the use of piston rings. These may be of one or several pieces, and may be held out by their own spring or by separate springs, and finally may be one or two in number on the piston.

Frequently, the piston is spooled out for part of its central length, sometimes for the sake of getting certain air connections and throwing either the valve or the piston itself, but usually to get the shoulders, which will strike and move the tappets, when tappets are used.

The cylinder with piston and bit, that is, the engine proper, is moved back and forth, closer or farther from the bottom of the hole, in a shell containing runways or guides in which projecting side lugs at the bottom of the cylinder may slide. The shell may be cast in one piece or the guides may be so constructed as to be adjustable. Wear is bound to take place, and if the top or gib of the guide is made separate and bolted to the rest of the shell, the space in which the cylinder lugs slide can be made smaller or larger in either direction by removing or inserting fillers or shims between the gib and the shell. This adjustment is also possible with a shell cast as one piece.

The position of the cylinder in the shell is adjusted by means of a feed screw. This extends the length of the shell and turns in a bearing thereon. Its thread engages a nut attached to the bottom of the cylinder. There is a crank at the end of the screw, and the counter-clockwise rotation of the crank forces the cylinder forward, while the clockwise rotation withdraws it. The shell has on the bottom a lug called by various names, such as "saucer" or "standard," which is in effect a thick bevel-edged disk. This is gripped in a clamping device, which is itself bolted to the column bar or tripod upon which the machine is mounted. This standard can be rotated in its clamp when the clamping bolt is released, and thus the direction in which the machine points can be varied in one plane, while other arrangements of saddle and arm permit shifting of the drill and varying its direction in other planes.

TYPES OF VALVES

The reciprocation of the piston in the cylinder is controlled by a valve of some sort. The valve may control both live air and exhaust, or live air only. It is usually seated above the cylinder and communicates with the latter through long ports cast in the cylinder shell. Piston drills are most easily classified on the basis of the type of valve which is used. This may be of the tappet type, wherein the valve is thrown mechanically from one of its positions to the other, and the air thus directed into either one or the other end of the cylinder; the blow is struck against the tappets by shoulders on the piston itself; the tappets are in mechanical connection with the valve; the latter is most commonly of the "D" or slide-valve type, but is not necessarily so.

The second type of valve is that which is altogether air thrown; in this case the piston itself acts frequently as a valve and may be considered a large spool valve. Such air-thrown valves may be of the spool, butterfly or ball type, the spool valve being by far the most common. The spool valve is essentially a slide valve. It consists of alternating cylindrical portions of small and large diameter. The small diameter portions register with two ports in the seat, connect them and permit air to flow from one to the other. The large portions fit close in the cylindrical casing and are called the spools. They may be all of the same diameter, or one may be larger than the other; they may be three or four in number.

The third type of valve is the auxiliary. This consists of a smaller intermediate valve mechanically moved by the piston through tappets and arranged to operate in connection with small ports so as to change the air pressure on the main or the spool valve and thus throw it.

Examples of the different types of drills have been selected for presentation here with particular regard to what is new, to what is the principal product of the various manufacturers, and to illustrate certain departures from ordinary practice. It is obviously impossible to describe every machine upon the market without going to unwarranted length. The tappet valve is rapidly becoming extinct, and only one is described here.

It will be noted that several well known makes of machines are not represented in this series of articles. This is because of the fact that the manufacturers thereof declined to furnish the necessary material to make possible an adequate treatment. The descriptions which are included could not have been written without the hearty coöperation and assistance of the manufacturers concerned, to whom acknowledgment is herewith made.

(To be continued)

Mine Stores and What Mines Use--III

SYNOPSIS—Continuation of list of supplies consumed at Nevada Con., Miami, New Jersey Zinc and Hollinger, including drill supplies, electrical supplies, leather and rubber goods, chemicals, rope, wire and miscellaneous materials.

In Parts I and II of this article, a list of fuels, lumber, explosives, oils and greases, iron and steel, pipe and fittings, tools, tramming and haulage supplies, building material, general hardware and machinery and parts used at the Nevada Consolidated Copper Co., Ely, Nev.; Miami Copper Co., Miami, Ariz.; New Jersey Zinc Co., Franklin Furnace, N. J.; and the Hollinger Gold Mines, Porcupine, Can., was given. The following list completes the supplies used at these mines during the same period covered by previous articles. The list of the Miami Copper Co. was not furnished in quite as much detail as furnished by the other mines, some articles were lumped and only their cost given. During the period covered by the Miami list, $449,989 was actually charged out to operation and construction. Structural steel, and 823 lockers for change house, amounting to $21,597, were not included in the list published. The consumption of supplies at Miami amounts to about $83,000 a month and it carries about $315,000 total stock which is turned over once about every four months.

NEVADA CONSOLIDATED COPPER CO.

Mine Supplies for 10 Months in Steam-shovel Mining; 2,376,966 Dry Tons Ore and 2,480,962 Cu.yd. of Waste Mined

Churn Drills and Fittings

No. 5 Keystone, complete	1
Casing, $7\frac{5}{8}$-in., ft.	3281
Boiler flues	410
Crosshead and crank end brasses	104
Casing, $4\frac{1}{4}$-in., ft.	15
Fluted rock bits, $5\frac{5}{8}$-in.	39
Spudding sheaves	11
Eccentric straps	14
Crossheads	15
Sand-reel bearing cups	2
Crankshafts	3
Sand-reel gear	1
Intermediate pinions	4
Stub shaft	1
Sand-line sheaves	3
Pitman bearings	2
Slip tongs, pair	1
Drill-stem box ends	9
Drill-stem pins	4
Engine beds	1
Exhaust ell	1
Bull gear	1
Muffler	1
Flywheels	1
Cannon speed pins	8
Chain-sprocket locks	6
Socket-holder plates	5
Keystone special blowers	9
Intermediate shaft	1
Sand-reel female frictions	6
Sand-reel male frictions	2
Center grate	1
Drive pinions	6
Drive shoes	5
30-in. front wheels	5
8x8-in. cylinders	2
Sprockets	7
Worm gear	1
Rear-axle caps	3
Crank gears	2
Sand reels	8
Horn for drill circle	1
Differential gear	1
Rope sockets	3
Eccentric sheaves	3
Wrist pin	1
Bolster plate	1
Tread wheels	8
Drill jars, set	1

Electrical Supplies

Electric light globes	2,531
Electric carbons	572
R. C. wire, No. 10, 12 and 14, ft.	29,481
Lamp cord, ft.	6,425
Flexible wire, No. 2, ft.	36
Cap wire, ft.	1,000
Bare copper wire, lb.	7,145
Bare wire, No. 6, lb.	785
Twisted telephone wire, ft.	500
W. P. wire, ft.	1,146
Guy wire, ft.	100
Annunciator wire, lb.	144
Listed fuse wire, lb.	26
30-amp. fuse blocks	24
Transformer fuse blocks	3
30-60-amp. 600-v. fuses	184
Desk phone sets	3
Telephone protectors	12
Mouth pieces	12
Telephone poles	23
Transmitter arm	1
Inside arc globes	67
Climbers, pair	1
Tin circuit panel cutout	1
Capitol tape, lb.	83
Lamp coloring, qt.	2
Carbolineum, gal.	20
W. P. sockets	357
Key sockets	281
Extension plugs	33
Porcelain knobs	1,605
Ceiling rosettes	118
Wood brackets	49
Brass wall brackets	26
Light fixtures	24
Shade holders	38
New Gourd globes	12
Lamp changer	1
Stage lights	4
10-amp. snap switches	50
Knife switches	22
10-amp. panel switches	1
Receptacles	19
10,000-volt transmission insulators	150
Lamp guards	92
Insulator tops and bottoms	188
Oak pins	138
Socket bushings	400
Plug cutouts	10
Red fiber, sheets	16
Porcelain tubes	551
Electric radiators	2
Transformers	1
Motor starters	3
10-hp. potential starter	1
Cord adjusters	12
Holophane shades	66
High tension cross-arms	63
Soldering irons	7
Solder paste, lb.	2
Attachable plugs	70
Glass insulators	253
Side-cut pliers, pairs	3
Milanite tacks	1,000
Portable lamp	1
Electric disk stove	1
Electric plate	1
No. 6 Columbia dry cells	100
Transil oil, gal.	5

Belting, Hose, Packing, Etc.

Belting, all kinds, ft.	817
Steel belt lacing, in.	2517
Leather belt lacing, ft.	1007
Cling surface belt lacing, lb.	30
Composition wire, ft.	100
Sundry packings, lb.	1824
Sight-feed gaskets	144
Water-gage gaskets, lb.	30
J. M. manhole gaskets	89
Handhole gaskets	272
Copper cylinder gaskets	41
Packing expanders	6
Steam hose, $\frac{1}{2}$- and 1-in., ft.	3,088
Gaskets	60
Water hose, 1-in., ft.	150
Cotton fire hose, $1\frac{1}{2}$-in., ft.	890
Suction hose, 4-in., ft.	15
Hose nozzles	6
Hose plugs	1
Hose clamps	10
Brass hose nipples	25
Fire-hose gaskets, $1\frac{1}{2}$-in.	12
Babbitt-metal ring, sets	96
Expansion ring	1
Air-pump packing, sets	50
Candle wicking, balls	542

Rope, Cable, and Chain

Manila rope, 1-in., lb.	1,303
Spot sash cord, ft.	6,004
Swing cables, ft.	796
Cable clamps	63
Rope socket	1
Special steel cable, ft.	1,369
Drill cable, 2-in., ft.	7,850
Boom cables	2
Chain, $\frac{1}{2}$-in., ft.	210

Chemicals

Calcium carbide, lb.	282,100
Muriatic acid, carboys	3
Nitric acid, carboys	1
Ammonia, carboys	2
Formaldehyde, gal.	12
Sodium carbonate, lb.	50
Carbonate of lime, lb	50
Soda, lb.	200
Glycerin, qt.	1
Borax, lb.	50

Assay Office Supplies

Bucking board	1
Canvas sample sacks	1,000
Sample envelopes, 5x7	5,000
Burettes	2

Engineering Supplies

42-in. straight-edge	1
Level rod	1

Office Supplies

Millionaire calculator	1
Oak cabinets	2
Adding machine	1

Miscellaneous Supplies

Cotton and wool waste, lb.	7,726
Oakum, lb.	10
Babbitt, lb.	9,322
Solder, lb.	228
Bright tin, lb.	91
Pig lead, lb.	200
Bar brass, lb.	4,015
Sheet brass, ft.	25
Sheet brass, sheets	20
Copper sheets	21
Lead tinplate, sheets	14
Copper tubing, ft.	18
Brass straining cloth, sq.ft.	5
Welding compound, lb.	735
Boiler compound, lb.	10,356
Boiler compound, gal.	1,550
Solder paste, lb.	5
Soap, cakes	300
Bon Ami, cakes	156
Sapolio, cakes	3
Lye, cans	105
Matches, cases	2
Towels	48
Pillows and bed sheets, each	6
Pressboard sheets	50
Window shades	12
Pint condenser	1
Smooth-On cement, lb.	40
Balls of twine	30
Staples	1,000
Fiberette, sq.ft.	500
Rubber boots pairs	70
Tarpaulins	5
White duck canvas, yd.	72
Oil coats	200
Tents	2
20-gal. stone jars	2
Tanned leather, side	1
Red lead, lb.	493
White lead, lb.	7,776
Sundry paints, gal.	1,096
Sundry colors, lb.	653
Putty, lb.	97
Bee's wax, lb.	2
Tin funnels	2
Tin dippers	36
Ticket punches	2
Ideal oilers	76
Copperized oilers	37
Oil cans	64
Granite wash pans	4
Gasoline stove	1
Heating stoves	33
Stove parts, pieces	26
Stove pipe, lengths	5
Stove-pipe elbows	12
Stove grates	56
Stove dampers	26
Coal shovels and hods	3
Stove polish, cans	15
Mesh netting, pieces	4
Brass checks	1,000
Moonstone copying stone	1
Congress chairs	60
Hospital beds	24
Mattresses	273
Bed springs	29
Mirror	1
Emery cloth sheets	704
Sandpaper, sheets	100
Toilet paper, cases	2
Hotel cooking utensils, pieces	169
Bales wood	293
Tin mal. ears	288
Copper ferrules	2,406
Tanned felt, rolls	26

NEVADA CONSOLIDATED COPPER CO.

Supplies Used in Underground Mining at the Veteran Mine. Months, Jan. 1, to Oct. 31, 1913 216,794 Dry Tons of Ore Mined

Drills and Drill Parts

Stoping drills	14
Sleeves	6
Valves	5
Feed cylinders	2
Feed cylinder bushing	1
Hose spuds	59
Ratchet springs	2
Lock-ring springs	2
U-bolts	2
Cup leathers	29
Pawl springs	12
Rotation pawls	1
Rotation pawl springs	3
Rotation pawl plungers	2
Rotation washers	1
Oil cocks	2
Air front heads, set	[illegible]
Air front head bushing	1

Bras[illegible]	[illegible]	Machine bushings	2
Stoping bar [illegible]	1	Lock nut and bushing	1
Stoping ba[illegible]	1	Feed screw	1
Arm bolts	2	Feed-screw nut	1
Column arm [illegible]	2	Throttle cocks	2
Lock [illegible]	4	Packing rings	13
Union [illegible]	6	Ring gaskets	2
Waugh [illegible]	2	Retaining key	1
W[illegible]	2	Waugh side rods	2
W[illegible] han-[illegible]	2	Waugh piston hammers	2
Pist[illegible]	1		

Electrical Supplies

F[illegible]lobes	1,568	Bronze telephone wire, lb.	20
[illegible] ft	8,301	Telephone wire, ft.	620
Lamp [illegible]ds	6	Telephones	5
[illegible] shade	1	R. C. Wire, ft.	13,880
[illegible] sockets	16	Manson's tape, lb.	32
[illegible] socket hanger	1	Wire solder, lb.	9
Rosettes	43	Soldering paste, lb.	1
Keyless sockets	94	10-amp. fuse	35
Dry batteries	31	Fuse plugs	182
Carbons	4	600-volt fuses	10
Contactor points	42	Enclosed fuse cut outs	8
¾-in. tubular gaskets, lb.	3	Fuse blocks	4
Glass insulators	1,000	Pole cut out switches	10
Porcelain insulators	3,077	Enclosed fuses	5
Snap switches	2	Comb. switches & cut outs	2
Porcelain knobs, ⅜-in.	84	W. T. case 40,000 volt	1
Induction coils	1	Bell ringer	1
Perkins switches	2	Telephone protectors	2

Belting, Packing, Hose, Etc.

Rubber belting, ft.	202	Air hose, ft.	1050
Leather belting, ft.	70	Air hose couplings	15
Leather belt lacing, in.	580	Air hose nipples	2
Belt dressing, lb.	12	Air hose clamps	60
Various packing, lb.	594	Air hose menders	6

Rope, Cable, Etc.

Manila rope, ft.	3135	½-in. wire cable, ft.	2000
Drill cable, 2-in., ft.	675	Tiller rope, ft.	450
Sand lie, ft.	509	Sash cord, ft.	250
Cable clamps	27	Cable lubricant, gal.	22

Chemicals

Calcium carbide, lb.	850	Iron carbonate, lb.	10
Ammonia, carboys	8	Potassium cyanide, lb.	10
Nitric acid, carboys	4	Potassium chlorate, lb.	65
Sodium thiosulphate, lb.	1	Bromine, lb.	½
Sulphur, lb.	1	Barium chloride, lb.	1
Zinc oxide, lb.	1	Microcosmic salt, lb.	½
Hydrofluoric acid, lb.	1	Ferrous sulphide, lb.	2
Stannous chloride, lb.	½	Acetic acid, lb.	1
Barium carbonate, lb.	1	Calcium carbonate, lb.	1
Silver nitrate, oz.	1	Ammonium sulphide, lb.	1
Zinc shavings, lb.	1	Hydrochloric acid, lb.	16
Sulphuric acid, lb.	16	Aluminum, sheet	½

Assay Office Supplies

Porcelain crucibles	6	Pipe stem triangles	3
Forceps	2	Woulff bottles	1
8-oz. copper flasks	60	Test tubes	12
Rubber sheeting, yd.	2	Filters	1,500
Annealing cups	12	Rubber tubing, ft.	76
Burette tips	12		

Miscellaneous Supplies

Waste, bales	2	Sandpaper, sheets	24
Stove	1	Grate for stove	2
Coal scuttles	2	Lengths of stove pipe	53
Coal shovels	2	Stove pipe elbows	1
Sundry paints, gal.	14	Burnt umber, lb.	2
White lead, lb.	170	Solder, lb.	2
Babbitt, lb.	129	Creolin, lb.	5
Emery powder, lb.	3	Tent	1
Smooth-On cement, can	1	Burners for acetylene lamps	200
Rubber tubing, ft.	16	Welding compound, lb.	25
Danger signs	24	Bottles for fire extinguisher	60
Garbage cart	1		
Cement sacks	40	Acetyline lamp felts, gasket screens, each	200
Emery cloth, sheets	12		

MIAMI COPPER CO.

Mine Supplies, Jan. 1, to July 1, 1913, Underground Mining; 489,627 Tons of Ore and 32,668 Tons of Waste Mined

Electrical Supplies

Lead cables, lb.	10,481	3-pole fuse boxes	3
Copper and trolley wire, lb.	13,966	Cooper-Hewitt tubes	32
No. 1 braided wire, ft.	5,180	Triple pole switch	1
All wire bonds	[illegible]	Disconnecting switch	1
Electric light bulbs	1,558	Alexalites	14
440 V. compensators	2	Corr. Glass linings	6
Type R controller	1	Holophane Hemispheres	20

Belting and Hose

12-in. [illegible] ply, ft.	368	2-in. linen garden hose, ft.	450
14-in. [illegible], ft.	[illegible]59	¾-in. 5-ply air drill hose, ft.	2,400
16-in. [illegible] ply, ft.	179	[illegible]-in. garden hose, ft.	1,965
18-in. [illegible], ft.	[illegible]18		
24-in. [illegible]	60		

Rope, Cable, Etc.

Steel rope, lb.	[illegible]

Chemicals

Soda ash, lb.	[illegible]

Miscellaneous Supplies

Waste, lb.	[illegible]	Water bags, 5 and 10-gal.	24
Desk for office	[illegible]	[illegible] ochre, lb.	1,150
Letter press	[illegible]	[illegible] lead, lb.	10,499
Stationery	[illegible]	[illegible] paints, gal.	[illegible]88
Howe depot scale	[illegible]	[illegible] lead, lb.	8,565
Miners oil cans	[illegible]	[illegible] babbitt, lb.	2,178

NEW JERSEY ZINC CO.

Mine Supplies Used in Six Months; Ore Broken, 261,650 Tons; Waste Broken, 97,770 Tons; Total Tons Broken, 359,420 Tons

Drills and Drill Parts

Waugh No. 17 valveless stoping drill:	
Complete drills	1
Chuck	1
Spraying device	1
Tappets	3
Ingersoll-Rand hitch cutter:	
Complete machines	3
Retaining springs	24
Valves	2
Pistons	4
Valve springs	3
Ingersoll-Rand BA 13 block holer:	
Anvil block	1
Front head	1
Cylinder bushing	1
Front head springs	2
Ingersoll-Rand hose coupling parts:	
Clamps	17
Nuts	4
Menders	8
Stems	4
McKiernan hose coupling parts:	
Clamps	289
Nuts	122
Stems	113
Menders	99
Spuds	185
Ingersoll-Rand BCR 33 sinking drill:	
Complete machines	4
Buffer blocks	2
Plunger buffers	2
Casing linings	2
Piston	1
Plunger	1
Locking plungers	6
Sleeves	4
Pawl springs	34
Anvil blocks	11
Front head bolts & nuts	13
Front head	1
Rotating pawls	144
Oil plugs	3
Pawl plungers	13
Rings	9
Head springs	13
Rotating valves	6
Ingersoll-Rand BCR 43 jackhamer:	
Through bolts and nuts	21
Steel holders	14
Sleeve nut and washer	1
Rifle nuts	3
Pawls	11
Pawl springs	22
Plungers	11
Through bolt springs	8
Throttle valves	16
Valve chests	2
N. E. steels	3
Rifle bars	9
Oilers complete	2
Pistons	16
Oil plugs	11
Rotating sleeves	12
Valve chest studs & nuts	5
Butterfly valves	3
Ingersoll-Rand MC 50 stopers:	
Complete machines	5
Anvil blocks	110
Tube bushings	2
Tubes complete	3
Extensions	3
Rotating handles	2
Cup leathers	187
Nozzles	22
Hose nuts	8
Pistons	9
Sprays	4
Oiler tube	1
Throttle valves	5
Cup leather washers	2
Hose clamps	3
Barrel bolts	171
Clamps	4
Front cylinders	8
Extension gibs	4
Clamp keys	5
Hose nipples	8
Bar bolts & nuts	68
Tube nuts	3
Slide rods	29
Lock springs	3
Inner tube	1
Lock washer	1
Leyner Ingersoll Drill:	
Through bolts and nuts	2
Back head clamp	1
Cap gasket	1
Chuck keys	8
Chuck nuts	1
Rotating pawls	11
Bach head plugs	1
Tube rubbers	6
Pawl plunger springs	26
Water valve	1
Chuck bushings	2
Steel chuck	1
Front heads	2
Rifle nuts	2
Feed nuts	1
Pistons complete	3
Pawl plungers	11
Cushion springs	9
Water tubes	19
Front cylinder washer	1

Electrical Supplies, Etc.

Electric lamp globes	173	Split knobs	100
Lamp cord, ft.	4	Electric cut out	1
Porcelain tubes	3	Mesco batteries	23
S. B. magnets	2	Telephone parts:	
Fuse plugs	8	Coils	2
Solid knobs	90	Mouth pieces	2
Tape, lb.	3	Ringers	4
Wire connectors	9	Transmitter	1
Push button	1	Cords	8
Pig tail motor brushes	24	Receivers	2
Sockets	9	Springs	2

Belting, Packing, Hose, Etc.

Gandy belt, ft.	125	Air hose, ft.	1,525
Leather belt, ft.	2	Steam hose, ft.	22
Rubber belt, ft.	18	Clamps	42
Candor belt, ft.	5	Packings, lb.	164
Steel lacing, in.	19	Felt packing, sets	10
Leather gaskets	734		

Rope, Etc.

Rope, lb.	451	Cable dressing, lb.	810
Chain, lb.	203		

Chemicals

Carbide, lb.	22,550	Borax, lb.	14
Chloride of lime, cans	60	Hydrated lime, lb.	3

Miscellaneous Supplies

Waste, lb.	329	Dippers	3
Wicks	22	Babbitt, lb.	152
Cotton wicking, balls	2	Sheet brass, lb.	4
Acetylene lamps	543	Soldering paste, boxes	15
Acetylene lamp burners	1,256	Solder, lb.	20
		White lead, lb.	3
Acetylene lamp reflectors	60	Red lead, lb.	5
		Asphalt paint, gal.	69
Carbide cans	192	Shellac, pt.	1
Oil flasks and cans	37	White felt, lb.	7
Oilers	1	Twine, balls	72
Chain guard	1	Cord, hanks	8
Duck, yd.	5	Rubber boots, pairs	2
Emery, pulverized, lb.	2	Oil coats	2
Emery, sheets	45	Oil pants, pair	1
Sand paper, sheets	32	Oil suits	28

HOLLINGER GOLD MINES

Supplies for 1 Year (Part Used in Construction); 140,131 Tons of Ore and 11,544 Tons of Waste Mined

Drills and Drill Parts

New drills:	
Little giants Rand No. 43	3
Sullivan Hammer D. A. 21	11
Type L plugger	1
Rand hammer No. B. C. 21	1
Rand plugger B. C. 26	4
Parts, L. G. 43 Rand Rock Drill:	
Chuck bolts	864
Chuck bolt nuts	530
Buffer springs	490
Pawl springs	290
Pawls complete with springs	130
Pawl springs, rivets & burrs, lb	10
Pawl bolts and nuts	210
Cylinders	27
Cylinder chest studs & nuts	130
Steam chests	53
Steam chest studs & nuts	242
Taper ring head leathers	570
Taper ring head bushings	43
Taper ring head collars	28
Machine ends	380
Chuck head liners	210
C. H. ring head bodies	31
Slide valves	170
Valve seats	27
Throttle valves	137
Jamb nuts	192
U. H. stuffers	19
U. H. packings	4
Oil plugs	94
Pistons	47
Piston rings	360
Piston ring springs	210
Feed screw handles	59
Feed nuts	180
Feed screws	140
Feed screw washers	180
Chuck keys	103
Chuck bushings	310
Chuck wrenches	53
Crossheads	185
Standards	185
Rockers	209
Rocker bolts with nuts and lock washers	240
Ratchet box rings	38
Ratchet box covers	29
Solid ratchets & rotating bars	60
Rotating nuts	50
Shell bolts with nut and lock washers	95
Positive hose couplings and clamps	236
Throttle plugs	160
Parts for 4½ Rand S. S. Column:	
Column heads	107
Column arm bolts	105
Jack screw nuts	92
Jack screws	87
Base blocks	119
Clamps, cone half	43
Clamp caps	116
Clamp hook bolts	124
Clamp bolts	72
Base block bolts & nuts	131
Parts B. C. Rand Plugger Drill:	
Striking blocks	9
Rotating handles	2
Front head springs	3
Front beads	5
Front head bolts and nuts	37
Parts B. C. 21 Rand Hammer Drill:	
Cylinder bushings	42
Packing leathers	98
Front heads	7
Feed tail pieces	19
Pistons	11
Valve chests	3
Cylinders	1
Butterfly valves	38
Parts L Rand Plugger:	
Pistons	2
Cylinders	5
Strainers	8
Valve box cap	1
Valve boxes	2
Valve buffers	2
Parts D. A. 21 Sullivan Hammer Drill:	
Pistons	23
Cylinders	38
Clamps	113
Clamp keys	147
Bushings	382
Rotating handles	91
Retaining keys	207
Feed pistons	138
Inlet bushings	140
Inlet elbows	88
Valve boxes	49
Valves	412
Valve box covers	53
Throttle valves	318
Heads	9
Feed cylinders	104
Feed cylinder bushings	119
Lock rings	217
Lock ring springs	198
Sundry drill parts:	
Sullivan U. E. 2 cylinders	2
Sullivan U. E. 2 pistons	3
Sullivan U. E. 2 foot plates	6
Waugh chucks	6
Waugh sprays	9
Diamond drill parts:	
"E" splines, set	1
"E" lining for quill	1
"E" drive spindle	1
"E" rods, ft	220
"E" core barrel, ft	10
Drive chuck jaws	1
Core shells	2
Diamonds	11
"E" blank bits	50

Electrical Supplies, Etc.

Conduit, ft	1,530
R. C. wire, ft	5,855
W. P. wire, ft	1,950
W. P. copper wire, lb.	352
Lead covered cable, ft.	500
Lamp cord, ft	1,400
Bare copper cable, 4/o, ft.	200
Conduit cable conductor, ft	505
Telephone wire, ft	1,475
Telephone wire, iron, lb.	140
Flexible cord, ft	400
Circular loom, ft	530
German silver wire, lb.	4
Fuse wire, lb	34
Fuse plugs	170
Fuse blocks	43
Fuse shells	27
Enclosed fuses	430
Outdoor fuse blocks	11
Fusible receptacles	70
Fuse bases	8
Transformer fuse blocks	6
Carbon lamps	1,680
Tungsten lamps	340
Lamp shades	23
Wire lamp guards	48
Brass key sockets	580
Portable lamp guards	2
T-10-J cylinder complete	1
Distributor boxes	6
Contact fingers for controller, set	1
Attachment plugs	62
W. P. fixtures	47
Cleat rosettes	280
Porcelain tubes	1,850
Concealed rosettes	240
S. W. cleats	750
Flush receptacles	18
Wire molding, ft	400
Snap switches	95
Combination switch and cutouts	47
Cutouts	43
Knife switches	29
Disconnecting switches	4
Split knobs	2,560
Oak top pins	67
Oak side blocks	82
Giant strain insulators	23
Glass insulators	42
Insulated staples	500
Electric bell pulls	15
Dry batteries	113
Electric bells & gongs	14
Magnet resistance coils	2
Field coils	3
Receptacles for iron	4
Pierce brackets	16
Angle wall receptacles	8
Keyless cleat receptacles	12
Short circuiting rings	2
Nichrome resistance, lb.	4
Chatterton compound, lb.	10
Contact blades for 50 hp. compensator, set	1
Carbon brushes for generator	32
Motor bearings, sets	3
Condulets	187
Cable rings	270
T-10-J contact bases, sets	8
Segments for compensator	6
C. T. W. P. junction boxes	6
W. P. sockets	109
Soldering paste, lb	14
Friction tape, lb	220
Splicing compound, lb.	43
Commutator compound, stick	12
Gasoline blow torches	4
Imperial compound, gal.	25
Hook sticks	2
Cable terminal	1
Bristol recording charts	5,000

Belting, Packing, Hose, Etc

Leather belting, ft	719
Stitched M. X. belting, ft.	481
Belt punches	107
Rawhide belt laces, lb.	75
Fire hose, 2½-in., ft	1,550
Miscellaneous hose, ft.	1,500
Suction hose, lengths	5
Hose couplings, sets	109
Fire hose adapters	
Packing, various kinds, lb.	1,046
Conveyor belting, ft	61
Rubber belting, ft	1,512
Steel laces, boxes	43
Air hose, under 1 in., ft.	2,950
Air hose, 1 in., ft	2,600
Fire hose reels	2
Fire hose nozzles	12
Fire hose spanners	50
Asbestos manhole gaskets	63

Rope, Wire, Etc.

Steel cable, below 1 in., ft.	3,190
Steel cable, 1 in., ft	4,260
Guy wire, ft.	500
Spring and miscellaneous wire, lb	192
Chain, lb	207
Open wire rope sockets	42
Galvanized cable, ⅜-in., ft	900
Manilla rope, lb	3,012
Bell wire, ft	1,800
Cable clamps	190
Jack chains	276

Chemicals

Muriatic acid, lb	72,617
C. P. Nitric acid, lb	96
Caustic soda, lb	600
Litharge, lb	17,755
Zinc dust, lb	119,370
Cyanide, lb	87,660
Soda bicarbonate, lb	3,600
Niter, lb	800
Silver Nitrate, oz	8
Com'l. prussiate of potash, lb	14
Lead foil, lb	83
Silver foil, lb	50
Calcium carbide, lb	11,700
Manganese dioxide, lb.	340
Soda ash, lb	1,120
Bone ash, lb	7,347
Lead acetate, lb	380
C. P. lead acetate, lb	9
Borax, lb	33,690
Sodium silicate, lb	1,338
Nitrate of soda, lb	1,460
Pot. iodide, lb	1.5
Silver nitrate, lb	4.25
Chloride of lime, tons	1¾
Mercury, flasks	23
Unslacked lime, tons	187

Engineering Supplies

K. & E. drawing paper, rolls	9
Gallia paper, rolls	4
Tracing cloth, rolls	5
Cross section paper, rolls	2
Blue process paper, rolls	8
Blueprint paper, rolls	26
Direct black print paper, rolls	21
Water colors, pans	4
Camel hair brushes	36
Oil colors, tubes	12
Rubber cement, tube	1
Art gum, pc	36
Field and level books	18
Steel erasers	48
Lettering pens	6
Brass thumb tacks, gross	2
Tapes, steel and linen	20
Brass plumb bobs	11
Plumb bob string, yd	150
Plumb bob suspending cup	1
Anemometer	1
Parts for instruments	5
Heavy glass plates	5

Stationery and Office Supplies

Report forms, etc	51,300
Envelopes, large & small	6,000
Letter heads	10,000
Foolscap paper, pads	96
5x8-in. pads	600
Telephone paper, rolls	6
Linen tags	500
Journal and ledger, pages	2,700
Memo. books	168
Record books	5
Time books	192
Carbon paper, boxes	9
Hook files	12
Majestic binders	3
Shannon files	18
Letter trays	2
Bedford McNeill code	1
Pen nibs, gross	14
Penholders	48
Pencils, gross	8
Blue and red pencils	120
Ideal paper clips	4,000
Hotchkiss staples, boxes	30
Rubber bands, lb	4
Erasers	48
Chemical ink eraser, boxes	4
Ink, red and blue, qt.	33
Steel figures and letters, set	2
Typewriter ribbons	36
Adding machine ribbons	3
Paste, bottles	3
Steel erasers	3
Ink pots	5
Telephone roll holder	1

Assay Office Supplies, Etc.

Silver foil, oz	15
Platinum weights, 1 M. G	16
Platinum weights, 2 M. G	5
Screens, sets	6
Sampling pans	60
Rubber tubing, ft	210
Rubber bulbs	2
Rubber stoppers	156
Furnace pump	1
Grate bars	51
Furnace liners, sets	5
Winchesters	32
Bucking board	1
Battersea crucibles, No. 5½	124
Battersea crucibles, No. 5	20
Gold pan	1
Gold washing horn	1
Moisture scale	1
Hand bellows	1
Steel forceps	11
Double graduates	11
Single graduates	7
Glass beakers	48
Watch glasses	36
Glass funnels	48
Bucket for sampler	1
C. I. muffles	27
Furnace flat plates	9
Furnace clay rings	6
Iler disks, sets	9
Large graphite crucibles	27
Small graphite crucibles	29
Denver crucibles, 30 gr.	200
Asbestos mitts, pairs	29
Sample grinder	1

Dr[illegible] Etc.			
White oil [illegible]	[illegible]	Sewing machine needles, gross	6
Heavy [illegible] 84-in., [illegible]	[illegible]	Brown kearsarge flannel, yd.	3,400
Heavy [illegible] 72-in., [illegible]	[illegible]	Overalls, suits	36
Heavy [illegible] 54-[illegible]	250	Oilskins	588
Rubb[illegible]	192	Oil hats	280
Cot[illegible]	120	Rubber gloves, long, pair	516
Th[illegible], lb.	102	Towels	36
		Glovers needles	324
		Sail maker's needles	12
Miscellaneous Supplies			
[illegible]	[illegible]	Candle wick, balls	370
[illegible], lb.	100	Hair insulator, bales	44
[illegible], tons	13	Hair felt, rolls	28
[illegible], lb.	700	Rawhide leather, lb.	56
White lead, tons	2.25	Sole leather, lb.	93
Lamp black, lb.	130	Emery cloth, great gross	[illegible]
Welding compound, lb.	180	Sand paper, great gross	[illegible]
Pig zinc, lb.	1,180	Resin, lb.	280
Emery flour, lb.	23	Stove pipes, lengths	90
Soft soap, lb.	1,870	Stove pipe elbows	37
Brass time checks	5,000	Carbide candle	1
Bristol counters	7	Dynamite thaw cans	4
Cement, special high temperature, lb.	200	Engine room clock	1
Lantern globes	384	Oil measures, 1-qt.	12
Oakum, lb.	360	Oil measures, 1-gal.	15
Heavy galvanized iron pans, 28x30x4 in.	36	Respirators	60
Heating stove	1	Safe	1
Enamel danger signs	48	Standard scales	4
Toilet soap, cases	21	Telephones	12
Fire extinguishers	40	Turnbuckles	260
Speaking tube whistles	72	Fire extinguisher charges	63
Cotton waste, lb.	7,388		

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Developments at Candor, N. C.

Special Correspondence

In the latter part of August, the mill of the Candor Mines Co. was shut down and with the exception of pumping, work was stopped in its Iola mine. A few weeks later, the property was sold to Elie Sheets and associates of Washington, for a reported price of $30,000. The buyers of the mine are interested in the Martha Washington which lies to the west and southwest of the Iola and has been in process of development for several months. It is the intention to treat the Martha Washington ore at the Iola mill, which will be started again soon. At present, the mill bins are being loaded with ore from the old Iola dumps. While it is conceded that the known reserves of the Iola have been practically stoped out, the new owners are starting a search for more ore. Two vertical shafts are being sunk; one is shallow to cut a pillar of ore supposed to have been left in the upper workings on the Iola vein, and the other is to develop what is known as the hanging-wall stringer, a branch from the main vein. This latter shaft may be sunk as deep as 100 ft., and sinking may be done below the present deepest level of the mine, 650 ft. If the vein continues on its present dip of 57°, it will eventually pass out of the boundary lines of the Iola property to the Martha Washington, and as the mining laws of the Western states do not prevail here, it will become the property of the latter company; thus by acquiring the Iola the depths of the Martha Washington can be explored with greater economy. It will become the first deep-level mine of the South if ore is found in this part of its territory, and it does not seem probable that the vein will cease to yield pay ore at 650 ft.

During its life of nearly 11 years, the Iola has been the most interesting precious-metal mine of the South, and has been the most important producer during that time. With one possible exception, no other southern mine has ever [illegible] such a production of ore of uniformly good grade. In its early days, the average value of the mill heads was around $20 per ton, and later, with greater depth and greater tonnage, it is reported to be around $10. Six different milling plants have been built on the property, two of which were destroyed by fire. The first cyaniding plant for separate treatment of slimes and sand in the South was built here in 1904 by H. A. Megraw, and was operated until the sale of the mine to the Candor company in 1908. The new mill built in 1911 employed the heaviest gravity stamps used in the United States at that time, and introduced to this section, modern milling equipment, such as Dorr classifiers and thickeners, the Parral method of agitation and the Kelly filter.

The Candor Mines Co. was composed of interests also active in the Mines Company of America, and other enterprises. Their retirement from this field is viewed with regret. They developed the mine after buying it from the Iola company, built two different mills, and have without doubt, made a fair profit. They prefer to sell, however, rather than to enter on a new campaign of development on the lower levels. A former owner of the mine also gained wealth by its exploitation, and there is a railroad not far from here that was built in part by the production of this mine. The general development of the surrounding country has received marked impetus from the same source.

Operations are also under way once more, at the adjoining Uwarra mine, both underground and in the mill. The mill is handling ore and at the same time is being rearranged under the direction of the general manager, Andrew Walz. The Uwarra company has arranged with the Iola management to take care of all its underground water, thereby effecting a saving in power for the Uwarra, all the water being handled by the big Cornish pump in the Iola main shaft.

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Inquiry into Iron Mining in Canada

Pursuant to a request made to the Dominion Government for the granting of some measure of assistance toward the development of iron-ore mining in Canada, and in accordance with the statement of the Minister of Finance, that the iron-mining industry would be investigated, a committee has been appointed, consisting of O. E. Leroy, G. C. Mackenzie, E. Lindeman, and J. McLeish, secretary, of the Department of Mines, to inquire into the situation.

Every owner or operator of an iron-ore property in Canada should be interested in facilitating this inquiry and should communicate with the Deputy Minister of Mines, at Ottawa, or the secretary of the committee, who will furnish a schedule of questions covering the information required by the committee.

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Chief Consolidated

The semi annual report of the Chief Consolidated Mining Co., Eureka, Utah, for period ended June 30, 1914, shows a balance of receipts on hand amounting to $228,131.99, after paying a dividend of $13,838.20. This makes an increase in balances on hand of $13,073.13 since the first of the year and indicates a net profit of $56,911.33 for the period. This profit was made from shipments of ore amounting to 23,739 tons, with a gross value of $16.16 per ton. Freight, smelting and sampling charges amounted to $8.74 per ton, leaving a net value of $7.72 per ton before deducting mining expenses.

Driving the Sheep Creek Tunnel*

SYNOPSIS—Detailed description of driving 8707 ft. of the Sheep Creek adit of the Alaska Gastineau Co., near Juneau, for development purposes and for ore haulage to the mill. Preliminary work, equipment, routine of drilling and mucking, costs, rate of progress, survey for the connection, are covered. Maximum speed, 661 ft. per month; average for last six months, 596 ft.; average for entire 16 months, 544.2 ft., a world's record. Four piston drills on horizontal bars, slick sheets instead of switches, storage-battery locomotive, exhaust fans in relay, were features of work. Bonus system and perfect discipline largely responsible for speed.

⁂

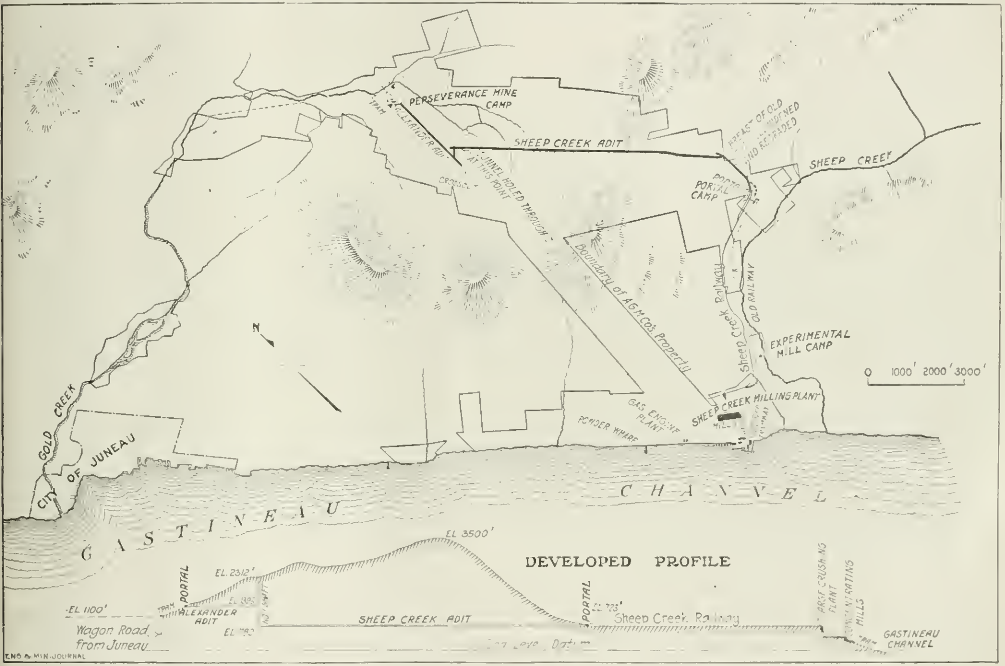
The Sheep Creek tunnel was part of the development program of the Alaska Gastineau Mining Co., at Juneau, Alaska. The Alaska Gastineau is the operating company of the Alaska Gold Mines Co. The tunnel was driven to develop the lode, and to form part of the transportation system between the mine and the 6000-ton mill under construction on the shore of Gastineau Channel.

The portal of the tunnel is 723 ft. above sea level and 7250 ft. distant from the coarse-crushing plant of the mill. Its underground terminal is its intersection with the main or No. 1 shaft of the Perseverance mine, 1530 ft. below the surface and 613 ft. below the Alexander level, previously the lowest working adit on the Perseverance property.

In locating the tunnel, the object was to attain the maximum amount of development with the shortest possible length. The first 1450 ft. is crosscut, the remainder is parallel with the foot wall of the lode and close to it. It is intended to explore laterally from the tunnel with crosscuts and diamond-drill holes.

Preliminary Work

A good deal of preliminary work was necessary before the actual driving of the tunnel was begun. A camp with warehouses, etc., was established on Gastineau Channel. From this point a 2200-ft. inclined tramway connected at an elevation of 650 ft. with an old narrow-gage railroad or tramway, which ran along the side of Sheep Creek Basin to the old mine. This railroad was built entirely on trestles which had to be strengthened and rebuilt. The money put into this preliminary construction is not chargeable to the tunnel, inasmuch as the installation will be used for future operations of the property.



Plan and Profile of the Tunnel Underground Connections and Surface Works

The Tunnel Camp

A camp was established at the end of the narrow-gage railroad near the entrance to the tunnel. There was a three-story rooming house, 20x66 ft., and a one story mess house, 24x66 ft., containing dining room, kitchen, storeroom and in the basement a room for the fire-fighting apparatus. A third building was used for a change room on the lower floor and a club room on the second. The change room was equipped with steam-heated lockers, bathrooms, shower baths and lavatories. The club floor had a reading room, writing room, card room and assembly room. The central heating plant was located in the power house. The tunnel foreman had a cottage, and another small building provided sleeping quarters for the cooks and mess-house help.

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*An abstract of a report made by the engineering staff of the Alaska Gastineau Mining Co., and communicated to the Journal by the managing director of the Alaska Gold Mines Co.

The blacksmith shop was 24x50 ft., equipped with two forges, one No. 5 Leyner-Ingersoll sharpener, benches, tools, etc., and an air hammer made from a 3¼-in. piston machine. The carpenter shop was 12x24 ft. Adjacent to the two shops was a storeroom, 12x30 ft., for spare drill parts, fittings and miscellaneous supplies.

The powder magazine was on the railroad track about one-half mile from the tunnel. An auxiliary magazine and thawer was situated about 150 ft. from the tunnel entrance with which it was connected by a covered passage. All powder was thawed in the original boxes by electricity and was taken to the face in the same boxes, except that made into primers; the primers were made up in this auxiliary magazine.

Compressors, Drills and Ventilating System

The compressor was an Ingersoll-Rand, Imperial, type 10, cross-compound, 22 and 13x16-in. machine; it was belt driven by a General Electric, form K 200-hp., 2200-volt induction motor. The air left the receiver at 105 lb. and was carried in 7-in. casing pipe for about half the distance to the end of the tunnel and in standard 6-in. for the remainder. Flange unions were used throughout to facilitate making connections.

An exhaust ventilating system was used. The first fan placed just outside the tunnel was a No. 5, Type K, American Blower Co. exhaust machine, belt-driven by a 20-hp. motor at a speed of 3000 r.p.m., and delivering 3000 cu.ft. of free air per min. against a 12-oz. pressure. At 3000 ft. in a second fan, built by the Lewis Burton Co., was installed in series to handle the same amount of air against an 8-oz. suction; it was belt-connected to a 15-hp., 1740-r.p.m. induction motor. At intervals of about 2550 ft., additional fans of the same size and type were installed. A 15-in. ventilating pipe was made up of 18-gage galvanized iron in 25-ft. lengths. The lengths were provided with slip joints with lugs for wiring them together; all joints were wrapped with tarred canvas to insure their being air-tight. The pipe was riveted and thoroughly soldered and practically tight against the pressure used. The series operation of the fans was intended to eliminate the necessity of heavy pipe to resist collapse, such as might have been necessary with a single machine operating on a much higher suction, and also to reduce the leakage along the line, which would have accompanied a high suction.

The drills were Ingersoll-Rand E 44, 3¼-in. piston machines. Six were kept on hand, four at the face, one in the tunnel and one in the shop being overhauled. In use they were mounted on 1½-in. horizontal bars 9 ft. long. Of the drill steel the starters were made of 2-in. cruciform, with 2¾-in. gage, 32 in. long. The seconds were of 1¾ in. cruciform, with 2½-in. gage and 52 in. long; the last three pieces were made of 1½-in. steel, gages 2 5/16 in., 2⅛ in. and 1 15/16 in., length 74 in., 94 in. and 116 in. About 70 pieces were kept up, sharpening being done on the day shift only and over 500 pieces frequently being dulled per day.

Features of the Tunnel

Of the total tunnel length, 474 ft. was driven through slide rock and gravel near the portal; 4009 ft. in greenstone, 4224 ft. in slate and 1085 ft. in metagabbro; the last three rocks alternated, the stretches varying from a few feet, up to several thousand.

In general the direction of the tunnel followed the strike of the formation, making it difficult to break the rock, especially the hard silicified slate, where the effect of the cleavage planes was marked. The holes broke short and a great many were required. Greenstone also developed cleavage planes in places with a similar result. When the tunnel was in homogeneous blocky greenstone, the rate of progress jumped to about a foot per hour, and there is no doubt but that if the entire distance had been driven in such rock, the record made would have been improved by at least 25%, and the costs correspondingly reduced. In general, shallow rounds giving an average advance of 4 ft., were found to be most economical and rapid.

The tunnel was 10 ft. wide and 8 ft. high, with a small ditch along one side. Timbering was necessary only in the loose ground near the portal, and at this point the section was kept 8x10 ft. inside timbers. While the total length of tunnel is 9792.2 ft., 910 ft. had previously been driven, and 564.5 ft. of this was widened out and became part of the main tunnel, while 427 ft. adjacent to the portal had to be driven anew in order to get proper alignment and cross-section. This work was done apart from the driving of the main tunnel, and only the latter will be considered here. From the solid rock face from which the main tunnel started to its intersection with the crosscut from the Perseverance shaft, the distance is 8800.5 ft.; 210 ft. of branch tunnel was also driven by the same crew. The relations of the different parts of the tunnel, as well as surface construction, are shown in the accompanying map and profile.

The tunnel was driven for single track its entire length, with the intention of widening out for sidings later. The average upgrade from the entrance was 0.65%, based on questions of drainage and equalization of tractive effort with loaded and empty cars.

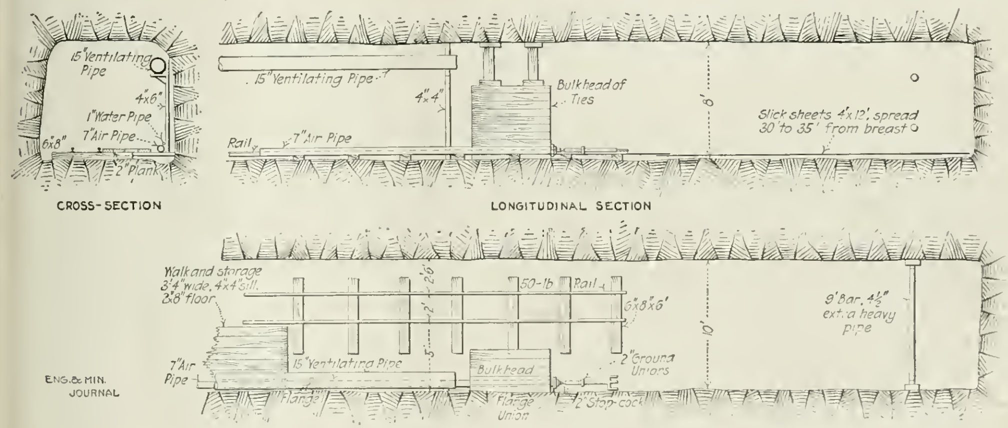
Force Employed and Shift Arrangement

The force employed consisted of 70 men. Working on day shift only, there was a general foreman, a timekeeper, a tool sharpener, a tool-sharpener helper, a blacksmith, a blacksmith helper, a carpenter, an electrician, a powderman, and an outside man. Two compressor men worked 12-hr. shifts each. Divided into three shifts there were three shift bosses, 12 upper-bar machinemen, 12 lower-bar machinemen, 18 muckers, three carmen, three locomotive engineers, three locomotive brakemen and four pipe- and trackmen.

The arrangement of shifts was unusual. The cycle was completed in 18 instead of 24 hr.; during this time each of the three crews into which the force was divided worked 6 hr. and rested 12, so that in each 24 hr. there was 8 hr. of work for each man. The incoming shift would relieve the outgoing shift at the working face and there was no intermission in the work for the purpose of eating a meal; this eliminated the delay of the meal time and the slackening of work following heavy eating. The plan was eminently successful and acceptable to the men; the only objection was the complication in the meals at the boarding house; eight meals had to be served every 24 hr., two for each 6-hr. shift; each shift got a meal about three-quarter of an hour before it went on and another when it came off.

Routine of Drilling

After spitting the round, the men walked back in the tunnel about 1000 ft. The holes were counted and immediately after the last lifter went off the men started toward the face again. The fans being in full operation continuously, no smoke was encountered until within about 60 ft. of the face. One man then carried to the breast a water hose, previously connected to the water line and sprayed the muck. Meanwhile the manifold was connected to the air line and the air hoses attached thereto. The top bar was next brought up and jacked into place; two machines were placed on the bar, the air hose connected as soon as possible and drilling started. At the beginning of tunneling operations it required about 30 min. from the time the last lifter was fired until the top-bar machines were running. By the end of the undertaking, this took frequently only 10 min. and seldom more than 15.


CROSS-SECTION

LONGITUDINAL SECTION

PLAN

Sections and Plan of Arrangements at the Tunnel Heading

With the top machines in operation, the four lower-bar machinemen started mucking out to make room for the lower bar. They threw back to the slick sheet, from which the muckers loaded into the cars. It was usually possible to set the lower bar and finish drilling the lower holes by the time the top machines were finished, so that all of the machines were torn down together.

Routine of Mucking

While the machines were being placed in position, mucking began. The empty car was brought ahead and the track cleaned up to the slick sheet. Of the six muckers, four were shoveling continually and two resting. The average output of the force was 10 to 12 tons per hour. On a slick sheet beside the track, within 50 ft. of the face at all times, an empty car was kept. Whenever a car was loaded, the carman took it down the track and brought back the empty. There was thus only a fraction of a minute lost in changing cars. A few hundred feet back from the face another slick sheet was maintained and when the locomotive brought in a train of empties, they were thrown off the track on this sheet. The loaded cars were run back to this point, made up into a train and hauled out. From this latter sheet, the empty cars were run one at a time up to the sheet near the face. The empty cars weighed about 1100 lb. and were handled by a man using a crowbar. The sheets were kept about the same height as the top of the rail so that the car required to be lifted only the height of the flange. No switches were used anywhere. At no time did the removal of the muck limit the speed of drifting or interfere with the drilling cycle.

The steel plates used for the slick-sheet sidings were ¼x48x140 in. The siding some distance from the face was 48 to 60 ft. long; directly opposite it were ¼x22x140-in. sheets, resting on planks down the center of the track, and also flush with the rail heads.

Track-Laying

After practically all the muck was cleaned out, the shovelers laid ties to grade as the tunnel advanced, thus facilitating the subsequent laying of the rails. A 25-ft. false track was advanced over the ends of the rails as necessary, so that the cars were always next to the muck pile. When the advance permitted the insertion of a set of rails, the foreman and muckers did the work in 15 to 20 min., without disturbing the machinemen.

Blasting

On the completion of the round, shovelers, machinemen and everybody helped to tear down the machines and bars. Then ¼x36x140-in. slick sheets were spread out for 30 ft. back from the face and covered with a little muck. These sheets were handled with grappling hooks through holes in each corner. When the machines were removed, an air hose was attached to a blow pipe and the holes cleaned. The shift boss, machinemen and foreman then did the loading. Double fuse was used on the lifters. The explosives were Bear Brand fuse, California 8X caps and Hercules E. L. F. extra 60% powder. Spitting the fuses completed the cycle. There is no relation whatever between the shift and the drilling cycle, the machinemen relieving each other without stopping drilling.

TIME SCHEDULE

Beginning with the time the last hole was heard to explode, the average time schedule for the last five months' operations would be about as follows:

Operations	Time Consumed Min.
Returning to face	4
Setting up bar	[illegible]
Mounting and starting up two machines	3
Shoveling back for bottom bar	30
Drilling 20 to 25 holes	210
Tearing down machines	5
Blowing out holes	4
Loading holes	6
Cutting and spitting fuses	2
Interval to report of first hole	4
Interval from report of first hole to report of last hole	3
Total	4 hr. 37 min.

THE ROUND

In drilling the round the standard center cut, generally with six holes, was used; these cut holes varied from 7½ to 8 ft. The side holes and lifters, which averaged 5½ ft., were put in to suit the ground. Variations in the nature of the information necessitated a good deal of variation in the layout of the holes. A good many relievers and "kickers" were frequently necessary. The usual round required 21 to 23 holes, although at times 29 were necessary. For a 22-hole round the total footage was about 110; the average rate of drilling dry holes was 6 ft. per hr., of drilling wet holes, 7 to 10 ft. per hr.; the average time for a complete round was 3½ to 5 hr.; the average advance per round was about 4 ft.

TABLE I. COMPARATIVE DATA ON AMERICAN AND EUROPEAN TUNNEL DRIVING RECORDS

Name of Tunnel	Size in Ft.	Character of Rock	Progress for Entire Length: Average Monthly Advance in Ft.	Progress for Entire Length: During Months	Progress over Long Periods: Average Monthly Advance in Ft.	Progress over Long Periods: During Months	Best Monthly Record, in Ft.	Authority
Sheep Creek	8x10	Greenstone and slate	544.2	16	596	6	661	
Loetschberg, Switzerland	6x10½	Limestone and gneiss	490	54	683	18	1013	Trans. A. I. M. E., 1911
Simplon, Switzerland	6½x9½	Schist					685	E. & M. J., July, 1913
Arlberg, Switzerland	8½x9½	Gneiss	474	36			641	Prelini "Tunneling"
Tauern, Austria					525	11	548	Engineering News
Laramie-Poudre	7½x9½	Granite	473	19	525	12	653	Trans. A. S. C. E., 1912
Strawberry, Utah	9x11	Limestone			426	11	492	E. & M. J., June 10, 1911
St. Louis Waterworks	10 ft. diam.	Limestone	430	5¼			745	Comp. Air, June, 1911
Arizona Copper Co.	8x8	Porphyry			669	3	799	E. & M. J., Aug., 1912
Rawley, Colo.	7x8				358	17.4		E. & M. J., Feb. 1, 1913
Mammoth, Calif.	8½x9½				316	9½	395	E. & M. J., Dec. 21, 1912
Roosevelt, Colo.	6x10				292	12	435	Mines and Minerals
Mt. Royal, Montreal	8x12	Limestone					810	E. & M. J., July 26, 1913
Gunnison	6x10½	Soft limestone					824	E. & M. J., July 26, 1913
Los Angeles Aqueduct	12x13	Black shale					604	Mines and Minerals
Los Angeles Aqueduct	12x13	Cemented sand					1061	Mines and Mineral

TRAMMING

The muck from the face was hand-trammed at first, subsequently a storage-battery locomotive was used, transporting material, men and waste rock. This was a 4-ton Jeffrey machine, equipped with 63 Edison, A-8, nickel-steel cells. The cells were charged from a 14-kw. motor-generator set, consisting of a 20-hp., 400-volt, alternating-current motor, direct-connected to a 125-volt, compound-wound, direct-current generator. The Matheson side-dumping roller-bearing cars had a capacity of 30 cu.ft.; they were made by the Joshua Hendy Iron Works, of San Francisco. Drill steel and miscellaneous material were handled principally on small flat cars. The 30-ft. capacity cars were the largest that could be used on the slick-sheet sidings. They were loaded heaping full, since when loaded they did not require to be derailed. The track gage was 24 in., the widest for which the side dump cars could be built and allow the loaded car on the track to pass the empty on the siding.

At the beginning of operations, the locomotive hauled but 12 cars in a train, but as the length of the tunnel increased, it became necessary eventually to handle trains of 20 cars. The material was used for fills on the surface railroad between the tunnel portal and the mill site, the filling being dumped from temporary trestles constructed for the purpose. One motorman and one brakeman handled and dumped the trains.

PIPE, TRACK AND WIRING

The ventilating pipe was carried on 4x6-in. vertical posts spaced 15 ft. It was kept close to the face and protected by a bulkhead of ties. A compressed-air line was carried along the bottom on 4x4-in. sills, which also supported the board walk; the end of this pipe was protected by the same bulkhead. The main line was always thus within a hose length of the face. An extra manifold was kept on hand and when it was necessary to extend the pipe line, this manifold was attached to the new length of pipe before the latter was put on; this considerably facilitated the operation.

The rails used were 50-lb. and were laid on 6x8-in. by 6-ft. ties. When the track is widened to its permanent gage of 36 in., one rail only will be moved.

Six wires were carried the length of the tunnel; three of these were used for the single-phase, 110-volt lighting system, the purpose of the third wire being to give equal voltage at all points in the tunnel. The other three wires constituted the three-phase, 440-volt alternating circuit for the ventilating-fan motors.

SPEED OF ADVANCE

Drilling was started November, 1912, but the work was not considered as completely organized until December, 1912. Between Dec. 1, 1912, and April 1, 1914, a period of 16 months, the tunnel was advanced 8707 ft. with a single heading, an average of 544.2 ft. per month. During the last six months, the average monthly advance was 596 ft. The greatest monthly advance was 661 ft. made in November, 1913. At various times advances of 24 ft. per day were made. It is believed that this constitutes the world's record for sustained progress in extremely hard rock with an 8x10-ft. tunnel section. Monthly records have been made considerably in excess of 661 ft., but we know of no record which equals the average advance of 544.2 ft. over the entire period of operation covering 16 months and of no American record which equals that of 596 ft. maintained for six months. Tables I and II present data covering this point.

TABLE II. COMPARATIVE DATA ON SHEEP CREEK AND LOETSCHBERG TUNNELS

	Sheep Creek	Loetschberg	Ratio
Size of tunnel, ft.	8x10	6x10½	
Area of cross-section, sq.ft.	80	63.5	1.26 : 1
Best monthly record, ft.	661	1013	1 : 1.53
Record on entire length, ft.	544.2	490	1.1 : 1
Average progress per round, ft.	4	3.97	
Average length holes, ft.	6.37	4.54	1.4 : 1
Number of holes per round	22	13.4	1.64 : 1
Total footage holes per round	140	61.3	2.28 : 1
Drilling time per round, hr.	1.58	4	1 : 2.53
Drilling time per ft. of hole, min.	1.72	1.55	1.1 : 1
Entire duration one round, hr.	5.3	4.48	1.18 : 1
Strength of dynamite used	60%	85%	
Pounds used per ft. advance	34	15.5	
Number of drills used	4	4	
Support for drills	Horizontal bars	Carriage	

The data on the Loetschberg tunnel are based on a paper "Tunnel Driving in the Alps," by W. L. Saunders, A. I. M. E. Trans., 1911. Detailed data are given only for a period from January, 1908 to July, 1910. The tunnel was started Oct. 1, 1906 and finished Mar. 31, 1911. The details given would probably be slightly modified if a complete record were available. The record of 1013 ft. was made subsequent to July 1, 1910.

Wages and Bonus

On account of the peculiar shift arrangement, the men were paid by the hour, and in addition a bonus was distributed. The wages were as follows:

Machinemen, muckers and carmen	$0.50
Shift bosses	0.58
Blacksmith	0.60
Tool sharpeners	0.50
Tool-sharpener helpers	0.40
Blacksmith helpers	0.35
Compressor men	0.40
Electricians	0.50
Timekeepers	0.45
Carpenters	0.60

A bonus was paid as follows: For 300 ft. per month or under, no bonus; for 300 to 350 ft. per month, $7 per ft. for the 50 ft.; for 350 to 400 ft. per month, $8 per ft. for the 50 ft.; for 400 to 450 ft. per month, $9 per ft. for the 50 ft. This increased $1 per ft. for every additional 50 ft.

The foreman distributed the bonus according to his judgment. It was his practice to give the lower-bar machinemen $30 a month bonus, independent of the total amount received. The muckers, carmen and motormen each received $10 to $15 per month bonus at the foreman's discretion. The tool sharpeners received $15 per month bonus. The amounts noted above were deducted from the total bonus of any one month and the remainder divided equally among the top-bar machinemen and the shift bosses. His idea was to give the greatest reward and the greatest incentive to the men chiefly responsible for the rate of progress. The result was thoroughly satisfactory.

Necessity for High Speed

The development of the Alaska Gastineau property involves the expenditure of an extremely large sum. It consists of several different elements, and economy requires that these be completed as nearly as possible at the same time. Driving the tunnel was the work which involved the greatest number of contingencies and unknown factors. It was, therefore, imperative that it be completed in time, and for this reason the high speed of driving was aimed at. More important, however, was the fact that by pushing the tunnel through rapidly, it became available for development work by raises which otherwise would have had to be done by sinking, and the raising cost is only about one-third of the sinking. The tunnel was also made available for handling a considerable amount of muck, 300 tons, which otherwise would have required hoisting to the Alexander level and dumping on a hillside where room was limited. There is no doubt but that the tunnel could have been driven more slowly at a lower cost per foot, but the indirect economies mentioned would not have been obtained.

Costs

The following cost data apply to the 8707 ft. driven between Dec. 1, 1912, and April 1, 1914, this representing the distance driven under the standard conditions described:

Wages	$14.72
Bonus	4.14
Explosives	4.47
Lighting	0.28
Tool replacement	1.35
Lumber and miscellaneous supplies	0.75
Store expense and transportation	0.38
Power and compressed air	2.53
Loss on boarding house	1.17
Depreciation on mining tools	1.29
Total	$31.08

A $1 charge per man per day for board did not cover the cost, inasmuch as the food was of high class and expenses of transportation and help were excessive. Nearly all the men ate four meals per day. Under "power and compressed air" is concluded the operating expense of furnishing the compressed air and of ventilating. The labor of installing pipes is included, but not the cost of the pipes themselves, since this became permanent equipment.

Survey for Connection

The survey for the tunnel connection was a rather elaborate affair. The triangulation system was worked out with the principal base lines on the shore of Gastineau Channel, and check base lines adjacent to the Sheep Creek portal and the Alexander-crosscut portal. The base lines and the angles were measured with extreme care and adjusted by the method of least squares. The stations used for the connection were about 12.000 ft. distant from each other horizontally and 700 ft. vertically. The range of mountains between rose 2500 to 3500 ft. higher than the tunnel portals. The traverse was carried 2100 ft. through the Alexander crosscut to the shaft, involving four angle points. This traverse was closed to a plumb-line down the shaft from the surface, the plumb-line being located from the triangulation point near the shaft collar. The check was within 0.2 ft.

The line was carried down the shaft from the Alexander level 620 ft. by means of double-wire plumbing. The base was about 12 ft. Piano wire was used and 10-lb. weights in the form of crosses. During plumbing, hoisting in the shaft was suspended. With this base the probable error in azimuth was at least 1 min. From the bottom of the shaft the traverse was carried 400 ft. to the connection with the Sheep Creek tunnel. This involved three set-ups with a probable error of 52 sec. The traverse from the Sheep Creek side through the tunnel was 10,100 ft. long and involved 25 sets-ups. The angles were repeated six times, the last three times with the telescope plunged. Each angle was measured thus twice, and the mean of the readings taken. Two complete traverses were run and the resulting probable error was 7.25 sec. The tape used had been standardized against the tape used for the triangulation base lines and corrections for pull and temperature were applied. The probable error of linear measurements was 0.006 ft. Elevations were carried by wye-leveling along the wagon roads from the Alexander crosscut to the Sheep Creek portal. The distance covered was a little over 12 miles.

Double turning points were used throughout and fore and back sights kept nearly equal. The rod used was standardized and two complete lines of levels were run.

When the connection was made between the Sheep Creek tunnel and the crosscuts in the shaft, the error of closure was 0.675 ft., or 1 in 37,000. The error in levels was 0.414 ft., or one in 570,000.

It is believed that the excellent results obtained in driving this tunnel were due to the following factors: (1) The energy and skill of the foreman, P. H. O'Neill; (2) the bonus system; (3) efficient ventilation; (4) the elimination of switches in the tramming system; (5) the excellent equipment and the large supply of spare parts kept on hand.

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Dry Washing for Gold

By Hugo W. Miller*

It is well known by many mining men of this country that Sonora and the west coast of Mexico have produced a great deal of gold. Having been for some time at the gateway to this mining region, and having some idea of what it produces under the worst possible conditions, I can predict nothing but a boom for it when the troubles are settled, and the country is again under development.

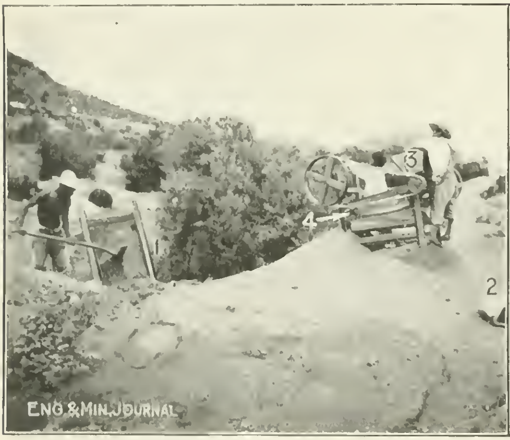
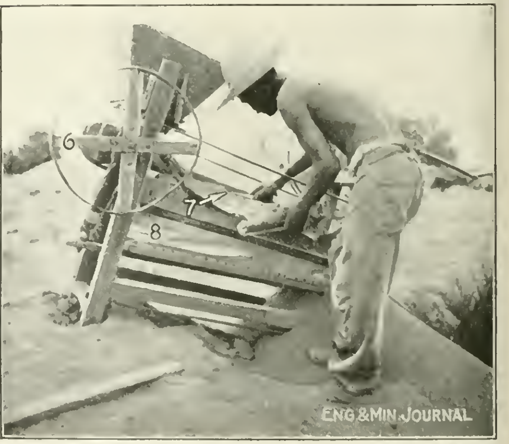


Fig. 1. Working Old Dump with Dry Washer



Cleaning Up Gold from Dry Washer

The two photographs shown here will give a good idea of the method employed by the natives in recovering the gold from the gravels in the Altar, as well as other districts of Sonora. In this case, an old dump is being worked over.

The Altar gold occurs in ancient river beds. The bedrock in most places is about 60 ft. below the present surface. The ore or gravel immediately above the bedrock is followed by underground-mining methods. Timbering is in most cases unnecessary. It is called a cement rock, and consists of gravel and fragments of granite, schists, diorite, limestones, and porphyries, of different sizes which have been cemented into a hard mass by a red silt, and [illegible] salts. The ground is drilled and shot as in lode mining. The ore is drawn out and screened, the fines are scattered in the sun to dry and the coarse laid aside on a dump to weather. On weathering, the cement seems to disintegrate, thereby in time freeing more gold which can be recovered by more screening and dry washing. Where the American has taken charge of properties, however, the Quenner machine has been installed to break up the cement just after it is hoisted, hence freeing most of the gold the first time and leaving the naked barren pebbles to be worked by the natives.

In Fig. 1 is shown the native: (1) screening the dump. One of his boys, with a rawhide bucket (2) carries these fines and dumps them into the hopper (3), while still another turns the handle of the machine which furnishes the power necessary.

The ore runs over a stationary table (4) covered with a tightly stretched muslin cloth which is porous enough to permit the passage, uniformly, of air through the surface of the table. In the other picture will be seen the riffles or strips of wood (7), which stop the heavier gold on its downward passage over the table. The air is furnished by a large bellows (8) driven by a crank in the back of the machine under the hopper. The wheel (6) serves to balance the drive pulley and acts as a sort of a flywheel.

The gusts of air made by the bellows, cause the lighter gangue on the table to fly up, and the inclination of the table causes it to work forward, but the gold which is too heavy to be lifted by the air moves down the table till it lodges against one of the riffles (7). After all the fines are run through the washer, the side board is removed, and the concentrates brushed off. These concentrates consist of magnetite, garnet, black sands, and gold dust and nuggets. The gold is separated from these impurities by dry panning in the ordinary gold pan. The fineness of the melted gold bars varies from about 850 to 930. In some of the old mining camps these mines and dumps have been worked for over thirty years. At one place I stopped where an American was in charge, and out of about five tons of fines screened out of a dump which had been worked over three times before, a recovery was made of about 3 oz. fine gold.

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*Mining engineer, Nogales, Ariz.

Details of Practical Mining

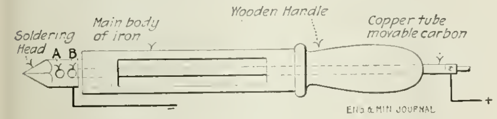
Electric Soldering Iron

By Frederick W. Foote*

I saw recently at Castle Gate, Utah, a simple and efficient electric soldering iron. It was made there in the shops by G. P. Curry, assistant electrician.

Essentially, it is an electric arc in a soldering head. This gives sufficient heat; in fact, the current has to be shut off at intervals to prevent burning. The iron in use was operated at 60 volts and consumed about 10 amp. This with power at $1\frac{1}{4}$c. per kw.-hr. amounts to $\frac{3}{4}$c. per hr., which is not excessive.

Referring to the drawing, the soldering head, square in section, has two $\frac{3}{8}$-in. holes drilled into it. The hole *A* goes all the way through and is used to hold a $\frac{3}{8}$-in. carbon rod connected to the positive terminal of the source of power. The second hole *B* goes to the center where it connected at right angles to a $\frac{5}{8}$-in. hole containing the other carbon, an air gap being left.



Soldering Iron Heated by Electric Arc

The hole *B* acts as a ventilator to supply air to the gap, increasing the efficiency. The main body of the iron is a piece of circular steel tubing to which the head is riveted. Slots are cut in the sides, as shown, to facilitate the manipulation of the movable carbon. This is insulated by means of a band of mica at the junction, so as not to heat the wooden handle. A $\frac{1}{2}$-in. hole drilled through the handle allows the insertion of a copper tube in which the movable carbon is placed. The electrical connections are made at the head and the copper tube as shown.

The spark gap is regulated by shoving the carbon in and out in its copper casing. The dimensions depend on the size of head used. The drawing shows approximately the proper proportions.

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Gold Dredge Stacker Motor†

The stacker motor on a gold dredge is subject to severe duty, owing to the fact that the motor is usually at the far end of the stacker and therefore exposed to the weather, and also when the loaded stacker has been at rest, considerable torque is required to start it.

In cold climates, a stacker when at rest is often apt to freeze, due to moisture contained in the waste being carried by it. Starting under these conditions is particularly arduous for the motor and in some places this trouble is overcome by putting the stacker in a continuous canvas tent or tunnel, and passing steam pipes up inside this tent, steam being provided by a small low-pressure heating boiler. But this again makes life hard for the motor, because moisture vaporized by the heat of the steam pipes rises to the far end of the stacker where the motor is placed, and often condenses there on the motor whenever that machine is shut down and allowed to cool. Accordingly, a motor for stacker service should be designed with adequate insulation to resist continuous moisture and in some cases drip guards have advantageously been placed over the ventilating opening in the motor.

Squirrel-cage motors with heavy-torque characteristics have been used successfully for stacker drives, but the general tendency is to use motors with phase-wound rotors in order to obtain a good starting torque. Whether the complications of a phase-wound motor are justifiable is a question, says Girard B. Rosenblatt, who expresses a preference for a squirrel-cage motor designed for good torque characteristics, with possibly a trifle more resistance in the secondary circuit than is found in standard squirrel-cage induction motors. A stacker motor is relatively small, as compared with the total motor installation on the dredge, and a slight loss in efficiency on such a small unit, is more than offset by a saving in the maintenance.

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New Stadia Method

A real novelty in stadia methods, according to Engineering News, has been brought out by J. Zwicky, of St. Gallen, Switzerland. Instead of using two horizontal crosswires in the telescope reticule as stadia interval, he forms a horizontal stadia interval by using two telescopes whose horizontal axes make a small angle with each other. In the instrument as practically constructed, one of the telescopes is mounted immediately above the other, and a link connection causes the two telescopes to rotate together vertically. Since both telescopes revolve in vertical planes, the intercept which they cut off on a horizontally held stadia rod is proportional to the horizontal distance between instrument and rod, instead of being proportional to the slope distance (as with upright rod held normal to the line of sight, or with horizontal rod and ordinary stadia wires), or proportional to a function of the slope distance (as with ordinary vertical stadia rod).

The two prime advantages of this instrument and stadia method are claimed to be: (1) The possibility of using a much smaller stadia ratio than 100, thus permitting the attainment of much greater accuracy on ordinary lengths of sight; (2) the elimination of all calculations to get horizontal distances. The former advantage permits of getting a precision of better than 1:1000. In a survey of an 80-acre tract, where all measurements (except those in woodland, where the tape was used) were made by this stadia method (with interval 1:20), a precision of about 1 in 3000 was obtained.

Holding the rod in horizontal position needs two rodmen instead of one, which is a disadvantage. To eliminate calculation for obtaining elevations also, a reduction chart is attached to the side of the transit standards and a pointer fixed to the horizontal axis of rotation moves over this chart as the telescope is revolved. The inventor describes the new method and instrument in the *Schweizerische [illegible]*, of Sept. 5, 1911.

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*Britannia Beach, B. C.

†Proc., A. I. E. E., August, 1914.

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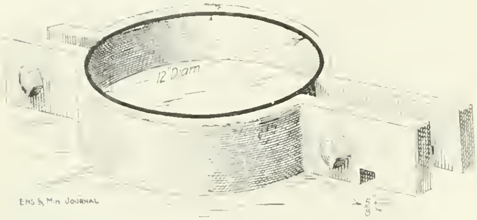
Ventilating and Counterweight Pipe*

In sinking the Palms shaft of the Newport Mining Co., two birds were killed with one stone in an ingenious manner. A 12-in. pipe connected to a 7½-hp. electric fan was used for ventilating and then left in the shaft to serve as a guide-way for the cage counterweight. The pipe extended to within 15 or 25 ft. of the bottom of the shaft, and was used to exhaust the smoke and gases after blasting. The joints were flanged; to lower a section of pipe the bucket was removed from the hoisting rope, eye-bolts were inserted in three of the flange holes, and rods connected these bolts to a ring in the clevis at the end of the hoisting rope. At the end of the 12-in. line already in place, two chain blocks were hung, and by means of two ¾-in. wire rope slings the section of pipe was taken from the hoisting rope and placed in the proper position for connection with the 12-in. line.



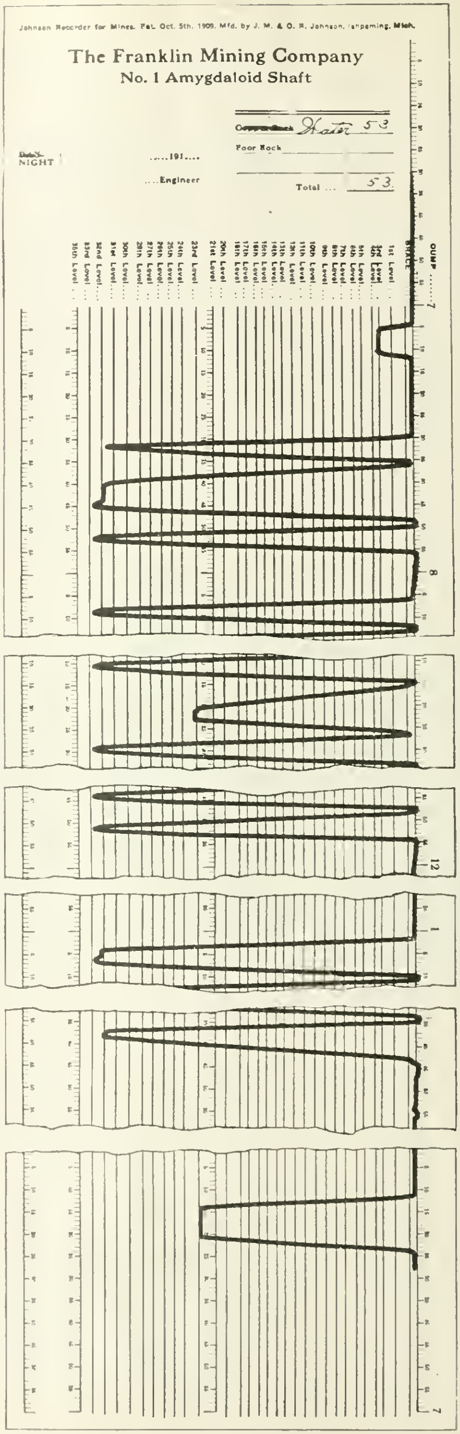
PIPE HANGER TO CATCH OVER FLANGE OF STEEL SHAFT SETS

To support this pipe in the shaft, the clamps shown in the accompanying illustration were used. The slots in one end engaged the flange of the H-section steel members, which formed the shaft sets. Every alternate one of these rested upon a wall plate, and the others upon dividers.

⁂

Automatic Skip Recorder

The Franklin Mining Co., in the Lake Superior copper district, is using on its hoist at the Franklin Jr. mine an automatic recording device which provides a permanent record, on paper, of every movement of the skip during a 12-hr. period. The mechanism is comparatively simple. Two drums are mounted on vertical spindles about 12 in. apart, and these drums contain a paper chart. The paper travels from right to left, the left-hand drum being driven by clockwork. The chart is divided longitudinally according to hours and minutes, from 6 a.m. to 6 p.m., or *vice versa*. A vertical arm, bearing an ink pen, containing red ink, registers both horizontal and vertical lines on this chart, and receives its motion through a chain sprocket and gears from the



SAMPLE OF GRAPHIC RECORD OBTAINED. THE BREAKS REPRESENT A SERIES OF UNIFORM CURVES, SHOWING UNINTERRUPTED HOISTING countershaft of the hoist. There is also a lower arm on the machine which can be connected to the electric-signal system and to operate a pencil vertically across the lower line of figures on the chart, and thus show the time at which any signals are rung. In the particular case of the Franklin Mining Co., this part of the machine was not satisfactory, because the electric signals are given so fast that the clockwork is not rapid enough to record them.

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*An excerpt from an article presented before the Ishpeming meeting of the Lake Superior Mining Institute, Aug. 31, 1914.

The other part of the device is giving entire satisfaction at this mine. Before it was installed, there was no way of checking conflicting statements of the hoisting engineer and the men underground, in disputes arising as to the position of the skip at any time. In cases where hoisting was held up, the underground dumpers would be likely to say that they could not get the skip, which was lying idle at some level above or below them. The engineer, on the other hand, would claim that the signals were not rung and that there was nothing wrong with the skip. With this recorder in operation, it is impossible for any such dispute to arise. The chart shows exactly where the skip was at any hour or minute of the day and how long it took to make any trip; the speed of hoisting or lowering can be computed from the figures, since the vertical divisions on the chart show the positions of the various levels in the mine. The only attention the recorder needs is the filling of the pen with ink every day and the occasional oiling of the parts. The engineers like the device because it places the responsibility where it belongs. The charts are removed daily and filed in the office of the superintendent, where they are kept for several months. The recorder is the invention of J. M. & O. R. Johnson, Ishpeming, Mich., by whom it is sold, together with the chart blanks.

⁂

Cut and Fill Stoping at the Copper Queen*

In certain portions of the Copper Queen mine at Bisbee, Ariz., notably in the Holbrook, Spray and Gardner divisions, some cut-and-fill stopes have been opened. This system of mining is, of course, applicable only in hard ground, and these stopes are exclusively in sulphide ores. The experiments have to date proved successful, and have materially decreased the mining cost, as compared to the square-set method; it is believed that this system should be worked wherever the conditions are suitable. The method in vogue is somewhat as follows:

The orebody is prospected as far as possible in advance, and the side and vertical dimensions of the ore determined. Drifts are driven where possible under the bottom of the ore and raises put through the ore to the level above to permit the dumping of filling. Chambers are then cut out, drifts formed either by cribs or sets of timber, the back blasted down, raises cribbed up at convenient points, and filling dumped in, upon which the men may work and at all times be kept close to the back. Wherever possible, the stope is worked on an angle of about 45°, so that the broken ore may slide down upon a plank bed laid upon the filling to the chutes. This materially reduces the cost of getting the ore into chutes, and is very desirable wherever it is possible to use it. Prospecting can be done from any elevation, as the stope is worked up to that point, and the filling easily and cheaply disposed of. Wherever it is possible to work them upon an angle of 45°, little timber is needed. Wherever a stope cannot be worked upon the slope and where the backs are carried horizontal, it is often necessary to put up temporary supports by cribbing and blocking up the back to make the stope safe while the ore is being extracted.

One absolute necessity is that the men be watched closely and taught to bar down the backs, taking care before they commence drilling operations that all loose or unsafe ground is taken down. Perhaps the method is at a disadvantage where ore is intersected by stringers or bunches of waste; but, if care is taken, this waste can always be blasted down or put in the gob and the ore mined clean.

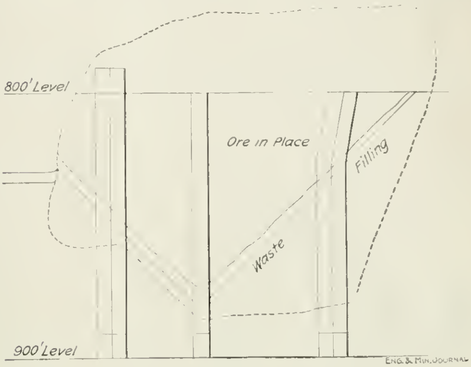

Fig. 1. Ready for New Cut

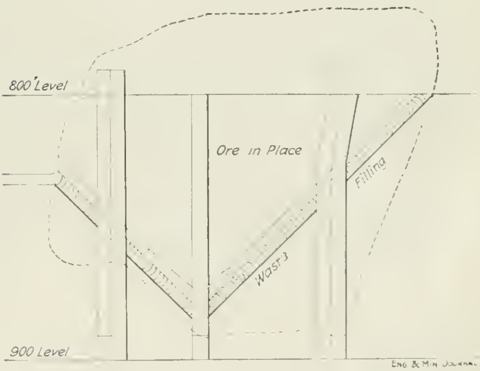

Fig. 2. New Layer of Filling Run-in

Referring to Fig. 1, starting at the top of the slope, water holes are drilled and a section of ground about 8 ft. thick and 20 ft. wide is blasted down. The drilling is done in this way wherever it is possible in order to keep the back solid. Fig. 2 shows that the ore has been removed, waste filling has been run in and floored over, and the stope put again in the condition as shown in the other figure.

[While the term "cut and fill" is applicable to this mining system, it is more commonly used for cases in which the back of the ore and the top of the fill are kept approximately horizontal.—Editor.]

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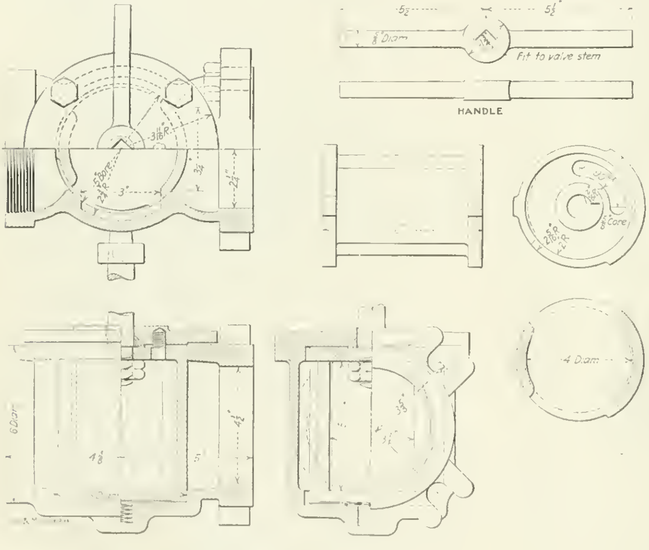
*From the A. I. M. E. "Bulletin," August, 1914.

Details of Milling and Smelting

A Stop-Cock Tuyere Valve

In many parts of the country, the tuyere valves used on blast furnaces are of the gate-valve type, but in the Southwest, particularly at the Copper Queen and associated properties, a stop-cock or corliss type of valve is used. This type of tuyere valve, we understand, originated at the Copper Queen works and proved so satisfactory there that it was adopted by the Detroit Copper Mining Co., through whose courtesy the accompanying drawings are reproduced. The valve works more easily than the gate-valve type and may be closed air tight. It has a slotted flange on one end, so that by simply loosening the holding bolts, the tuyere pipe may be quickly removed to facilitate repairs or change of jackets.



Stop-Cock Tuyere Valve

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Leaching Zinc Ores

The difficulties in the way of leaching zinc ores with sulphuric acid or ferric sulphate have long been recognized. Such solutions must be freed from iron, a difficult and often expensive process, while there is usually a considerable amount of zinc left undissolved in the ore.

Anson G. Betts proposes to get around this difficulty (U. S. pat. 1,066,215) by adding a small quantity of a peroxide or chemical stronger in its action than ferric sulphate to a dilute sulphuric acid solution. A chromate or chromic acid, or a permanganate or permanganic acid, is suitable. He says: "I am not able to offer any chemical explanation of the action of the oxidizing agent in preventing the solution of the iron in the ore, but can only state that it accomplishes the desired result, even in the presence of an excess of sulphuric acid."

⁂

Fettling Practice at North American Smelting Works

The fettling of reverberatory furnaces has undergone a marked change in the last eight or ten years. This is well illustrated in the table on the opposite page, which has been compiled from replies received from officials of the leading smelting works in North America that use reverberatory furnaces. The table presents in concise form much interesting data regarding the reverberatory furnaces of the country, but the most striking feature is the diversity in fettling practice between the older and newer plants. Most of the newer works fettle the furnaces through the roof, while the older plants throw the fettling in through the side doors. The older works still use for the most part quartz or other high-silica material, and naturally use this fettling as sparingly as possible. The newer plants, on the other hand, drop almost any material on the sidewalls and in large quantities, the idea being that the sidewalls will be protected if a sufficient amount of cold materials be dropped thereon. It should be remarked, however, that most of the plants that fettle through the roof use ores or products containing sulphur, some carrying the revolution so far as to use raw concentrates, or converter slag or matte cleanings—materials that a few years ago would have seemed absolutely heretical.

When the fettling is dropped through the roof on the side walls in great quantities, some of it naturally floated out into the furnace, and after some experimentation it was found that raw ore, floating off with the slag, during skimming, was increasing the metal loss; this led to the use of siliceous ores containing copper as sulphide, in which form it would be readily removed by the heat of the furnace. This practice has been carried still farther by the use of ores carrying as much as 15% sulphur as at Douglas, and also by the use of raw concentrates, as at Cananea and elsewhere, confirming the hypothesis that a large quantity of cold materials was what was needed to protect the side walls.

It should be borne in mind in consulting the table that much of the data is approximate and subject to the personal equation of the official answering the series of

Fettling Practice at Important North American Smelting Works

Works at.... ..	Coppercliff, Ont.	Great Falls, Mont.	Anaconda, Mont.	Tooele, Utah	Garfield, Utah	McGill, Nev.	Humboldt, Ariz.	Clifton, Ariz.	Douglas, Ariz., C. & A. Wks.	Douglas, Ariz., C. Q. Wks.	Hayden, Ariz.	El Paso, Texas	Cananea, Mex.
Size of reverberatory furnace	19x112 ft.	15 ft. 9 in. x 42 ft.	19x110 ft.	19x102 ft.	20 ft. 4 in. x 123 ft. 5 in.	18 ft. 9 in. x 131 ft. 9 in.	19x60 ft.	22x100 ft.	19x100 ft.	19x91½ ft.	19x112 ft.	19x100 ft.	19½x100 ft.
Kind of material smelted	Calcines, 80%, green ore and flue dust, 20%	Roasted conc. and flue dust	Roasted conc. and flue dust	Low-grade calcines	Roasted conc., flue dust and lime sand	Roasted conc., flue dust, converter secondaries and lime rock	Roasted conc., fine mine ore, raw conc., limerock and "cleanup"*g*	Roasted conc., siliceous ores and fluxes	Calcines and flue dust	Calcines, flue dust and raw ore	Roasted conc. and limerock	Roasted conc. and flue dust	Roasted conc. and flue dust
Present fettling materials	Green ore and calcines	Crushed sandstone	Crushed sandstone*e*	Siliceous ores and crushed silica*f*	Crushed quartz, siliceous tailings and siliceous ores	Siliceous sulphide conc. or mill slimes	Siliceous, 60%, ores and mill slimes	Siliceous copper ores, and slag and matte*h*	Copper ores, carrying S, 1 7 to 23 8%; SiO_2, 29 2 to 70 9%	Copper Queen sulphur-bearing ores*m*	Conc. and converter slag	Siliceous ore	High-grade conc. and siliceous ore
How fettled	Dropped through roof	Thrown in	Thrown in*e*	Dropped through roof	Dropped through roof	Thrown in	Thrown in*i*	Dropped through roof	Dropped through roof	Dropped through roof	Fed through special side openings	Thrown in, except at bridge above which are fettling holes	Dropped through roof
Frequency of fettling	Continually	About every 10 days	Monthly	Every 2 to 4 hours	About every 5 days	Daily	Twice daily	Each shift as required	Practically continuously	Practically continuously	Practically continuously	Three times daily	Practically continuously
Tons of fettling used per furnace day	300*a*	2 8	1	8 - 10	5	27	About 5% of total charge	66	55	75	About 20% of total charge	About 6% of total charge	67*n*
Tons smelted exclusive of fettling	100 - 150*a*	200*b*	275	300	401	612	.. .	260	290	225			159
Total tons smelted	400 - 450	203	276	310	406	639	125	326*j*	345*l*	300			226
Fuel	Pulverized coal	Gas*c*	Coal*e*	Coal	Oil*r*	Oil	Oil	Oil	Oil	Oil	Oil	Oil	Oil
Fuel ratio*	1 : 6	1 : 2*d*	1 : 4 25	1 : 5	0 70 bbl.	0 58 bbl.	1 1 bbl.	0.837 bbl.*k*	0 8 bbl.*k*	0 9 bbl			0 995 bbl
SiO_2 in slag	33 - 35%	37 9%	39 68%	39 0%	43 5%	42 6%	42%	38 5%		34 8%			39 8%
Any trouble with siliceous floaters	No	Occasionally	No	No	Some floaters but not enough to make trouble	No	No	Yes	No	No	Occasionally	Occasionally	. .
How often are side walls repaired	Not since starting 8 mo. ago		Once in 8 years	Eight or nine months	Eight months	Semiannually	Not yet rebuilt	When making general repairs	One repair in 8½ months	Eight to nine months	Six to nine months	About once a year; except door jambs which are repaired about every 6 weeks	Large repair about every six months; usually, one small repair during interim
Where is greatest wear in furnace	Roof	At bridge	Matte line near firebox	Arch and sides 20 to 30 ft. from bridge	In the 40 ft. nearest the firing end	In the 50 ft. nearest the firing end	Bridge and side walls, from six to 25 ft. from bridge	Under second charge hole, 20 ft. from burners	In first 30 ft. from the bridge wall	At firing end	In first 30 ft. from bridge	In first 30 ft. from bridge	First 40 ft. of arch and 20 ft. of side walls

Notes:

* Coal consumption expressed in ratio of tons of coal to tons of charge smelted, oil consumption expressed as barrels of oil per ton of charge smelted.

a About Most of the tonnage smelted is charged through fettling hoppers; when over 25% is dropped from regular charge hoppers a good fuel ratio is not maintained.

b Exclusive of fettling and converter slag.

c Gas-fired furnaces now being replaced by direct fired furnaces.

d The coal used is a high-ash, high-sulphur bituminous coal of the following composition: H_2O, 7 9%; volatile matter, 23 8; fixed carbon 41 2; ash 21 1, sulphur, 4 5; B.t.u., 9310 per lb.

e Now changing to coal-dust firing, and fettling through roof with calcined concentrates and flue dust

f Siliceous ores used for daily fettling; furnaces tapped down at intervals of one to two months and fettled with crushed silica.

g From 20 to 22 tons of cold charge fed daily

h Average per furnace-day: ores, 18 tons; slag and matte, 48 tons.

i Furnace equipped for fettling through roof, which will be practiced when certain conveying devices are ready.

j Solid charge

k Per ton of solid charge, and includes starting and stopping furnaces.

l Solid charge; in addition about 100 tons of liquid converter slag is poured into the furnace.

m Tonnage smelted increased from 230 to 300 tons when Bisbee sulphide ore (15 5% S) was substituted for 80% SiO_2 fettling.

n Average per furnace-day in 1913; conc., 64 tons; siliceous ore, 3 tons

r Coal-dust firing being tried in one furnace

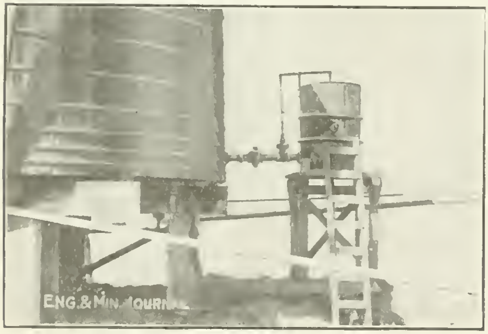
Situation of Works	Composition of Reverberatory Slags							Composition of Fettling Materials									
	Au Oz.	Ag Oz.	Cu %	SiO_2 %	FeO %	CaO %	Al_2O_3	Au Oz	Ag Oz	Cu %	SiO_2 %	Al_2O_3 %	Fe %	CaO %	S %	Zn %	Pb %
Coppercliff, Ont.	*nil*	*nil*	0.50*o*	33–35	51.4*p*	. .		*nil*	*nil*	5 50*o*	25 0		41 5	.	7.0		
Great Falls, Mont.	0.001	0 1	0 45	37.9	43 0	4 0	9 0			..	95 0	1 8	0 7	1 1	.	.	
Anaconda, Mont.	0 0006	0 19	0 39	39 7	42 3	4 6	7 0			.	97.5	1 7	0 1	0 2	.	.	..
Tooele, Utah	0 005	0 40	0 35	39 0	46.9*b*	4 5	.	0 40	20 00	0 40	75 0		6 5	3 0	0 5	. .	1.5
Garfield, Utah	0 001	0 035	0.35	43.5	27 0	18 0	7 5	0 10	7 0	0 20	85 6	1 2	2 9	0 8	.	....	0.4
McGill, Nev.	0 003	0 008	0.345	42.6	36 3	10 3	6 5	0.02	0 07	3 26	66 1	8 8	7 0	0 9	6 7	... .	
Humboldt, Ariz.	.	. .	0.33	42	29 6*b*	15		.	.	..	40 0					..	
Clifton, Ariz.	...			38 5	42 4	5 1*c*	9 7		.	7 30	40 0	10 1	6.5	0 8*q*	2 1	Siliceous ores	
										9 50	29 1	6 3	26 6	7 6*q*	4 5	Slag and matte	
Douglas, Ariz., C.& A.			0 5	34	46	7	6	0 033	0 15	4 2	29 2	7 1	24 7	0 7	23 8	Sulphide ore	
								0 004	0 36	5 4	29 5	12 4	22 7	3 2	1 7	Oxide ore	
								0 107	5 00	3 0	70 9	6 6	6 3	1.5	3 6	Siliceous ore	
Douglas, Ariz., C.Q.	.	0 10	0 487	34 8	43 1	1.9	8 6	0 02	1.06	6 45	23.2	7.5	25 4	1 9	15 5	. . .	
Hayden, Ariz		.			.		..	...	.	18 0	26 0	5.0	22 0	.	24 0	Concentrates	
								. .	.. . ..	1 5	23 0	4 0	51.0	1 0	1 5	Converter slag	
El Paso, Tex.	.	.		.				.		.	60.0	16 0	1.5		3	. ..	
Cananea, Mex.	*nil*	0 12	0 48	39 8	37 5	4 5	10 4	0 013	2 1	37.81	16 0	4 7	14 0	0 5	22.4	Concentrates	
								0 001	0 35	3 54	50 9	10.2	12 6	2 8	6 5	Ore	

o Cu-Ni *p* Reported as Fe: converted to FeO for comparison. *q* CaO-MgO questions submitted. For example, in the matter of tonnage figures, it may readily be that one official is reporting the tonnage of his furnace under the best normal operating conditions, whereas another may have given the average tonnage actually smelted in a given month, thus including interruptions or accidents that invariably cause the actual tonnage smelted below the average of the furnace under the best conditions. Hence the tonnage given should be merely regarded as approximate. In several instances officials went to the trouble to point out that molten converter slag was not includel in tonnage reported. This is what would normally be expected, but it is not clear whether this is the case in every instance. The answers to the varions questions have been inserted in the table in the original phraseology of the reporting official wherever that was consistent with a proper interpretation by comparison with other data submitted. The subsidiary table showing the analyses of the slags and of the fettling materials will be of interest, and some of the other incidental information will attract attention, particularly that touching on the practice in Montana, where some important changes are taking place.

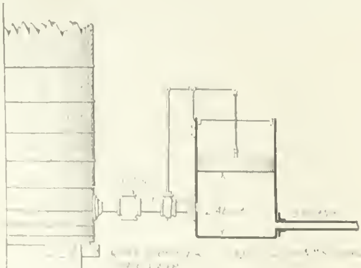
⁂

Constant- Flow Arrangement

An arrangement for delivering a constant flow of solution has been installed at the Tom Reed mill, Oatman, Ariz., designed by S. S. Jones, superintendent. It consists of a float in an oil drum, connected with a quick-closing gate valve. Action is entirely automatic, and an even flow of solution is maintained at all times. The illustrations explain the device fully.



THE CONSTANT-FLOW DEVICE



CONSTANT-FLOW DEVICE

Fines On Blast Furnace Charge

The advantages of sintered ore for lead blast furnaces were discussed by Irving A. Palmer, in his paper before the Salt Lake meeting of the Americna Institute of Mining Engineers. One of the important advantages of sinter is its similarity in composition to the general average of the charge. He said that it was often held that the detrimental effects of fines on the blast-furnace charge were largely mechanical, such as decreasing the furnace speed, increasing the amount of flue dust made, and causing the formation of accretions and blowholes. As a matter of fact, one of the most serious objections to fines is that they cause irregularities in the formation of the slag and matte. The fines of the charge naturally precede the coarse material in getting to the lower part of the furnace. This is due both to the natural fall through the openings in the charge and to the jigging effect of the blast.

Irregularities are almost sure to occur when the fines of the charge differ greatly in composition from the rest of the mixture, as when lead carbonates and sulphides, raw-iron sulphides, and limonite ore are used as flux. Finely divided lead ore is particularly bad; much of it is imperfectly reduced and thus goes in part to the matte and slag. On the other hand, a portion of the lead-carbonate fines is reduced too soon, and the upward rush of the blast carries small particles of metal to the upper part of the furnace, when they again combine with oxygen or sulphur, forming accretions or going into the dust chamber. Shaft accretions always contains a large portion of lead sulphides even though the charge be almost free from galena.

At one of the Mexican smelting plants some years ago, the furnace charges were made up largely of coarse siliceous ores, coarse limerock and limy ores, and iron-lead carbonates containing a large percentage of fines. blast-furnace flue dust and raw lead concentrates and pyrite ores were frequently added. The charge, as a whole, was very open as is indicated by the low blast pressures for the given volume of air. The tonnage smelted was low and the lead losses high. The furnaces ran irregularly and there were continual crucible troubles. Fines of the lead and iron ores, the concentrates and the flue dust, drifting down through the charge, were the first to reach the fusion zone, thus destroying the adjustment of conditions necessary to good work. It was found that by crushing the lime ores and adding siliceous fines to the charge, a material improvement in results were effected.

At Pueblo, Colo., it was a common occurrence at one time for finely divided Cripple Creek ore to fall unfused into the slag. The fines were refractory and fed in large quantities. It should be stated that careful assay showed that the gold tellurides had been thoroughly leached out of the unsmelted ore.

⁂

The Jigging Action of the Blast when smelting in shaft furnaces is sometimes very noticeable, particularly when the blowing apparatus is being run at reduced speed, said Irving A. Palmer in his paper before the Salt Lake meeting of the American Institute of Mining Engineers. At one Mexican smelting plant, the first lead furnace was blown in with air supplied from a blower delivering 300 cu.ft. of air per revolution. As the blower was much too large for the particular furnace it was run below normal speed, causing the blast to be delivered in slow pulsations. The furnace charge descended so irregularly that a satisfactory slag could not be made, and the metal losses were high. When more furnaces were blown in and the speed of the blower increased, the furnace work rapidly improved and no further trouble was experienced with pulsations of the blast.

Company Reports

The Lucky Tiger

The report of the Lucky Tiger-Combination Gold Mining Co., the holding company of the Tiger Mining Co., El Tigre, Sonora, Mex., for 1913, shows an operating profit of $729,657 and a profit of $668,578, after charging off $61,079 for depreciation of plant and equipment. This profit was realized from the production of 69,460 tons of ore and 21,778 tons of dump tailings cyanided. Of the ore production 68,528 tons were milled and 932 tons shipped. The contents of the ore per ton were as follows, milling ore: 0.109 oz. Au, 28.4 oz. Ag, 0.05% Cu, and 0.23% Pb; shipping ore: 0.488 oz. Au, 285.16 oz. Ag, 2.32% Cu, 12.05% Pb; dump tailings: 0.079 oz. Au and 13.62 oz. Ag. The average gross value of the shipping ore was $196.90 per ton; of milling ore, $19.46; of all ore, $21.85; of dump tailings, $9.74; of ore and tailings treated about $19 per ton. The net profit, after charging depreciation of plant and equipment, was about $7.35 per ton of ore and tailings, indicating a total cost of $11.65 per ton treated and shipped, including losses. The cost of cyaniding 21,778 tons of dump tails was $3.631 per ton, and marketing bullion from tails 74.9c.; total cost of treating dump tails, $4.38 per ton. The cost of ore produced and treated, not including depreciation, was as follows:

COST OF PRODUCTION FROM ORE MINED, PER TON

Mining	$2.805
Development	0.592
Transporting ore to mill	0.092
Milling:	
Concentrating	1.031
Cyaniding current tailings	2.967
General expenses, including management, local taxes, etc.	0.602
Marketing ore and concentrates	2.741
Marketing bullion	0.823
Total	$11.653
Less sundry profits	1.011
Total cost per ton of ore mined	$10.642

The company paid $450,662 in dividends during the year, making a total of $2,054,472 to date. Total production to date amounts to 323,250 tons, of which 14,590 tons have been shipped to smelters. There were 28,907 tons of ore broken in stopes at the end of the year.

*

Le Roi No. 2

The report of the Le Roi No. 2, Rossland, B. C., for the year ended Sept. 30, 1913, shows that 51,625 tons of rock were handled, consisting of 19,023 tons of shipping ore, 16,530 tons of milling ore, 12,214 tons of waste to dumps and 3858 tons of waste placed in old workings. The total stoping cost per ton of ore was $3.57, made up as follows: Ore production, $1.22; ore sorting, 15c.; general expense, 43c.; power, 55c.; general mine expense, 55c.; diamond drilling, 67c. Ore-production expense, $1.22 per ton, consisting of labor, 78c.; explosives, 35c.; illuminants, 3c.; and sundries, 6c. per ton. Development work totaled 4633 ft., of which 3503 ft. were drifts, 628 ft. crosscuts, 482 ft. raises and 20 ft. winzes; the average cost of this work was $15.87 per ft. There were 79 diamond-drill holes drilled to an average depth of 190 ft. at an average cost of $1.60 per ft. The mill treated 16,530 tons of ore, averaging 0.12 oz. gold and 11.05 lb. of copper per ton, and produced 1595 tons of concentrates, averaging 0.818 oz. gold, 0.635 oz. silver and 18.1 lb. of copper per ton. The cost per ton treated was $1.09. Smelting charges amounted to $6.38 per ton of concentrates. The shipping ore averaged $19.60 per ton and smelting charges were $6.07 per ton. Depreciation of plants and machinery amounted to $2.84 per ton.

*

Butte & Superior

An analysis of the Butte & Superior Copper Co.'s 1913 report shows a net gain in quick assets amounting to $184,177.53; of this $3375 came from the sale of capital stock and the remainder from operating receipts. The following tabulation will explain the financial statements contained in the report:

1912 balance of quick assets	$608,592.26
1913 balance of quick assets	792,769.79
Net gain in quick assets during 1913	$184,177.53

Receipts for 1913:

		Total	Per Ton Treated
From sale of concentrates		$3,013,736.74	$10.149
From sale of residues and concentrates		512,924.15	1.727
Total		$3,526,660.89	$11.876
Less freight and ore penalties		850,007.99	2.862
Receipts above freight and ore penalties		$2,676,652.90	$9.014
Operating costs:			
Mining, 293,706 tons	$918,868.15		3.094
Milling, 296,940 tons	799,878.87		2.693
Other charges	20,111.41		0.069
Total operating cost		1,738,858.43	$5.856
Operating profit		$937,794.47	$3.158
Other income		5,193.81	
Total income as shown in report			$942,988.28
Less apparent adjustment as shown by undivided profits account but not explained in report			771.28
Amount charged to undivided profits			$942,217.00
Less other expenditures:			
For mining claims		$824.45	
Plant and equipment		426,618.56	
Property in process of acquirement		235,592.11	
Investments		36,066.69	
Deferred charges		62,312.66	
Total other expenditures			761,414.47
Balance			$180,802.53
Received from sale of capital stock			3,375.00
Increase in quick assets during 1913			$184,177.53

In regard to ore reserves the report states that notwithstanding the apparent depletion of ore reserves above the 1300 level, some additional work on the 1400 level and between the 1300 and 1400 levels, commenced toward the end of the year, disclosed extensions of ore bodies near the eastern end of the Black Rock claim somewhat greater than had been expected. Taking this into consideration it is said that developed ore reserves suffered no depletion during the year but rather increased. Technical calculations of ore completely blocked out at the end of the year showed about 1,050,000 tons, compared with 1,200,000 tons at the end of 1912. The additional ore on the 1[illegible] level was not considered in this calculation. The average grade of the ore blocked out is stated to be over 21% zinc with about 7 oz. silver per ton. The ore also contains small quantities of gold, copper and lead. The following table will give details of ore treated and concentrates produced during 1913:

	296,940 Tons of Ore Milled	Concentrates Produced 104,174 Tons of Zinc	Concentrates Produced 2269 Tons of Lead
Average assay:			
Gold, oz.	0.021	0.05	0.83
Silver, oz.	10.590	24.19	43.28
Copper, %	0.23	0.47	0.31
Lead, %	1.169	2.08	39.41
Zinc, %	19.89	49.00	19.72
Total contents:			
Gold, oz.	6,280.07	5,201.45	187.786
Silver, oz.	3,145,779	2,520,375	98.202
Copper, lb. ...	1,366,618	977,405	14,151
Lead, lb.	6,944,082	4,330,422	1,788,465
Zinc, lb.......	118,137,915	102,102,868	895,048

The average mill extraction follows: For the first quarter of the year, 73.47%; second quarter, 88.33%; third quarter, 89.49%; fourth quarter, 90.15%; average for the year, 86.43%. These figures are based on zinc contained in zinc concentrates only. During the last quarter of the year the zinc concentrates averaged 50.54% zinc and the lead concentrates over 43% lead. The second section of the mill was not completed and put into operation until July. During the last five months of 1913 the average daily tonnage treated with both sections running was 1056 tons. The average tonnage during the last three months was 1087 tons per day. When running full time with a full ore supply from the mine, the mill is said to have a capacity of 1200 tons a day.

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Porcupine-Crown Mines

The following figures for the second half of 1913 were taken from the report of the Porcupine-Crown Mines, Porcupine, Canada. Receipts from production of bullion and sundry revenue, $275,038; expenses, $124,466; profit, $150,572. These figures evidently do not include expenditures for development as a tabulation of costs shows. In this statement the cost, based on milling 74 tons a day, is $7.79, made up as follows: Ore breaking, $2.11 per ton; development, $1.17; prospecting, 60c.; general expenses, $1.50; milling, $1.61; administration, 29c. and home-office expenses, insurance, etc., 48c. per ton. Ore reserves in the mine are estimated to contain 72,472 tons, averaging $25.66 gold per ton. Ore in dumps brings the total reserve to 86,000 tons, with an average grade of $22.37 per ton. The mill treated 19,754 tons, averaging $20.30 per ton and the extraction was 85%. The tails from this ore were saved and are now being treated by cyanide.

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Crown Reserve

The 1913 annual report of the Crown Reserve Mining Co., Cobalt, Ont., shows a profit of $528,984 on operations at Cobalt. The production amounted to 1,776,678 oz. of silver. The cost of production amounted to 23.02c. per oz. of silver as follows: Mining and development, 7.06c.; power and lights, 1.74c.; maintenance of plant, 0.74c.; general mine expenses, 1.34c.; superintendence and traveling, 0.65c.; head office expense, 0.57c.; depreciation, 1.02c.; ore handling, [illegible]95c.; milling, 7.04c.; freight, treatment and smelter deductions, 0.91c. per oz. The average price received for silver was 50.15c. The total production of the Crown Reserve to date amounts to 17,033,821 oz. of silver at an average cost of 12.411c. Dividends in 1913 amounted to $795,966 and $5,571,764 to date. In addition to dividends, $810,026 has been paid in royalties. The high-grade ore has averaged from 3443 to 4784 oz. silver, and milling ore from 17.71 to 24 oz. silver per ton. The production of the company has been reduced owing to the exhaustion of high-grade ore in the Carson vein.

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Quincy Mining Co.

The 1913 report of the Quincy Mining Co., Hancock, Mich., shows that it produced 18,161,575 lb. of mineral, which yielded 12,184,128 lb. of refined copper against a production of 20,634,800 lb. during 1912. The falling off in production was due to the strike. The net income from operations was $76,160. After payment of dividends amounting to $412,500 and $150,000 for lands, a surplus of $746,938 remained at the end of the year.

The report states that a safety and efficiency department has been organized with H. L. Chamberlin at its head, who is assisted by a corps of 10 inspectors. Many safety appliances have been added underground and in buildings at the mine and smelter. Instructions have also been given in "First-Aid-to-the-Injured" and in mine-rescue work and fire fighting. Two complete outfits for fire fighting underground and a pulmotor have been installed. Emergency chests for first-aid-to-the-injured have been placed at stations throughout the mine.

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North Butte

According to the report of the North Butte Mining Co., Butte, Mont., for 1913, it shipped 162,799 wet tons of ore and 71 wet tons of precipitates, and treated 454,981 dry tons of ore and 45 dry tons of precipitates at the smelter. This ore produced 28,318,321 lb. of copper, 1,602,163 oz. of silver and 1567 oz. of gold. The cost of producing this copper was 9.76c. a lb., divided as follows: Mining and development, 6.484c.; freight on ore, 0.196c.; concentrating, smelting, freights, refining and selling, 6.378c.; general expenses and taxes, 0.165; total, 13.223c.; less a credit of 3.463c. for gold and silver contents and miscellaneous income. The net income for the year was $1,437,777 and dividends aggregating $820,000 were paid. The mine was in operation 315 days, the average number of men employed was 880 and the average number of tons hoisted per day was 1313; this would indicate that a little over 1.5 tons were handled per man per day.

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Corbin Copper Co.

The 1913 report of the Corbin Copper Co., Butte, Mont., shows that $260,000 in assessments were collected and that interest receipts amounted to $2233. After paying off a deficit carried forward from 1912 and $179,050 for expenditures for the year, a surplus of $18,631 was left. A summary of the work shows that 300 ft. of shaft and 100 ft. of drifts and crosscuts were driven on the Butte property; and 225 ft. of shaft, 615 ft. of crosscuts, 125 ft. of drifts, and 400 ft. of shaft retimbering on the Rochester property. No work was done on the Glenberg property. Arrangements have been made with the United States Smelting, Refining & Mining Exploration Co. to furnish money for the payment of purchase money due for the Gambrinus group of claims.

Pittsburgh Meeting of the A. I. M. E.

Special Correspondence

SYNOPSIS—Notes of an interesting meeting held in Pittsburgh, Penn., Oct. 8-10, attended by nearly 300 members.

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The autumn meeting of the A. I. M. E. was opened at Pittsburgh on Thursday, Oct. 8, about 175 members being registered at the headquarters in the Hotel Schenley. This hotel, in a suburban district, about four miles east of the center of the city, was selected because of its pleasant surroundings, the buildings of the University of Pittsburgh, the Carnegie Institute of Technology, the Carnegie Institute, and other public institutions being in the immediate vicinity.

The first session was held in the afternoon in the auditorium of the Carnegie Institute. S. A. Taylor, chairman of the local executive committee, opened the meeting, speaking very briefly and introducing Dr. W. J. Holland, curator of the Carnegie Institute, who delivered an address of welcome, which was also brief. B. B. Thayer, President of the A. I. M. E., responded and was the briefest of all. But little time having been lost in the preliminaries, the reading of technical papers was begun, S. A. Taylor presiding. All of the papers had previously been printed in the bulletins of the A. I. M. E.

California Magnesite

The first paper presented was by I. C. Morganroth, of the Harbison & Walker Refractories Co., on the occurrence and uses of magnesite. The discussion following this took the form of some questions and answers. Dr. David T. Day wanted to know about the California magnesite deposits and their commercial possibilities. Mr. Morganroth was rather contemptuous and pessimistic respecting them. He said that in general they were small, only one (near San Francisco) being of considerable size, that the mineral was of a kind difficult to burn satisfactorily, the last of the carbon dioxide being hard to expel, and finally transportation costs are severely against the California deposits. He thought that if the California mineral could be had at $2 per ton it would still be cheaper to import the Austro-Hungarian; that if mineral of the same kind as the Californian were wanted it would be cheaper to import the Grecian, which is obtainable from mines only about three miles from sea coast and connected therewith by wire-rope tramway. Mr. Morganroth said that the European War had not yet inconvenienced the domestic users of magnesite who had supplies of several months on hand.

The Iron Ore of Brazil

A paper on the iron resources of Brazil by E. C. Harder was read by Bradley Stoughton, the author being absent. Mr. Harder wrote: "Few mineral deposits have in recent years attracted such general and widespread attention as the Brazilian iron-ore deposits, due mainly to the quantities of rich ore occurring there, in contrast to the ever-decreasing grade of ores shipped from many large producing iron-ore districts of the world. The Brazilian ore is of very good grade, yielding 67 and 68% metallic iron. In very few places in the world has iron ore been found in marketable quantities which even approaches this ore in grade, while in Brazil several hundred million tons of such ore are in sight. Up to the present time no iron ore has been exported from Brazil and only a very insignificant quantity has been used to supply the small domestic furnaces."

Following this, Dr. I. C. White said that he had inspected iron-ore deposits in Minas Geraes and that they were the largest he had ever seen, but the conditions of bringing the ore to seaboard are highly adverse.

Coal-Dust Explosions

George S. Rice, of the U. S. Bureau of Mines, described some experiments in the experimental mine of the bureau on the subject of coal-dust explosions and especially the use of stops provided with some inert dust, such as limestone dust, in checking the extension of such explosions. He said in part:

> The first time in this country that coal dust was considered to be the chief agency in a mine explosion was in 1884, when the Pocahontas explosion occurred, causing the loss of 112 men. Experiments with coal dust were conducted, and it was ascertained that coal dust was chiefly responsible for the majority of mine disasters.
>
> The coal-mining industry of the United States, as compared with that industry in European countries, was backward in taking up experimental investigations relating to coal dust. Finally, in 1907, such a series of disastrous mine explosions occurred that the country was aroused, and Congress appropriated money for the investigation of mine explosions and other mine accidents, which subsequently led to the formation of the Bureau of Mines. Thus the first, and so far, the only large scale coal-dust experiments in this country were started by the Federal Government at the Pittsburgh station, established in the fall of 1908.

The recent experimental work at the Bruceton mine has been in the direction of interposing shelves or tilting boxes containing an inert dust, especially limestone dust, in the probable path of an explosion, which may dislodge the dust and check further progress by its dilnent effect.

William Griffiths inquired if ordinary dirt would not serve just as well and have the advantage of being cheaper and more generally available. Mr. Rice replied that he did not know, not having tried it. E. S. Hutchinson made some remarks about his investigation of the Pocahontas explosion in 1884, which was the first thing that drew attention to coal-dust explosions in this country.

Taxation of Coal Mines

A paper by H. M. Chance on the taxation of coal mines was not read, Dr. Chance being absent. In discussion of this paper, R. V. Norris presented an entirely new contribution upon the subject, having especial reference to taxation in the Pennsylvania anthracite field. For a long time valuations in that field were simply guessed. Then came into vogue the system of assessing upon a valuation per foot-acre, the rate being $10 per foot-acre up to 1907. Then the counties began to increase it arbitrarily, their figures rising to $65 per foot-acre in some cases, and being determined chiefly by how much money they wanted to raise. The coal interests had but little to say about spending the money. Thus in Hanover townships, 97% of the taxes are drawn from coal lands and that township lately spent upward of $200,000 in building two miles of road. The taxes have in some cases become so high as to be confiscatory. Mr. Norris mentioned one case of a coal property leased on a royalty basis where the taxes come to $2000 more per annum than the royalties. The owner cannot break the lease and consequently is out of pocket $2000 per annum for owning the property. In this case the taxes were lately raised 163%.

These things have led to a lot of litigation, which has not yet been settled. The Supreme Court of the State has, however, declared the foot-acre basis to be illegal. Mr. Norris is of the opinion that new legislation on the subject of mine taxation in Pennsylvania is necessary and recommends a system based on annual output.

William Griffith warmly approved of Mr. Norris' remarks and suggestions. He said the only legal way for an expert to value mining property in Pennsylvania at present is to act as he would for a private client but never to tell in a court of law what were his reasons. Just value the property and say nothing more.

S. A. Taylor told of a manifest injustice in the corporation law. A mining company is allowed to deduct 5% for amortization. Assuming $1.20 per ton as the price realized for coal in the Pittsburgh district, 5% comes to 6c. per ton, but the actual cost to the company is 15 to 20c. per ton. If a company is operating a leased mine it may deduct the royalty paid from the gross proceeds, but if it be operating a freehold property it is out from 9 to 11c. per ton, i.e., it is taxed on the amount of return of principal.

R. D. Hall spoke against the system of taxing on basis of output, arguing that by exempting nonproducing mines it promoted hoarding of coal lands.

The session was then adjourned.

Moving Pictures of Mining

In the evening session, also held in the lecture room of the Carnegie Institute, T. T. Read delivered a lecture on the native method of iron making in China and of sinking wells for brine. J. W. Paul, of the U. S. Bureau of Mines, exhibited three reels of moving pictures showing methods of mining at Nanticoke, Penn., and Edwin Higgins, also of the U. S. Bureau of Mines, exhibited two reels showing the methods of iron mining as practiced by Witherbee, Sherman & Co., at Mineville, N. Y. Both of these presentations were excellent exhibits of the art of taking motion pictures and were the more extraordinary for having been taken under the adverse conditions of underground. The iron-mining pictures were decidedly the better of the two. In the taking of these pictures the U. S. Bureau of Mines and the mining companies coöperated and shared the expense. Their purpose is to popularize the safety work of the Bureau.

Friday Sessions

In the morning session of Friday, Oct. 9, the technical papers were presented in separate sectional meetings, as follows:

Iron and Steel—J. Birkinbine, "The Reserves of Iron Ore for the United States"; G. K. Burgess, J. J. Crowe, H. S. Rawdon, and R. W. Waltenberg, "Finishing Temperatures and Properties of Rails"; J. K. Furst, "The Plant of the Duplex Process for Making Steel"; Albert Sauveur, "Manganese Steel and the Allotropic Theory."

Coal and Coke—J. Taffanel, "Coal-Dust Explosion Investigations"; H. N. Eavenson, "Coal-Mine Explosions Caused by Gas or Dust"; H. A. Kuhn, "The Pittsburgh Coal Field in Western Pennsylvania"; R. S. Lewis, "The Book Cliffs Coal Fields, Utah"; A. E. Gibson, "An Aërial Tramway for Mining Cliff Coal"; M. B. Yung, "Tin and Coal Deposits of the Fu Chuan District, China"; J. P. K. Miller, "The Manufacture of Coke."

Non-Metallic Minerals—E. H. Sellards, "The Origin, Mining and Preparation of Phosphate Rock"; J. A. Barr, "Tennessee Phosphate Practice"; W. C. Phalen, "Salt Making by Solar Evaporation"; J. A. Dresser, "Asbestos in Southern Quebec"; O. B. Hopkins, "Asbestos Deposits in Georgia"; D. T. Farnham, "Quarrying Shale by the Tunnel System"; H. A. Gardner & G. B. Heckel, "Barytes as a Paint Pigment."

In the iron and steel division, following the reading of the paper by G. K. Burgess and others on the properties of rails, J. E. Johnson, Jr., tried to start a discussion by asserting that all of the transverse fractures of steel rails are found to occur in those made of openhearth steel, the old bessemer rails being not guilty. The steel men present seemed to regard this like the unlocking of a door of a closet containing a skeleton and did not feel like talking about it. Anyway there was no discussion about it.

Excursions

Friday afternoon was devoted to excursions, members having the option of visiting the Homestead Steel Works, the plant of the National Tube Co., the works of the Harbison-Walker Refractories Co. and the U. S. Bureau of Mines' experimental mine at Bruceton.

The Harbison-Walker Refractories Co. makes daily about 150,000 firebrick, clay and silica, at its plant near Pittsburgh. In other plants, of which it has a large number, it swells its daily output to about 1,000,000 brick, its manufactures including clay, silica, chrome, magnesite and bauxite brick and special shapes. At the Pittsburgh plant the clay and silica brick are made by the old hand process, which has been found to be the most reliable. The Pittsburgh district is, of course, the largest consumer of its products, large quantities of which are required by the metallurgical works of the vicinity, but a large business is also done with the metallurgical works west of the Mississippi River, especially in magnesite and silica brick which are used extensively by the copper smelters. The magnesite-brick business with them has grown to large proportions since the basic converters came so largely into use. The silica-brick business is growing with leaps and bounds in many quarters. The Harbison-Walker technical staff is loud in its expressions about the superiority of silica brick for many purposes for which clay brick have heretofore been used. Of course, it is necessary to have the silica brick properly made, which requires a good deal of experience. There is a growing demand for bauxite brick, especially for lining fireboxes, it being found that coal clinkers do not stick to such a lining. In making bauxite brick some clay is mixed with the bauxite to serve as a binder. In making silica brick the binder is 2% of lime, added as milk of lime in the edge runners, and it is important to be careful in adhering to the exact proportion.

A new department of the Harbison-Walker plant near Pittsburgh is a testing and research laboratory. Interesting experiments are being made upon the action of slags on firebrick of various classes. The test brick is made with two small saucer-like depressions. Into these is weighed a certain quantity of the slag to be tested and the brick holding this is heated to the desired temperature. After a certain time the brick is cooled and cut longitudinally through the saucers and the action of the slag on the brick is noted. In keeping the records a full-size sectional drawing is made and is inked to correspond with the showing of the brick itself, the conditions of the test being entered upon the same sheet.

Visitors to the plant of the National Tube Co. spoke appreciatively of witnessing the manufacture of 10-in. pipes, 40 ft. long. At the Homestead works of the Carnegie Steel Co., the armor-plate department was thrown open, an unusual courtesy. At the experimental coal mine at Bruceton a coal-dust explosion was fired.

The Subscription Dinner

In the evening was held a subscription dinner at the Hotel Schenley, the interest of which was enhanced by the presence of ladies. S. A. Taylor presided. Among the speakers after dinner were B. B. Thayer, Charles F. Rand and Bradley Stoughton, who referred especially to the work of the Institute. Mr. Thayer reported the present membership to be about 4700. Mr. Rand said that in spite of the increased revenue the expenses on account of more extensive publication and other activities had so increased that it was doubtful if the treasury would come out any better than even this year and intimated that in the near future the directors would propose to raise the annual dues to $15. This announcement did not apparently produce any chill in the meeting, but the festive character of the occasion probably prevented any real reflection of sentiment.

An unusual feature of the after-dinner speaking was the introduction of an address upon a technical subject. The presentation of a paper on the Mexican petroleum fields by that distinguished geologist, Ezequiel Ordoñez, had been postponed until Saturday in order to give Dr. I. C. White an opportunity to say something about it, but he being unexpectedly called away place was made for him in the after-dinner program. This proved to be an excellent idea, because Dr. White was so felicitous in his presentation of an interesting subject, avoiding all dry details, that his address, briefly given, was extremely entertaining to everybody. He spoke in the most appreciative terms of Señor Ordoñez whom he has known since 1897. He described the Mexican wells as being the greatest gushers ever known and told of the extraordinary difficulties that had been experienced in coping with their unexpected bursts of petroleum and the fate of the great well that is burning.

George Neilson, president of the Braeburn Steel Co., made some witty remarks that kept everybody laughing. The speech of the evening, however, was that of Edmund C. Pechin, one of the pioneers in iron-making in this country, and one of the four surviving charter members of the Institute. Mr. Pechin gave at some length a series of interesting reminiscences of early iron making in the Pittsburgh district, interspersing them with amusing stories. One of the best was his account of the celebrated Soho furnace, the prototype of modern blast furnaces which owed its design to a certain Bennett who was all his life a saloonkeeper in Pittsburgh. "He was a good saloonkeeper," said Mr. Pechin, "besides being a genius in the matter of blast furnaces." Mr. Pechin also told of his experience in giving his first account of this furnace at a meeting of iron masters at Middlesbrough, England. The audience would have liked to hear Mr. Pechin go on for an hour or two longer. However, the time was getting late, and Pittsburghers being in the habit of going to bed early, as Mr. Taylor said, adjournment was declared at 11:30 p.m.

Saturday Sessions

By Saturday morning the registration had risen to nearly 300 and the success of the meeting was fully established. In the morning there were further technical sessions, held in divisions as follows: Petroleum and gas, electricity and miscellaneous mining topics and iron and steel. The paper by R. H. Rice on turbine air compressors developed an animated discussion, the result of which was of course inconclusive, the relative merits of the turbine and piston compressors being a question that is not to be settled offhand.

In the afternoon there were excursions to a neighboring oil field and to the headquarters of the U. S. Bureau of Mines.

Chronology of Mining for September, 1914

Sept. 1—Calumet & Hecla passed quarterly dividend. Mine production curtailed and wages and salaries cut.—Resignation of Messrs. Kinzie, Kennedy and Lass from Treadwell group.—Martial law declared in Butte.

Sept. 7—Announcement of President Wilson's terms of settlement offered Colorado coal miners and operators.

Sept. 8—All but one (Davis-Daly) of Butte mining companies joined in declaration against closed shop.—Nevada Consolidated and Ray passed dividends; Chino cut.

Sept. 9—Frederick Thum, eminent metallurgist, died.—Muckie McDonald arrested in Butte.

Sept. 12—James B. Haggin died.—Announcement of gold strike north of Tonopah.

Sept. 14—Henry Bratnober, mining engineer prominent in Alaska and Yukon, died.

Sept. 16—Petition in bankruptcy filed in New York against Ohio Copper.

Sept. 17—Eleven men caught and killed by cave-in at Centennial-Eureka mine, Eureka, Utah.

Sept. 18—Three men killed by fall of ground in bottom of prospect shaft at Maiden Rock, near Butte.

Sept. 19—Interstate Commerce Commission reopened railroad-rate case.

Sept. 22—Anaconda cut dividend.—Job office of *Tonopah Bonanza* blown up.—Thomas Johnston Grier, superintendent of Homestake, died.

Sept. 23—Villa broke with Carranza.—New Texas School of Mines at El Paso opened.

Sept. 30—Announcement of first shipment to Canada by gold pool.

Purifications of Nickel Solutions

In a patent granted to H. L. Wells and the late Tom Cobb King (U. S. pat. 1,067,698) is described the method of purifying nickel solutions for electrolysis. The solution is supposed to have been obtained by treating nickel matte with hydrochloric acid, and contains cobalt, iron and copper as the chief impurities. The solution is passed over crushed nickel matte, while an additional amount of sulphuretted hydrogen over that generated from the matte is passed in. This precipitates the copper. This solution is then freed of H_2S by boiling, or passing air or steam through it.

A sufficient amount of black oxide of nickel is then added to oxidize the ferrous to ferric compounds and sufficient ammonia or carbonate to throw down a basic ferric salt. The solution is then filtered, after which cobalt can be removed by treating with nickel oxide or its equivalent nickel compound or chlorine and a carbonate sufficient to precipitate the black oxide of cobalt.

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Military Courts Suspended in Butte

SPECIAL CORRESPONDENCE

On Oct. 8 the supreme court of Montana in a habeas corpus test case, rendered a decision to the effect that the military court in trying and sentencing the defendant, Dan Gillis, acted without authority. At the same time the court held that the national guard was legally organized and effective. The defendant Gillis, who had been convicted in the military court at Butte of resisting an officer, was remanded to the military "to be dealt with according to law."

The court in effect holds that, "while the governor is authorized to detail the militia to suppress insurrection, neither the governor nor the guard can lawfully punish for insurrection or violation of the law. The civil courts cannot be ousted by the agencies detailed to aid them, nor can their functions be transferred to tribunals unknown to the constitution."

This virtually means the suspension of the military courts in Silver Bow County. It further means that the trial and commitment of prisoners, arrested, convicted and sentenced by the military authorities were void and their detention thereunder cannot be upheld. While not entitled to release, they are entitled to trial in the civil courts. Accordingly, all persons now serving sentence and those now in jail pending trial, among them Muckie McDonald and Joe Bradley, will have to be tried in the civil courts. County Attorney McCaffery contemplates asking the district court for a change of venue in the case of these prisoners, so that they may be tried in the courts of some other county where a jury of an impartial character can be secured.

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Flotation Process Litigation

Suit was commenced on Oct. 10 by Minerals Separation, Ltd., against the Miami Copper Co. in the U. S. District Court at Wilmington, Del., charging infringement of three patents by two different acts of infringement, one following the procedure of the licensees of Minerals Separation, Ltd., and the other being known as the Callow pneumatic flotation process. It is charged that these acts of infringement were carried on at Miami Ariz., before the commencement of the suit. On Oct. 12, Minerals Separation, Ltd., entered orders in the same court dismissing its two former suits against Miami Copper Co. without prejudice. The two patents involved in the two suits dismissed are included in the new suit just commenced, together with a third patent No. 1,099,699, issued June 9, 1914. The application of Minerals Separation, Ltd., to the U. S. Supreme Court for a writ of *a certiorari* in the case versus James M. Hyde, recently decided at San Francisco, will be presented on Oct. 26. Answer is expected on Nov. 3.

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St. Louis Engineers Visit Lead Belt

SPECIAL CORRESPONDENCE

The St. Louis Section of the American Institute of Mining Engineers made a two-day excursion to the disseminated lead belt in St. Francois County, Missouri, on Oct. 2 and 3. About 40 members of the Institute left St. Louis on a special car attached to the Iron Mountain train, reaching Bonne Terre at 10:30, and were at once conducted to the Bonne Terre mill, where the interest was divided between the large gas-engine power plant and the mill itself.

After dinner at the Bonne Terre Hotel, an interesting talk was given by H. A. Buehler, state geologist of Missouri, and by Oscar M. Bilharz, of Flat River, Mo., on the question of handling the water made by the mines in the district. The party was then taken in automobiles to Leadwood, where both the mine and the mill were visited. From Leadwood, the members went to Desloge, inspecting the mill, and paying particular attention to the air furnace, where the Desloge brand of lead is prepared for market.

In the evening, an informal meeting and smoker were held at the Bonne Terre Club, at which talks were given by Messrs. Bilharz, Desloge, Comins, Ring, Adami, Delano, Buehler and others. The subject most dwelt on was that of the oil-flotation process, recently introduced and now in successful use in every mill in the district. The slimes, after leaving the tables, are run through an open tank, into which is poured a refined creosote oil, and the contents of the tank are agitated in different manners, the oil taking up the fine particles of lead ore, a recovery of about 1% being secured through this process.

On Saturday, Oct. 3, the party first went to the Federal Mine No. 11, where an electric shovel was the chief point of interest. After this the mills at Doe River and St. Francois, both mills of very modern construction, were inspected. The party took the train from St. Francois, reaching St. Louis Saturday evening. This was the second meeting of the St. Louis section of the Institute, and was voted a great success and a most interesting trip by all.

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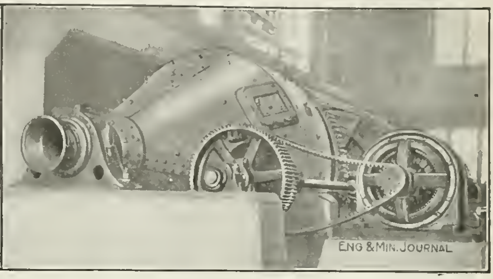
Queensland Mineral Output

The value of the mineral output of Queensland for 1913, according to the annual report of the Minister of Mines, was £3,857,881, a decrease of £317,474 from 1912. The decline in the gold yield from 347,946 oz. in 1912 (£1,477,978) to 265,735 oz. (£1,128,768) in 1913 is the most serious feature. Other items, arranged in order of descending value, are: Copper, 23,665 long tons; coal, 1,037,911; tin, 3197.35 long tons; silver, 601,979 oz.; lead, 3603 long tons; gems, £13,292; limestone, 161,165 long tons; wolfram ore, 358.75; iron ore, 40,838; molybdenite, 66.3; mixed bismuth and wolfram ores, 181.75 long tons; all else, £6095.

Photographs from the Field

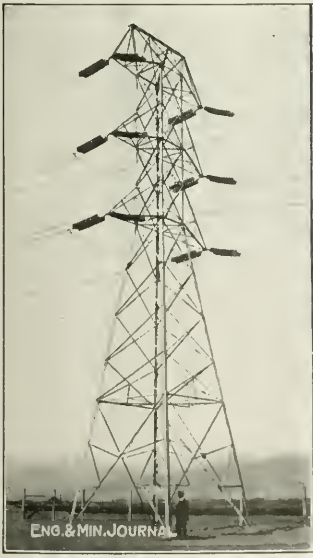
Timber Butte Mill, Butte, Montana



Hardinge Conical Mill at Timber Butte

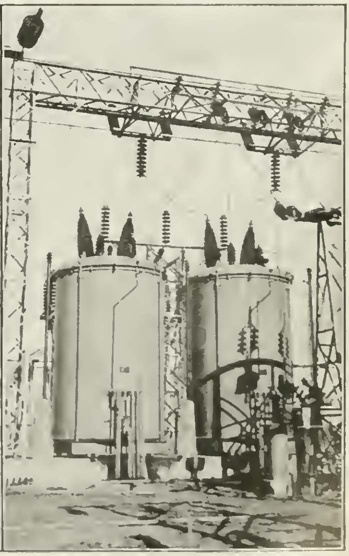
Central Colorado Power Co.'s Plant, Shoshone

Distributing Station, Utah Light and Power Co.



Tower on 130,000-Volt Line of Utah Power and Light Co.

Central Colorado Power Co.'s Plant, Shoshone, Colo.



130,000-Volt Transformers, Station of Utah Power and Light Co.

NEW PUBLICATIONS

ELECTRICAL MINING INSTALLATIONS. By P. W. Freudemacher. 4¼x6, pp. 181, illus.; $1. D. Van Nostrand Co., New York.

MINERALS OF CALIFORNIA. By Arthur S. Eakle. Pp. 226. Illus., California State Mining Bureau, San Francisco, California.

HANDBUCH DER MINERALCHEMIE. Vol. III, Part 4. By C. Doelter. 7x10, pp. 160, illus.; 6.50 marks. Theodor Steinkopff, Dresden, Germany.

THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY, JULY, 1914. (Not Including Topographic Maps.) Pp. 136. U. S. Geological Survey, Washington, D. C.

JAARVERSLAG DER BANKATINWINNING OVER HET EXPLOITATIEJAAR, 1912-1913. 6¾x9½, pp. 195, illus., paper. Dienst der Banka-Tinwinning, Muntok, Banka, D. E. I.

RECONNAISSANCE OF OIL AND GAS FIELDS IN WAYNE AND McCREARY COUNTIES, KENTUCKY. By M. J. Munn. Pp. 105, illus. Bull. 579, U. S. Geological Survey, Washington, D. C.

FORTSCHRITTE DER EDELMETALLAUGEREI WAEHREND DER LETZTEN JAHRZEHNTE. By Rolf Borchers. 6¾x10, pp. 153, illus., paper; 7.80 marks. Wilhelm Knapp, Halle a. S., Germany.

MINING DISTRICTS OF THE DILLON QUADRANGLE, MONTANA, AND ADJACENT AREAS. By Alexander N Winchell. Pp. 191, illus. Bull. 574, U. S. Geological Survey, Washington, D. C.

THE PRE-CAMBRIAN GEOLOGY OF SOUTHEASTERN ONTARIO. By Willet G. Miller and Cyril W. Knight. Pp. 151, illus. Vol. XXII, Part 2, Report of the Ontario Bureau of Mines, Toronto.

GUIDE PRATIQUE DE LA PROSPECTION DES MINES ET DE LEUR MISE EN VALEUR By Maurice Lecomte-Denis. Third Edition, Revised. 6½x10, pp. 610, paper, illus.; 25 fr. H. Dunod et E. Pinat, Paris.

PRACTICAL INSTRUCTIONS IN THE SEARCH FOR, AND THE DETERMINATION OF, THE USEFUL MINERALS INCLUDING THE RARE ORES. By Alexander McLeod. 4½x6½, pp. 114; $1.25. John Wiley & Sons, Inc., New York.

MEMORIALS OF HENRY FORBES JULIAN. By Hester Julian; with introductory notices by the Rev. J. O. Bevan and H. Livingstone Sulman. 6x9, pp. 310, illus.; $2.50. Charles Griffin & Co., Ltd., London; J. B Lippincott Co., Philadelphia.

THE ORE DEPOSITS OF NORTHEASTERN WASHINGTON. By Howland Bancroft. Including a section on the Republic mining district, by Waldemar Lindgren and Howland Bancroft. Pp. 215, illus. Bull. 550, U. S. Geological Survey, Washington, D. C.

RECENT COPPER SMELTING. Edited by Thomas T. Read. 6¼x9¼, pp. 459, illus.; $2.50. Mining and Scientific Press, San Francisco, California. A compilation of articles which, with few exceptions, have appeared in the "Mining and Scientific Press" during the last four years.

NOTES ON RADIUM-BEARING MINERALS. By Wyatt Malcolm Pp. 26, paper. Canadian Geological Survey, Ottawa.

This little work is intended as a guide to prospectors in search of radium-bearing ores. It gives a description of the minerals likely to contain uranium in commercial quantities and their modes of occurrence, with information as to tests for radium. The author points out that the chief deposits of the world are nearly all associated with igneous rocks of an acid character, such as granite, pegmatite dikes and quartz-porphyry dikes. They are found inclosed within the body of pegmatite dikes, or in veins cutting granite, or schists or slates intruded by granite or porphyry dikes. Powdery and crystalline minerals of a bright yellow to emerald green color, and heavy minerals of a dull or greasy luster should be tested. In the search for radium minerals the prospector should keep in mind the possibility of discovering others of economic importance. Any mineral considerably heavier than a piece of quartz or feldspar of equal size, is worth examination

POOR'S MANUAL OF INDUSTRIALS FOR 1914—Fifth annual number. Manufacturing, Mining and Miscellaneous Companies. 6x9, pp. 2460, $7.50 Poor's Railroad Manual Co., 535 Pearl St., New York.

Poor's Manual of Industrials for 1914 (fifth annual number) contains about 300 pages more than any previous issue, of which 138 new pages are devoted to mining, making a total of 375 pages devoted to this subject. About 750 new companies have been added and many new income accounts and balance sheets. These tables are mostly in comparative form. Information is given wherever possible, showing whether or not bond interest is payable without deduction for the normal United States income tax In addition, the manual contains an appendix giving late information on the railroads and utilities, supplementing these two manuals.

The publication of this volume completed Poor's Manual for 1914. The three books together contain over 6500 pages, covering the entire field of corporate investment in America. They give statements of practically every corporation in which there is a public interest, and are noted for their accuracy, completeness, and thoroughness.

THE COPPER SMELTING INDUSTRIES OF CANADA. By Alfred W. G. Wilson. Pp. 184; with maps and illustrations. Canada Department of Mines, Mines Branch. Ottawa, Canada.

In Chapter I of this interesting monograph Dr. Wilson has traced the development of the copper smelting industry in Canada from the time the first plant was built in 1848 at the Bruce mines in Ontario. A full account is given of the earlier operations in Ontario, of those at the Eustis mine and elsewhere in Quebec, and finally of the various plants in British Columbia. Following this are six chapters, each describing one of the existing copper smelting plants now at work in Canada. These are the plants of the Canadian Copper Co.; the Mond Nickel Co.; the Consolidated Mining & Smelting Co. of Canada; the Granby Consolidated; the British Columbia Copper Co.; and the Tyee Copper Co. Chapter VIII is a general summary with general remarks on copper blast furnaces, copper converters and on the possibilities of establishing custom smelting centers at other points. Chapter IX contains some tables of statistics of the copper industry. The book is profusely illustrated with photographs and drawings, and gives several maps. It is provided with an adequate index.

LODE MINING IN YUKON. By T. A. McLean. Pp. 216; with maps and illustrations. Canada Department of Mines, Mines Branch, Ottawa, Canada.

This report is the result of an examination of the more important quartz deposits in the Dawson, Duncan Creek and Conrad districts of the Yukon, with a special view to ascertaining their probable or possible economic value. The examination was extended to some properties in the Whitehorse district and in the Windy Arm region of British Columbia, which adjoins the Yukon. Gold was first discovered in the Yukon in 1869, but did not attract much attention until the discovery of the Klondike creeks and their wonderful riches in 1898. The returns have been almost wholly from placer mining, however, and comparatively nothing has come from lode mining. Quartz claims, indeed, were staked out in the Klondike as early as 1899; but development work has generally been desultory, and little real mining has been done. At the present time quartz claims are located over wide areas in the Dawson, Duncan Creek, Conrad and Whitehorse districts. So far as development has gone the veins are numerous, but generally small and nonpersistent; no high values have been found and no veins sufficient to make a large mine at any one point. Mr. McLean has made careful examinations of many points where prospecting and exploration have been carried on, and he gives the results of his observations in a clear and interesting way. The book is well illustrated with maps and photographs and is provided with a good index.

METALLURGY OF COPPER. By H. O. Hofman, pp. 556. Illustrated. Price, $5. New York and London. McGraw-Hill Book Co., 1914.

This is the second of the great series of metallurgical treatises that Professor Hofman is doing, the first having been his "General Metallurgy" which was published in 1913. Coming are treatises on lead, gold and silver, and the minor metals. The magnitude of his task excites our wonder. His execution of it elicits our admiration. Here we are having such an exhibition as Bruno Kerl and John Percy gave us half a century ago, and more recently Carl Schnabel. It was high time that another metallurgical giant should have essayed the task. None but a giant could do anything of this sort. In the preface to his last book Professor Hofman says that his aim was to furnish something which will meet the demands of the metallurgist of today; to present the leading physical and chemical facts; and to give the details of the modern methods of operation. No other single treatise, not excepting the classics of Doctor Peters, covers the entire ground. Professor Hofman does it, and does it admirably. His product is satisfying. It is as nearly up-to-date as any such work can be, it is painstakingly accurate, and it is adequate in its presentation of details.

As to the last point, a noteworthy feature is the copiousness of the footnotes. What an enormous research do they exhibit! In this we are reminded of Kerl's famous Grundriss der Metallhüttenkunde, but that classic covered all the fields of metallurgy and apart from the footnotes the text was necessarily slender. In Professor Hofman's fat volume devoted to a single metal there could be an amplitude of text, and for those who desire minute study there are the footnotes to take them back to the original authorities. Praise of Professor Hofman's treatise on copper is as unnecessary as it would be to try to gild burnished gold. The appreciation of the metallurgical profession will come to him.

Correspondence and Discussion

"Successful Failures"

The editorial on "Successful Failures" in the JOURNAL of Aug. 29, is a subject that I have been thinking of for some years, and it is getting a stronger hold on me the more I think of it. It is one of the subjects that should be taken up by engineers, young and old, whether civil, mining, mechanical, electrical, metallurgical, etc. There are countless numbers who could give their experiences for the benefit of fellow workers.

This subject, of course, has appealed to me from a mining and metallurgical point of view, and having taught these subjects for a number of years and watched the progress along these lines, I am more and more convinced that engineers should know of as many of the successful failures in their profession as possible. If young engineers, and older men as well, could refer to these "successful failures" by the prominent men in their profession, they would not make the same mistakes and much time, money and humiliation would be saved. It has occurred to me that a book on such a subject as "Successful Failures in Mining and Metallurgy" might be compiled by someone, if the engineers of these professions would write of some of their experiences along that line. This work has been in my mind for some time.

The publishing of an article by any engineer could be confidential if he so desired it. If enough material could be collected, classified, etc., and published in book form, it would be a welcome addition to the literature on mining and metallurgy.

C. L. BRYDEN.

Scranton, Penn., Sept. 12, 1914

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Productive Importance of Sedimentary Iron Ores

In a recent communication to the JOURNAL (June 13, 1914), attention was called to two facts regarding the sedimentary iron ores. The first was that they were far more important than is commonly considered; the second, that this importance could be stated quite exactly in figures, so that it was possible to put the question on a purely quantitative basis. By making use of estimates of the known iron-ore reserves of North and South America and Europe, it was possible to arrive at the conclusion that sedimentary ores make up about two-thirds of the world's reserve of iron ores.

These results give some idea of the ultimate or prospective importance of the sedimentary ores, as compared with those derived from other types of iron-ore deposits, but it may be suggested that their present importance is far less than indicated by the figures deduced from ore-reserve tonnages. This, however, would be an error, as can be demonstrated when the same method of proof is applied to the ore tonnages shipped for use during recent years. In the present communication this last method has been adopted.

During 1912, almost 58,000,000 tons of iron ore were mined in North America—including the United States, Newfoundland, Canada and Cuba. The source of these tonnages, so far as type of ore deposit is concerned, is indicated in the table following:

NORTH AMERICAN IRON ORE OUTPUT, 1912

Type of Deposit	Tons Mined	Per Cent. of Total
Sedimentary basin deposits..	5,145,621	9.0
Secondary concentrations.......	47,096,119	81.5
Residual deposits	1,564,531	2.7
Normal replacements.	1,724,756	3.0
Contact deposits.	544,475	0.9
Magmatic and doubtful...	1,705,255	2.9
Total..	57,780,757	100.0

The term secondary concentrations, as used here, includes the Lake Superior ores and others in which an original sedimentary ore bed has been raised to workable grade by later leaching and deposition. With this in mind, it can be seen that even in North America alone, the ores of sedimentary origin are of the first importance as present producers.

When the inquiry is extended to cover European ores, this fact becomes still more obvious, for all the important tonnage of Germany, France and Great Britain is from sedimentary deposits, only minor amounts being secured from deposits of other type. It is not possible to state the European results with absolute accuracy, for statistics from some countries are still missing, and in other instances it is not possible to place the ore according to type of deposit. But the results given in the table below will probably approximate fairly to the source of the European ore output during 1912.

EUROPEAN IRON-ORE OUTPUT, 1912.

Type of Deposit	Tons Mined	Per Cent. of Total
Sedimentary basin deposits....	63,000,000	74.1
Residual deposits..................	3,000,000	3.5
Normal replacements.	13,000,000	15.3
Magmatic and doubtful.........	6,000,000	7.1
Total..	85,000,000	100.0

The two continents differ markedly, it will be seen, in the types of ore deposits from which their present iron supplies are being drawn. The local variations are reduced, however, when the American and European totals are combined and used as a basis for determining the relative rank of the different types of deposit. This has been done in the table below, to which a column reprinted from my earlier communication has been added for comparison.

IMPORTANCE OF TYPES OF IRON-ORE DEPOSITS

Type of Deposit	Per Cent. of Annual American and European Ore Shipments	Per Cent. of World's Known Ore Reserves
Sedimentary basin deposit.....	47.7	63.1
Secondary concentration.....	33.0	7.9
Residual deposits...........	3.2	13.3
Normal replacements. ...	10.3	5.0
Contact deposits..	0.4	4.4
Magmatic and doubtful...	5.4	6.3
Total..	100.0	100.0

The final results, it will be seen, substantiate everything that has been said concerning the immense relative importance of the sedimentary ores, and the very slight importance of those in whose origin igneous action played any serious part either directly or indirectly.

EDWIN C. ECKEL.

Washington, D. C., July 11, 1914.

Editorials

The Situation of the Metals

The war conditions have produced extraordinary disturbances in the markets for all the metals. The prices for antimony, quicksilver and platinum went up and have stayed up. Tin and spelter went up and came down. Lead and copper simply went down, without even any temporary rise to excite hopes. In all of the major metal industries the effect of the war up to date has been distinctly adverse.

The lead market was weakish during the first half of the year. An exportation of about 20,000 tons of domestic lead relieved the situation, however, and prevented the slump that there might otherwise have been, owing to the large production and the none too good consumption. Just before the war, the export demand having ceased, the selling agencies made overtures to the miners, especially those of the Cœur d'Alene, to curtail their production, but no heed was given to this advice. After the war began there was some hope that there might be a renewal of the export business, but while it has been possible to sell small quantities to Europe, there has not yet matured any great demand from there, which would relieve the situation here. The situation here has been that the refiners have been carrying large stocks of lead which they have not been able to sell in spite of offers at concessions, inspired by the general desire to have money rather than lead at a time when money is dear and burdens are great. The miners having refused to read the signs of the times and the smelters being unwilling to add to the load they were carrying, the market took the course that automatically regulates supply and demand. If the level of 3.5c. is insufficiently low, we may look for something lower yet.

The zinc smelters at the mid-year were in a desperate plight, carrying a stock of 61,000 tons, a far larger quantity than ever known before in the history of the industry in this country, while there was strong presumptive evidence that the galvanizers and brass-makers were themselves overbought. Here again, we were witnessing a maintenance of excessive production, but few of the smelters being willing to make any material curtailment, and the aggregate of their output being about the largest on record. In July, the price for spelter had fallen to about 4.7c., St. Louis, and pessimists were foretelling a decline to around 4c. Then came the war and the sudden realization that England was going to be cut off from her main supply of spelter. The same thing was realized in England, and buying of American spelter began from there, with the result that our market rose by leaps and bounds to about 6c. Probably about 20,000 tons was sold for export at this time, but England had for the moment overbought herself, wherefore the demand from there, in which speculative interests had played a part, suddenly ceased; and England being able a little later to obtain some spelter from Rotterdam, the price in this market declined in September about as rapidly as it had risen in August. Early in October, the price was back at about 4.70c., or just where it started at the beginning of August. August, and now it is at 4.5c.

The smelters by their recent sales, domestic and foreign, relieved themselves considerably, but all of them are still carrying large unsold stocks. Reports from most of the Western works tell of unsightly piles of the metal awaiting orders for shipment. Without a doubt, America is going to experience a further demand for spelter for export. Even now there are signs of interest from the other side. But the third phase of this business will probably be a sober one. Whereas in August England cabled "We want spelter, and we'll take it at whatever price you ask," now she writes, "We'll take some of your spelter if you will deliver it over here for £22½.

The copper situation has been so much discussed that it is unnecessary to go further into the details of it now. It may be remarked only that, whereas the producers of both lead and spelter have paid the penalty of excessive production, the producers of copper were not guilty of anything of that sort and are the innocent victims of an unexpected industrial chaos. There was nothing for them to do but to curtail their production. In general, the American producers have reduced by about 50%. It is to be feared, however, that the leaders among the producers have been unduly optimistic in thinking that a curtailment of 50% would be enough. Nobody can yet tell definitely about this market, for the reason that what there is of it is restricted by common consent of the sellers, but the failure of demand to develop indicates that we may yet see a level of price that will produce the necessary curtailment by extinguishment of production.

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Fettling Reverberatory Furnaces

Some comments were made in these columns in March on the change that has taken place in the fettling of reverberatory furnaces. Data regarding the reverberatory practice at the leading smelting works of North America have been collected and are now presented in tabular form on p. 703 in this issue of the JOURNAL.

A decade ago, quartz was considered the most suitable material for protecting the walls of the reverberatory; today a majority of the smelters have abandoned it, or are using it sparingly. This change has come about largely through the development of a better method of placing the fettling. Most of the newer furnaces are fettled through the roof thus enabling the operators to place a much larger quantity of material on the walls without cooling the furnace unduly, as was invariably the case when the fettling material was shoveled in through the side doors.

At Anaconda, which was largely responsible for the revival of the reverberatory furnace, by reason of the great capacities obtained from the lengthened furnaces, preparations are now being made to fettle through the roof; roasted concentrates and flue dust will be the fettling materials, in place of crushed sandstone. Having originally a superior fettling material in the "Dillon quartz," the Anaconda metallurgists encountered no difficulties in maintaining the side walls of their furnaces. The plants in the South and elsewhere could secure no similar high-silica material, and were hard put to maintain the lining of their furnaces; necessity forced them to adopt the new method of fettling, the essence of which is the dropping of sufficient cold material on the original fettling to keep the walls cool and hence prevent wear. It is noteworthy that in several plants it was found that fettling with sulphur-bearing ores or concentrates, instead of straight silica, had the advantage of increasing the tonnage materially, as it avoids the smelting of the highly refractory fettling unavoidably detached from the furnace walls.

Another important feature of the changes in progress at Anaconda is the decision to try coal-dust firing. This, like basic converting, seems to be coming in for increased use following half-hearted successes attained in the earlier period of its history; like most successful processes, it requires intelligent and efficient handling in every detail to assure success. At the Great Falls works of the Anaconda company, changes are also in progress. The gas-fired furnaces for which this plant has been noted are now being replaced by direct-fired furnaces. The fireboxes, however, are so large that they are in effect gas producers; the coal used at Great Falls is of inferior grade and is not well suited to the coal-dust firing that is being tried at Anaconda.

Cyanide Consumption in America

The question of cyanide supply for gold and silver extraction has already had much attention from those particularly interested, and the matter of available supply has come in for serious discussion. The greatest trouble has been to find out just what is the average yearly consumption in the United States. There are no definite statistics available, and any estimate is necessarily uncertain. We may, however, obtain a figure which will serve as an approximate guide by studying the statistics of gold and silver production. In the summary of the mineral resources of the United States for 1912, the U. S. Geological Survey provides a series of figures which will serve as a starting point for an estimate of cyanide consumed, and incidentally shows other interesting facts. Using these data, it appears that amalgamation was responsible for 1,003,470 oz. of gold, and 795,755 oz. of silver, these amounts being respectively 22.3% and 1.2% of the total production of gold and silver. By cyanide 1,386,526 oz. of gold and 11,213,159 oz. of silver were produced, 30.9% and 17.8% of the total output of gold and silver respectively. The rest of the gold production is accounted for by chlorination, 0.4%; smelting, 21.6%; and placer mining, 24.8%. Of the silver, 80.8% of the total was produced by smelters, and 0.2% by placer mines.

The total of ore treated in gold and silver mills is given as 9,667,360 tons. Of this, it is reasonable to suppose that the portion treated by amalgamation alone is small. For purposes of an approximation then, it may be assumed that cyanide entered into the treatment of all of it. Since the quantity of cyanide consumed in treating gold and silver ores is widely different, and there is no data of consumption of cyanide per ounce of metal, a division of the tonnage into that treated for gold and that treated for silver is required. A rough division shows about 7,643,551 tons treated for gold, and about 2,023,809 for silver. A reasonable estimate of cyanide consumption per ton of ore treated would be about $\frac{1}{3}$ lb. for gold ores and 2 lb. for silver ores. On this basis, the total consumption would be about 6,500,000 lb. yearly. While this approximation can by no means be called a close one, it will still serve as an indication.

The cyanide consumption on the Rand has already been given in the JOURNAL, and amounts to about 11,000,000 lb. It is probable that if the consumption in Mexico and Canada were added to the U. S. consumption, the total would be greater than that of the Transvaal.

The Southeastern Missouri Mine Managers Become Co-operative

The flotation process is now in successful use by all of the lead-mining companies of southeastern Missouri, having been introduced there by H. A. Guess, the general manager of the Federal Lead Co. Mr. Guess, with a characteristic display of broad-minded professional spirit, communicated his developments to his brother managers in the district. This was an important and noteworthy step in that district, which heretofore has been remarkable for the absence of coöperation among its mining companies and their managers.

In the early days of the district there were some rivalries in securing properties through which orebodies were supposed to extend, but in recent years the district has been a closed one, practically all of the lead-bearing lands of St. Francois County having passed into the hands of a small number of companies. Consequently, there was absolutely no reason for the further preservation of secrecy about information and operation. However, the old ideas prevailed, and one mine manager would not even venture to call upon another, not even in a social way.

A few years ago, some of the engineers in St. Louis invited the managers, their assistants, etc., of St. Francois County, to a dinner conducted under the auspices of the St. Louis Section of the A. I. M. E. This invitation was regarded rather suspiciously in some quarters, and the acceptance of it was not as general as it ought to have been. The next year, however, there was a better result, and after that the fellows in the lead district began to ask, "When is that next dinner coming off?" These meetings served to make the lead miners acquainted with each other, the ice had been broken, and the exchange of professional experiences followed as a matter of course. Thus, southeastern Missouri has become a modern mining district in spirit, as it had previously so become in practice.

South American Export Trade

The National City Bank, with its characteristic enterprise, has inaugurated the publication of a very well prepared magazine, "The Americas," the purpose of which is to assist in the upbuilding of trade between North America and South America. In its foreword it says that it hopes to create a medium which will be of assistance in bringing the business men of the United States and South America closer together. Much valuable work has already been done by the Government, by the Pan-American Union and by other institutions and organizations, but much is yet to be done.

The National City Bank modestly refrains from referring to its own efforts, but we have an idea that they have been more direct and more practical than almost everything else put together. The foundation stones for international trade are banking facilities. When we have these directly between the United States and the South American countries, we shall have an increase of our export business. The fact that the City Bank has already opened some South American branches is the most encouraging news.

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International Congress

Information has been received that the International Congress of Mining and Metallurgy that was to be held in London in 1915 has been abandoned, of course, on account of the upset in conditions produced by the war. The proposed holding of this congress in the same year with the International Engineering Congress in San Francisco was always annoying. A good many persons would have liked to attend one of these congresses in one year and the other one the next year, but not both in the same year, neither time nor money permitting. Abandonment of one of these congresses is consequently a relief. However, we do not see how an International Congress is going to be conducted any more successfully in San Francisco than in London. We understand that the directors of the American Institute of Mining Engineers have recommended that the San Francisco congress be abandoned. An engineering congress may, of course, be held in San Francisco next year, but it cannot be truly international.

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Some reference was made recently to the shortage in the supply of potash salts and other raw material which we have been importing for use as fertilizers. That this will be only a temporary inconvenience is altogether probable. Even the inconvenience will be partly diminished by the fact that the South, which is the heaviest buyer of manufactured fertilizers, will of necessity be a light buyer this year. The sufferers will be the manufacturing companies; that is, the two or three large corporations which control this trade.

BY THE WAY

Our mail from Germany shows that our esteemed contemporary, *Metall und Erz*, continues its publication in spite of the war, although its fortnightly issues are thinner than formerly. From its news pages we learn that the following prices were established in Berlin on Aug. 29: Spelter, 50 to 51 marks; lead, 11 to 16; tin, 355 to 365; copper, 165 to 175; antimony, 85 to 90; aluminum, 212 to 220. The Sheet-Copper Association raised the price for sheet copper from 150 to 191 marks. The Sheet Zinc Association, on Aug. 26, raised the base price of sheet zinc from 51.2 to 54.2 marks. We are interested to learn from the advertising pages that the Bergakademie, at Clausthal, in Harz, makes its usual announcement respecting its forthcoming semester, viz.. from Oct. 16, 1914, to Mar. 15, 1915, and most of the well known names of its faculty appear in the advertisement.

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A subscriber in Mexico, requesting a new change of address. remarks: We hope that we shall not again worry you with further changes; most of us are tired of it ourselves. We have spent the summer watchlessly waiting with Woodrow, and the American occupation of Mexico is becoming a fact again, but we are simply here to straighten up affairs and to endeavor to stop the pillaging that has been going on for some months. Some companies can work, if they have cyanide. All materials are scarce, laborers are cocky even if they are hungry; and the outlook is that we are to have some more of the "same," but we have a sneaking idea that we can somehow weather the storm without having to beat it as we did before. We wonder what the next stunt of the American government will be to get the Americans out of Mexico and turn over the commerce of the country to the Germans and the English; there are no more Vera Cruz's to occupy.

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An E. M. was Sherlocking around New York to find a certain trained nurse, and found her in an upper-West-Side apartment, washing a sturdy infant. The father, after a brief introduction, asked the E. M. whether during his travels he had ever run across a prospector named So-and-so. Receiving a negative answer, he explained as follows: "About three years ago, before I married, I boarded at a swell place over in Brooklyn. There was quite a jolly crowd of bank clerks, bond salesmen and others; and one day a mining man came to board at our place. He never let on much about his business for a couple of weeks. Just got to be good friends with everybody, and he seemed a first-rate square sort of a fellow. One night he got to talking about his experiences in different mining camps and of the fine chances he knew of down in Mexico, and how his rich uncle in Denver was going to stake him for a trip in the spring. The upshot of it was that somebody proposed that we get up a little syndicate and send this experienced man down to prospect for mines in Mexico. At first he acted as if he would rather wait for his uncle's cash, but finally consented to a scheme by which 12 of us were to put up 50 dollars a month each, for about a year or less. The prospector showed how he could give us big returns on our money, and that maybe he'd be sending money to *us* before the year was up. Said he would have to travel around pretty much at first, locating the best ground, and that it would be a good idea to have the first six months' installments at the start so he could get a good outfit and hire enough Mexicans to get quick returns from the mines. We came across with $300 each and began to figure how soon we could throw up our jobs and live on Easy Street. But, don't you know, that fellow never sent for the rest of the money and we cannot imagine where he is." That night the E. M. figured it out on the back of an envelope.

GROSS RECEIPTS		
12 suckers, at $300 each		$3600
EXPENSES		
Three weeks' board, at $20	$60	
Theater tickets, about	30	
Taxis, about	15	
Flowers and candy for the ladies	25	
Drinks and cigars	20	
		150
Net profit		$3450

PERSONALS

Carl Johnson has removed from Cripple Creek, Colo., to Denver.

Daniel L. Beck is now head assayer for the Tomboy Gold Mines Co., at Smuggler, Colo.

George H. Heitz, of Leadville, Colo., was married Sept. 2 to Miss Winogene Nelson, of Durango.

R. B. Lamb has removed his office to rooms 501 and 503, Traders' Bank Building, Toronto, Ontario.

C. T. Van Winkle has returned to Salt Lake City, Utah, from Arizona, where he has been for some time.

George H. Garrey has returned to New York after making an examination of zinc properties in Tennessee.

Chester A. Fulton has gone to Venezuela as assistant manager of the Compañia Minera lo Increéble in the Yuruari district.

A. J. Eveland leaves New York this week for Pachuca, Hidalgo, Mexico, where he will join the staff of the Compañia de Santa Gertrudis.

J. Parke Channing, who has been recovering from an operation for appendicitis, has left the hospital, and is now at Great Barrington, Massachusetts.

Charles W. Burgess, who has been in Denver several months on account of ill health, has returned to Webb City, Mo., where he has charge of the S. V. D. mine.

J. E. Johnson, Jr., of New York, delivered a lecture on "Recent Developments in Cast Iron Manufacture" on Oct. 8, before the Franklin Institute in Philadelphia.

C. S. Newcomb will return to Mexico on Oct. 15, after several months' stay in the United States. His address will be J[illegible]tua 414, Mexico City, D. F., Mexico.

William M. Brewer has been visiting the Skeena Mining district and Graham Island in the Queen Charlotte Group, and will report on those districts to the Mines Department of British Columbia.

Charles F. Rand has resigned as president and director of Consolidated Coppermines Co., and its subsidiaries, in order to devote his entire time to his Cuban interests. The directors meet Oct. 20 to elect his successor.

Among British Columbia mining engineers who are now serving in the British Army are Captain **A. Fournier**, of Kaslo; **Lionel E. Hill**, of Rossland; Lieutenant-Colonel **R. G. Edwards Leckie**, of Vancouver, and Major **J. E. Leckie**, of Victoria.

C. A. Buck, vice-president Bethlehem Steel Co., has returned from an extended stay in Chile, where extensive work is in progress in the development of the Tofo iron mines of the company and in providing ore-handling and shipping facilities.

Chester D. Tripp has resigned the presidency of the Rogers-Brown Ore Co., operating the Kennedy, Armour No. 1, Armour No. 2, and Meacham mines, on the Cuyuna range in Minnesota. **Charles A. Stillman** has been named as his successor.

Wm. E. Dickinson, former superintendent of the Florence and Bates mines of the Florence Iron Co., Menominee range, is temporarily filling the chair of mining in the University of Kansas at Lawrence. He will serve until Feb. 1, to which date leave of absence granted the permanent instructor will extend.

R. B. Shover, formerly general superintendent of the openhearth plant of the Brier Hill Steel Co., Youngstown, Ohio, but who resigned several months ago, has been appointed general manager of the Tata Iron & Steel Co., Sakchi, India, whose plant consists of two blast furnaces, an openhearth steel works, a rail mill and two merchant bar mills. He expects to start at once for India to take up his new work. He was with the Ohio Steel Co. and the Carnegie Steel Co., before going to the Brier Hill works.

Richard Blackstone, for 10 years assistant superintendent and at present in charge of the Homestake mine, since the death of T. J. Grier, is one of oldest employees, in point of service, now with the company. He went to work as surveyor in 1878, later was made chief engineer. For many years he has had direct personal charge of construction. Under him were built Spearfish water system, hydro-electric plants, Recreation Hall and many other lesser installations. He also constructed Black Hills & Fort Pierre R.R., a Homestake subsidiary, tapping timber country south and east of Lead, and after construction was superintendent of it until its sale. For some years he was superintendent of north-end properties of Homestake, which included Caledonia, Deadwood-Terra and Father DeSmet, and was later made assistant superintendent of all the company's properties.

After a service of more than 40 years, Captain **John Trebilcock** has retired from the employ of the Steel Corporation on Marquette range and has been placed on the pension roll. He was at the Section 21 property at Winthrop for 32 years, most of that time as mining captain, and when that mine was closed a decade ago he was tranferred to a similar position at the Lake Superior Hematite and Hard Ore mines at Ishpeming, of the underground operations at which he had since been in charge. It is from this post that he has now retired.

OBITUARY

Charles Wesley Kennedy died in Brooklyn, N. Y., Oct. 12, aged 80 years. He was born in Paterson, N. J. He was well known among mining men, having been for many years a dealer in black diamonds, or bort, used in drilling work.

Edward Riley died at Marlowe, England, Sept. 12, aged 83 years. He was a distinguished steel chemist, and was a prominent figure in the early days of the bessemer process. Until a short time ago he took an active interest in the affairs of the Iron & Steel Institute. Mr. Riley was a chemist at Dowlais Iron Works when he made the first experiments in the bessemer process. At the time of his death he was a director of the North Eastern Steel Co., Ltd., as well as of Alfred Hickman, Ltd. Many years ago, the Carnegie gold medal of the Institute was presented to him.

Edmund Benjamin Preston, determinative mineralogist of the California State Mining Bureau, died at Santa Rosa, Calif., Sept. 27, aged 76 years. Mr. Preston was born of English parents at Calcutta, India, Oct. 17, 1838. His early education was obtained in the Royal Polytechnic Academy at Dresden, Saxony, where he spent four years; from there he went to the Freiberg School of Mines, where he spent 3½ years. He supplemented this with one year at the Leoben School of Mines. He went to California in the early sixties and for several years was engaged in mining in northern California, chiefly at Hayden Hill, Lassen County. In September, 1889 Mr. Preston was appointed a field assistant to William Irelan, Jr., then state mineralogist. He served in that capacity under other administrations for a total of 11 years. For the past 14 years he has steadily held the position of determinative mineralogist in the mining bureau and is credited with having made more than 70,000 determinations of mineral samples. During the period of his active field service Mr. Preston wrote Bulletin No. 6, "California Gold Mill Practice." This bulletin was issued in September, 1895, and was the most important contribution to the metallurgy of gold ores up to that time that had been published regarding the practice in California. Close confinement to his duties as determinative mineralogist prevented his carrying out other intended work along the same lines. Mr. Preston's field work and laboratory work combined gave him an acquaintance with mining men and the mining industry of California which probably excelled that of any other individual in a similar situation. He had been ill a year or more although he had been absent from his duties only twice for brief periods. His death resulted directly from pneumonia.

SOCIETIES

New Mexico School of Mines—This school at Socorro starts its winter term with an increase of 20% in registration and attendance.

American Institute of Mining Engineers—The October meeting of the Montana Section was to be held Oct. 16, at the Silver Bow Club, Butte. A technical session was to be held immediately after the dinner. The following papers were to be read and ample time provided for discussion: 1 "Coal-dust Fired Reverberatories at Anaconda," by L. V. Bender. 2 "Mining Claims within the National Forests," by E. D. Gardner, with discussion by F. A. Silcox, district forester for Montana and Northern Idaho.

Editorial Correspondence

SAN FRANCISCO—Sept 30

Polluting the Waters of the American River is charged against dredge operations on the Middle Fork, above Auburn. There are two dredges operating, one belonging to the Pacific Gold Dredging Co., and the other to the El Dorado & Placer Dredging Co. The discovery that the water of the river at Fair Oaks and Orangevale and other sections has been polluted and is carrying disease is quite recent. There has been dredging on the river for years. Of course the two boats now operating are handling a much larger amount of gravel than was handled heretofore, and are operating below Rocky Chucky Cañon which it has been suggested served as a filter for the tailings from the old Cache Rock dredge. It is possible that the tailings from these river dredges have interfered somewhat with the purity of the water, but it is not likely that any great amount of damage is done from this cause as far down stream as Fair Oaks.

North End Comstock Mines are still furnishing reasons for encouraging reports. Union crosscut toward west is being driven ahead and is entering interesting ground. The face is several hundred feet east of the old workings and ore discovered at this point it is said would be of great importance. A station is being cut on the 2650-ft. level of the Mexican winze. This work is below the water level of the old workings and requires much skill and caution. A surprising amount of low-grade ore is being exposed in the Belcher and Crown Point. The electric pumps in the Yellow Jacket are throwing more than 1,000,000 gal. of water per day into the Sutro tunnel, and it is believed when the Yellow Jacket is unwatered and explored, development will prove a good orebody. The pumps were designed by Whitman Symmes. Two of them have been installed on the 2500-ft. level; the other two are waiting installation.

California Industrial Accident Commission is arranging for a meeting on Nov. 5, which owners of both large and small mines are invited to attend. The purpose of the meeting is to consider the bettering of facilities for covering at actual cost the liability of mine owners under the Workmen's Compensation, Insurance and Safety Act. It has been suggested that the commission might be of service in devising and proposing legislation which would tend to relieve the situation complained of by mine owners. While the commission has undertaken the insuring of other industrial operators who are liable under the act, it has never undertaken the insurance of mines except for a maximum policy of $10,000. But unlimited insurance is sold by private companies covering mine accidents. The fact is that when the commission was organized and a fund provided for the establishment of insurance, this fund was not large enough to enable the commission to offer such relief as the mine operators required. There are features in the act that were in fact effective in retarding the industry. There is no doubt that this law should be revised. But it is only fair to the commission to say that it has been conducted in every way for the best interests of the industrial public generally, so far as the law itself would permit. A notable instance is in the carrying out of the work of mine inspection which is done in connection with the U. S. Bureau of Mines. The mine operators of the state are pretty thoroughly advised now as to the purpose and plans of the commission. It will no doubt aid them greatly in coming to some conclusion regarding a plan of mutual insurance if they will attend this meeting and exchange views and hear what the commission has to present. One thing is certain that since the inspection of the mines has been in progress there has been developed a better feeling amongst mining men.

DENVER—Oct. 8

At the Atlas Mine, in the Sneffles Range, the reported successful results of oil flotation for the mixed ores have aroused interest in the availability of this special treatment for other mines in the locality having similar ores. The Atlas test was on an operating scale and, after adaptation, the process seems to meet all expectations both as a means of direct concentration of the sulphide ores and slimes from the gangue and as an agency for selective separation within limits. Heretofore the attempts at solving the "complex" ore problem in this camp were mostly confined to the application of refinements and adaptations of the regular wet table methods. Some application of the electrostatic method has been made with good results but in general this method did not entirely seem to meet the operating conditions. A customs electrostatic plant at Ouray has done satisfactory work from a technical standpoint but companies have not largely availed themselves of the facilities of this plant. One reason is that the smelters have been letting down the bars on the zinky ores recently and the companies are not confronted with the zinc penalty "bugaboo" as formerly. It is reported that some of the special contracts accept 15% zinc in the ore without penalty. There remains however, the loss of the zinc and the freight cost on the zinc in concentrates is serious.

The Leadville District was dazed by the demoralized metal-market conditions at the outbreak of war. Commendable attempts to maintain operations were evidenced by all companies and a good number of them—including the Iron-Silver, Yak, Wolftone, Col. Sellers, New Monarch and Dinero—have succeeded thus far. Many small projects, especially leases, succumbed. Still, a survey of the present situation shows that the camp is weathering the troubles well and, in fact, has utilized the low-market period to make improvements that will enable the mines to do better than ever when satisfactory conditions return. Men have been kept steadily employed and the community thus far is thriving. Better still, a few new enterprises are starting up. The Nisi Prius, on Rock Hill, is under a new lease; the Davis, on Fryer Hill, is pushing its new shaft; the Peggy McCullom, on Breece Hill, along the extension of the President vein, has been taken under lease by Robert Bell, et al., who are installing hoisting machinery and preparing to reopen the old shaft; the New Winnie, on Breece Hill, has started a new shaft; the Double Decker is opening new ground; the Big Four, now under control of the Big Five Operating Co., is doing a lot of development and equipment work; the Ibex or Little Jonny, operating under numerous leases, has been opened up in many new places, and shows up splendidly. Railroad shipments to smelters outside this district, during September, amounted to 895 carloads or 85 carloads better than during September, 1913; while the Arkansas Valley plant is running at normal capacity.

In the Mineral Point Section of the San Juan District at the head of Uncompahgre Cañon, operations are mostly confined to explorations on a limited scale. The one time famous Polar Star on Engineer Mountain is reported to be under negotiation to English interests represented by a Denver engineer. This property under the regime of John J. Crook was a large producer of gold. A plan to explore the deep levels by a tunnel is being considered. The consummation of the plans for this property await the adjustment of title matters. The Richter tunnel is being driven to cut some of the Polar Star veins on their extension. The San Juan Chief near the Polar Star is now controlled by James E. Hill, of New York. It was expected last summer that plans to operate it would be realized but so far nothing has been announced. The Ben Butler near this property is idle. This property carries heavy zinc with gold. It was formerly operated by Thomas Walsh. At the Des Ouray group on the extension of the Old Lout vein the Wahnaka company of Ouray is doing some development and good results are reported. The only work on the Bagley tunnel, Houghton Mountain, is on the Red Cloud vein from which ore is being taken. The Columbus property near the Bagley tunnel and in the Animas Forks section has suspended work for a time. A tunnel is being driven to cut the Columbus vein. W. M. Johnston, of Chicago, has a contract on this property.

In the Poughkeepsie Gulch Section work has been done on the Old Lout mine by a New York company. The tunnel has been opened and some ore taken from the stopes. A reorganization of the company and the consolidation of an important group of adjoining properties is now under way. F. M. Jackson is in charge. The company expects to acquire the Maid-of-the-Mist and the Forest properties for operation through the Lout tunnel which is driven over 1800 ft. and cuts the Lout and other veins. The Maid-of-the-Mist is an extension of the Lout vein and is one of the oldest operations in the Gulch. The Lout operators expect to lease the Mickey Breen mill in Uncompahgre Cañon and install a flotation unit for the initial operation of the Lout mine. H. L. Damshroder of Ouray is developing the old Poughkeepsie mine at the head of the Gulch.

BUTTE—Oct. 7

Labor Situation—Mayor Duncan and Sheriff Driscoll have been removed from office, as reported last week, by an order of Judge Ayers, issued Oct. 6. As soon as the court entered this order, the attorneys for the two officials announced their intention of taking the matter before the supreme court for review and urged that the court grant a stay of execution for ten days in each case. This was denied. Thereupon the county commissioners appointed John Berkin, an assistant provost marshal under Marshal Conley, county sheriff. The city council in special session appointed Alderman Clarence Smith to the position of mayor.

Being asked his opinion of the verdict, Mr. Duncan declared that his removal was the result of capitalist conspirators against the rights and liberties of the working people; that he had been ousted, not because he failed in his duties but because he had the courage to act by a higher and humaner principle than is approved by the capitalist class. "I can," he said, "better afford to receive this treatment at the behest of the tyrannical masters who inflict it, than they can afford to have brought this upon me. The fight has just begun and I shall fight till either the capitalist system which enslaves my brothers and sisters is dead, or I am dead." He blames the Amalgamated for his undoing, it being popular to blame the Amalgamated for about everything, including the war in Europe. Duncan is socialist nominee for Congress and thinks his treatment will help him.

Mr. Driscoll made the following comment: "If I had to kill a thousand men to hold the job, I don't want the job." The gist of the defense of both officials had been that under the circumstances they did the best that could be done and that to have used more forceful means would, in their opinion, have caused wholesale bloodshed. This opinion is shared by many citizens who have no personal objects in either defending or finding fault with the attitude of the mayor and the sheriff.

The court, however, took the position, shared by an equal if not greater number of citizens, that order should have been maintained and the law enforced at any cost.

On the morning of Oct. 3 both military courts were suspended peremptorily by order of Major Donohue. As no reason was made public, speculation was rife as to both cause and effect of the order and the "Butte Socialist" immediately issued an extra, containing inflammatory and untrue statements in respect to the military regime, and an alleged explanation of the suspension of the military courts. The gist of this was that the supreme court would show Montana to be entirely without military law; that the assumption of authority by the military was illegal and would result in damage suits, aggregating millions of dollars; that the Daly bank, an adjunct of the Amalgamated company, would be "stuck" for more than $100,000 paid on alleged illegal warrants issued for military expenses, etc. To celebrate the suspension of the military courts which was wrongly supposed to have been ordered by Governor Stewart, the socialists arranged for a street parade on the night of Oct. 3. This, however, was abandoned when Major Donohue issued an order forbidding the parade as purposely designed to cause disorder. The "Butte Socialist" plant was closed by Marshal Conley and an order for the arrest of Mayor Smith, joint editor with Duncan, was issued. Smith hid Saturday night to avoid spending the night in jail and then gave himself up at military headquarters Sunday noon. He was ordered by Major Donohue to submit all copy of his paper to the military censor thereafter. He decided that he would not publish his paper under the restrictions and so notified Major Donohue, but later changed his mind and decided to publish. The Major stated that the restrictions imposed on the "Socialist" rested upon all the other newspapers of Butte, which were free to publish the truth but not untruthful, misleading and seditious statements or comment.

Whatever may have been the reasons for the temporary suspension of the military courts, ordered on the morning of Oct. 3, the order was revoked on the morning of Oct. 5. Among the principal cases to come up before this court are those of Muckie McDonald and Joe Bradley, charged with evading the service of warrants for arrest. Other charges may be preferred against them, including that of kidnapping and deporting men.

The plans for reducing the force of militia were put into effect Oct. 2, when 242 officers and men left for their homes, 351 men and 16 officers remaining. How long they will stay will depend on future events. Just now a marauding band of men calling themselves I. W. W.'s are headed for Butte where, according to the leaders, they intend to join an I. W. W. concentration from all parts of the West to defend the rights of their fellows "who have been subjugated in that city by the state militia of Montana." The army committed numerous depredations in the settlements along the Great Northern on the southern end of the Fort Peck Indian Reservation. They held up and robbed threshing crews at the revolver point and set fire to several threshing outfits. Efforts to resist their depredations resulted in the killing of a Great Northern civil engineer and several other persons. Reports received at this writing are to the effect that the army, estimated at from 1500 to 3000, all heavily armed, is headed for Butte from various directions. Wherever opposed they have destroyed property, burnt bridges, looted railway stations, shot and injured trainmen and committed depredations of every description. Should they make their appearance in Butte they will, no doubt, meet with the same effective treatment meted out to other lawbreakers since the arrival of the troops.

SALT LAKE CITY—Oct. 7

The Daly-Judge is to Use Flotation in its mill for the treatment of tailings. This company has obtained the best concentration and extraction possible with gravity equipment, and experiments with flotation have been carried on to effect a further saving on the fine material and slimes. The experiments show that this will pay, and that a good saving can be made on the tailings which will pass 60 mesh; the coarser material must be reground. Work has been under way for some time with the Callow process, using compressed air at low pressure for agitation. The laboratory tests have been sufficiently good to justify the installation of a portable experimental plant at the mill to treat 30 to 40 tons of tailings daily. This plant has been ordered, and will be installed in about two weeks. Flotation experiments will probably be carried on in treating the table feed direct from the classifiers. This material comes from the Huntington mills after being classified. The Daly-Judge mill is treating 150 tons of ore daily, and makes about 100 tons of tailings. In these more than 80% of the lead, silver, etc., and from 50 to 60% of the zinc is finer than 60 mesh. Experiments are being carried on with regrinding the coarser part of the tailings. The saving by flotation in the latter class of material, according to General Manager George W. Lambourne, has as yet not been so successful as on the fines, probably on account of the more intimate admixture of the sulphides with silica, lime, alumina, etc. The concentrates from the flotation process are treated on Wilfley tables, and two products a lead and a zinc, are made. The zinc concentrate carries 40 to 50% zinc. The lead concentrate carries most of the silver, the iron, and also the copper, which is usually low. The 40-ton experimental plant will be installed on the table floor. This plant is owned by the General Engineering Co., and if it works out as well in practice as in laboratory tests, the Daly-Judge will install a similar plant to treat all of the tailings.

SEATTLE—Oct. 6

Alfred H. Brooks has just completed a complete tour of Alaska and reports that in his opinion a larger output in all minerals will probably be taken from Alaska this year than last. There has been an abundance of water in the Nome region and many plants that lay idle last year have been in full operation all summer, while the gold output has been materially increased by the opening up of a number of small quartz mines. Next year the production of gold should be still greater, for, by that time many big plants which are now being installed at Juneau and smaller plants in other places will be in operation. This will be Alaska's greatest year in copper production; the shipments of ore to Puget Sound are estimated at more than 350,000 tons. Notwithstanding the decrease in the price of copper, owing to the European war, several of the Alaskan mines will continue to operate.

TORONTO—Oct. 10

Leasing of the Right-of-Way at Sesikinika for mining purposes has been decided on by the Timiskaming & Northern Ontario Ry. Commission. The ground to be leased extends from mile post 175 to post 178; tenders are now being called for this parcel. The section includes about 36 acres on both sides of the track. The term of the lease is for 999 years, and the royalty will be 10% of the gross output, as is the case with the Cobalt mines working on land owned by the railway. This is the first section of the right-of-way to be leased north of Cobalt, and is the result of the recent discoveries at Sesikinika, where gold ores in narrow but rich veins have been found. So far no discoveries have been made on the right-of-way, but the T. & N. O. Commission is not the one to stand back when there is any possible chance of making an honest dollar.

The Mining News

ALASKA

COAL LAND LEASING BILL likely to be held up and not passed this session of Congress; was returned to conference committee by Senate, Oct. 10.

BIG MISSOURI—Group on Salmon River at head of Portland Canal reported bonded by Dan Linlerborg and associates, through E. C. Howard to Alaska Gastineau company.

ARIZONA

Cochise County

SHATTUCK (Bisbee)—Denied by Thomas Bardon, president; L. G. Shattuck, managing director, and H. L. Mundie, member of board, that negotiations are under way to consolidate with Calumet & Arizona; denial repeated by C. & A. officers.

Graham County

DETROIT (Morenci)—In addition to suspension of work on each Sunday and Wednesday, company has lately put into effect five-hour shifts for remaining days of week.

Pinal County

LAKE SHORE—Operations at this copper property discontinued by Frank Leonard, new owner. Considerable new equipment was added after change in ownership, and development work will be resumed as soon as situation justifies.

MAMMOTH (Mammoth)—This gold mine 60 miles north of Tucson closed down pending better conditions for development. Property taken under bond about a year ago by Young Bros. who installed uptodate equipment and did large amount of satisfactory development work.

SILVER REEF (Casa Grande)—This group being opened by Mississippi capitalists under company name of Forbach & Co. William Forbach in charge of operations. Considerable tonnage of low-grade silver ore said to be developed and all-slime cyanide plant, about 50 tons capacity, being installed.

VEKOL (Casa Grande) — The 90-ton concentrating plant nearing completion. Designed principally to handle low-grade dump ores, but milling ore from mine will also be treated. Raise from 120-ft. level of shaft No. 1 being made to catch faulted orebody. Mining operations, direction of Capt. William McDermott.

Pima County

GOLD HILL (Tucson)—Surface and underground survey of this group in Little Ajo Mountains completed by M. M. Carpenter. Property carries gold chiefly. Further development and erection of small mill contemplated by C. A. McEuen, principal owner.

Yavapai County

NELSON (Crown King)—Nelson Short Line which connects mine and Crown King completed; standard gage, laid with 53-lb. rails. Road equipped with gasoline motor and will be used in handling supplies and materials.

A & A (Jerome) — Drifting continues on 1650-ft. level. Drift now in over 500 ft. After passing through north-south fault, nearly 200 ft. was driven through spiling ground. Face shows some ore at present. Three shifts being worked in mine and about 20 men on the surface.

CALIFORNIA

Amador County

COARSE GOLD GULCH (Volcano)—Property reported sold to Bert Shuttleworth of Drytown. Active development work will be prosecuted.:

Butte County

PACIFIC GOLD DREDGING CO. (Chico)—New dredge on Butto Creek put in commission.

Calaveras County

SHOTGUN (Fourth Crossing)—Property bonded by M. M. McLain. Will be developed by shaft.

Kern County

ALAMEDA (Randsburg)—Property leased by H. J. Crawford and J. C. McCormack, who will prosecute development work

Placer County

GARDELLA DREDGING CO. (Lincoln)—Material being assembled for construction of new gold dredge.

HERMAN (Westville)—New electric power plant installed. Power transmitted from Towle, 13 miles. E. B. Quigley, superintendent.

San Bernardino County

SEARLES LAKE POTASH MINES CO. (Searles Lake)—Plant to [illegible] cost $15,000. Property covers about 10,000 acres. [illegible] president of company. M. G. Sullivan, general [illegible]

Shasta County

NOBLE ELECTRIC STEEL (Heroult)—First electric furnace to manufacture ferromanganese started; second to start Nov. 15; total capacity [illegible] tons per day. Company has two high-grade deposits, one in San Bernardino County one in Calaveras. Should high prices for ferro continue, company will surely build another furnace to increase capacity to 100 tons.

Tuolumne County

TUOLUMNE RIVER PLACER CO. (Jacksonville)—Preparations made for mining in river bed. Concrete dam for diverting flow of river and 450 ft. of flume to be constructed. E. Wierck, superintendent.

Trinity County

DRILLING OPERATIONS being carried on in Eastman Gulch near Lewiston. Property formerly worked by hydraulic methods and prospecting is with view to installing dredge.

COLORADO

Boulder County

UP-TO-DATE (Cardinal)—Vein exposed in adit and shows supposed extension of shoot opened in shaft up the hill. Owing to altitude of property, further work postponed for season.

WOLF TONGUE (Nederland)—New compressor house under construction at portal of Clyde tunnel through which development work will be resumed in near future. Lilly and Red Spruce veins will be thoroughly opened by drifts. To encourage development work, company is paying lessees $3 per ft. for drifting and $7 for sinking.

Clear Creek County

DOCTOR-TOWN (Empire)—For testing purposes, 20-ton lot of complex, low-grade ore mined. Suitable plant will be erected.

Dolores County

PRO PATRIA MILL (Rico)—Rico Mining Co. preparing to start up to treat custom ores.

Gunnison County

BRANT INDEPENDENT (Pitkin) — Hydro-electric plant nearing completion. Includes two horizontal 100-hp. turbines under 110-ft. hydraulic head, connected to 2300-volt a.c. generators. Voltage stepped up to 6600 volts in oil-cooled transformers and transmitted two miles to Camp Bird mine where it is stepped down to 440 volts. Power will be used in this mine and to drive Copper Mountain adit.

Lake County

WESTERN ZINC MINING & REDUCING CO. (Leadville)—New smelting plant, after few weeks' close-down due to market scare, has resumed full capacity. E. J. Jones now controls company. A. B. Augustine having withdrawn.

Ouray County

WESTVIEW (Ouray)—American Gold will drive new adit below old one to explore American Nettle "contact" at greater depth.

Pitkin County

SMUGGLER (Aspen)—Fire that smoldered in this and adjoining mines for 20 years broke through bulkheads, Oct. 5, and threatened lives of entire underground crew. Supt. Dougald Matheson was most affected as he took risks in endeavoring to save men and, in addition to inhaling much deadly gas, broke one leg. Of 150 men in workings, about 20 were nearly overcome but none completely. Fire started spontaneously in carbonaceous shales associated with silver-lead orebodies and has defied all known methods of extinguishing.

San Juan County

HAMLET (Middleton)—E. A. Ritter, consulting engineer, has issued instructions for addition to mill to bring capacity up to 100 tons. Connections driven to permit handling ore from higher levels through adit opening into mill building, thus obviating use of old jig-back tram that became blockaded every winter.

San Miguel County

BRICKSON (Telluride)—Contract for 100 ft. of development finished and Liberty Bell has taken group under bond and lease.

Summit County

REILING PLACER (Breckenridge)—Boat digging bank 50 ft. deep, in channel 400 ft. wide, and recovering about $30,000 in gold per month.

TONOPAH PLACERS (Breckenridge)—Bullion bricks sold to Denver mint from middle-of-September cleanups are reported as bringing more than $40,000.

Teller County

FREE COINAGE MILL (Altman)—Operations resumed after shut down for repairs and alterations.

VINDICATOR (Independence)—New concentrating mill to be in operation by Oct. 15. Low-grade ore will be crushed, screened and washed.

GRANITE (Victor)—Upper workings leased to Victor Mining & Leasing Company, recently incorporated by Nelson Franklin, Thos. A. Tallon, K. C. Knudesen and F. L. Wilcox.

PRINCE ALBERT (Cripple Creek)—Raise being extended from Hand tunnel level on Beacon property. About 35 ft. from tunnel level, pay streak opened assaying $20. Work will soon be resumed in winze sunk from tunnel level on this vein.

PORTLAND (Victor)—A 3-ton Jeffrey storage-battery locomotive installed on 1750-foot level. New change-room being built, to accommodate 500 men. Will contain lockers, shower-baths and wash-rooms, also offices for shift-bosses, and first-aid room. Mr. Fred Jones, formerly mine surveyor, appointed superintendent.

GOLD DOLLAR CON. (Victor)—Encouraging surface discoveries on Beacon Hill. In sinking on Arequa townsite, lessees opened promising shoot of pay ore in well defined vein. At point south of Mable M. shaft shoot of ore opened at surface assaying 1 oz. Active operations will be resumed by Gold Dollar Leasing Co. through Mable M. shaft. A. Campbell, manager.

IDAHO

Coeur d'Alenes

H. E. M. MINING CO. (Wallace)—Directors authorized construction of first 100-ton unit of concentrating plant, to cost about $50,000.

STEWART (Wardner)—Preparing to sink shaft from 400-ft. level to 1000-ft.; workings being unwatered now. No. 4 level closed last June, and since then product handled through 200-ft. level. Practically all ore taken from mine has come from workings above 600-ft. level; but said entirely new orebody was discovered in lower workings last June; shaft is to develop this shoot and explore unworked portions of property.

KANSAS

SAMUEL MOSS OF BAXTER SPRINGS made one of best strikes in district, while drilling on his land. Struck run of lead ore at 70 ft. continuing down to 120 ft. making 50-ft. face assaying aout 10% galena. First hole put down in immediate vicinity. Still drilling in good ore and extent of new find cannot be guessed at.

N. J. RYAN LAND (Galena) — Company of Galena men opening fine silicate prospect on this land at Happy Hollow, north of Galena. Have had trouble sinking, lost two shafts, ground being soft and surface water strong. Third shaft sunk to 80 ft. through the ore. Ore will assay about 25%; there is about 12-ft. face.

HORNADAY & CO. (Galena)—Lease taken on Peacock mill and mines on Illinois Lead & Zinc land. Pumping expected to start in few days. Already two good mines on tract, but best run of ore cannot be mined on account of water. Hornaday people expect to drain ground, sublease it to miners, and clean their dirt in mill. This will open large tract of land idle for a long time, and will give employment to large number of miners.

MICHIGAN

Copper

VICTORIA (Victoria)—Operations continue unabating and generally successful. Sales of copper made entirely to domestic consumers. Company well sold up and is continuing operations for present unimpeded by general business conditions. Twenty-sixth level now reached and a crosscut under way, following cutting plat. Best copper again showing in footwall. Copper output for September will show better than 120 tons.

AHMEEK (Ahmeek)—Operations now confined to Nos. 1 and 2 shafts since curtailment went into effect. Ahmeek in better position than any mine in Lake Superior district to withstand long period of low prices, owing to richness of rock and efficiency of working force and management. Two shafts continue to produce grade of rock comparable to best that Wolverine did in palmiest days on Kearsarge lode. Newer shafts could increase Ahmeek's production by approximately 40% at any time. In meantime rock is running close to 24 lb. in copper.

BALTIC (Baltic)—No. 3 shaft, now sinking to 20th level. Close to 1000 ft. of well mineralized ground opened in south drifts at both 26th and 27th levels. No. 4 shaft sinking to 27th level, operations having been resumed after close down for repairs. No. 2 shaft maintaining reputation for good ground; raise from 25th level of No. 3 and winze from No. 2 at twenty-third now connected. West vein showing up some good rock in No. 5 shaft, bottomed at 18th level. This shaft has about served usefulness; situated less than 900 ft. north of No. 4 and its territory can be mined just as economically from No. 4, long trams being easily handled by electrical haulage system.

Iron

EXPLORATORY OPERATIONS begun in Crystal Falls district on Sheldon lands, west of city. Drilling by Cole & McDonald, of Duluth.

JUDSON (Alpha)—Machinery and other equipment formerly in use at Allen mine of Morris Iron Co., Virginia, Minn., purchased by Longyear interests for Judson mine.

INDIANA (Iron Mountain)—Shaft unwatered; workings opened to depth of 250 ft. and found in excellent condition. Mines idle 30 years. Thomas Furnace Co., of Milwaukee, conducting present operations, having recently taken over tract as result of exploratory work.

MINNESOTA

Cuyuna Range

BRAINERD-CUYUNA (Brainerd)—New timber drop shaft going down 2 ft. per day; 38 ft. already gained.

ADAMS (Oreland)—After several weeks' effort to unwater, operation abandoned until next season.

CUYUNA-SULTANA (Ironton)—Shaft No. 2, a 6x8½-ft. "lath" shaft, started Sept. 24, now down 26 ft. Considerable tonnage claimed; this shaft, while large enough for limited mining, is only exploratory.

HILL CREST (Ironton)—Orebody in Sect. 9, 46-29, adjoining Pennington mine, will be stripped and operated as openpit by Roger Hill, owner, name of the operation being Hill Crest Mine. Construction of buildings begun.

BARROWS MINING CO. (Barrows)—Drilling near N. P. station, in town of Barrows, recently developed ore analyzing over 65% iron. Company contemplates sinking concrete and steel shaft if tonnage warrants. Considerable body of ore shown by previous drilling

Mesabi Range

AFTER PUMPING WATER FROM CARSON LAKE, preparatory to mining iron ore below, Oliver Iron Mining Co. is filling considerable part of depression with solid material to keep in place large deposit of muck in lake bed. To drain water from this muck, "drop shaft" being sunk into it; now nearly 50 ft. deep, has penetrated body of clay, and will be continued until the capping of orebody is reached. Then, by continuous pumping, hoped to drain muck sufficiently to settle it permanently. Overburden from Sheridan pit, new property of the Oliver company to west of Mahoning pit, being used for the filling. Planned to sink permanent shaft through this at point near westerly shore of the lake, where there is no muck. Sheridan will be ready to produce in early spring.

HAWKINS (Nashwauk)—Erection of steel machine shops started.

QUINN-HARRISON (Nashwauk)—Plans being perfected for washing plant to be constructed this winter. Three shovels working in pit.

HILL ANNEX (Calumet)—Two shovels now at work stripping. Property is one of most valuable of Great Northern Ore Co.'s holdings. Guthrie Contracting Co., stripping contractors, estimate several years for completing removal of overburden. Making extensive preparations for work. Bunk houses to accommodate 250 men erected, equipped with bath, reading room and individual beds; model stripping camp of district.

Vermilion Range

ONAHMAN (Ely)—Management seriously considering drilling instead of going ahead with pit work, which is slow. One shaft going down and will not be stopped.

MONTANA

Lewis & Clark County

PIEGAN-GLOSTER (Marysville)—Speaking of progress at these mines of Barnes King Development Co., President Goodale says that equipment of mill now being installed will include crusher, three chilean mills, concentrating tables, classifiers and cyanide tanks. Large part of new equipment now on ground; mill expected to be ready for operation within three or four months. Capacity will be 100 tons per day. If Montana Power Co.'s line from Great Falls is finished in time to furnish power by January, it will be used. Otherwise, boilers and engines left by old company will be put in shape and mill run by steam until electric power is obtained. When property was taken over, old mill building found in good shape, although closed for about 25 years, and no repairs made in that time. Equipment of Gloster mill during time of running, 1880 to 1888, consisted of 60 stamps with amalgamating plates, pans and settlers; with exception of boilers and engines, was sold when mill was dismantled in 1888. Ore was brought from main shaft of Gloster by a surface tramway 2500 ft. long. Under new plans, ore will be brought 1700 ft. from Norman tunnel to mill, by aërial tramway. Old three-compartment shaft had caved around the surface to a depth of nearly 150 ft.; now cleaned out and retimbered down to Norman tunnel, present water level. Soundings show shaft clear at least 250 ft. below. As soon as electric power is available, hoist will be placed and mine unwatered by bailing. When 500-ft. level is reached, electric pump will be installed there for permanent drainage. Meanwhile, Norman tunnel, 300 ft. below lower Piegan tunnel, being driven to develop Ophir and Piegan claims; now about 110 ft. beyond Gloster shaft, advancing about 100 ft. per month.

NEVADA

Elko County

ELKO PRINCE (Gold Circle)—Reported mill will be built.

GOLD STRIKE WEST OF TUSCARORA made recently by woman. Two-foot shoot said to assay $70 to $100 per ton.

WINER MINING CO. (Contact)—Articles of incorporation filed. Capital stock, $100,000; par value, $1, of which $75,000 reported already paid up.

EASTERN STAR (Gold Circle)—Grading for new 50-ton mill under way, lumber being hauled and machinery ordered. Development work progressing with satisfactory results.

Humboldt County

GOLD CROWN (Adelaide)—A 4-in. shoot high-grade ore, showing free gold, struck recently.

NEVADA PACKARD (Rochester)—Five cars shipped in September, three by company and two by Kromer-Hampton lease. Settlements for first two cars were $2011 and $1937.

Lander County

ABEL (Battle Mountain)—High-grade gold ore reported struck in Lewis Cañon. Other mines working in district are Starr & Grove and Dean.

Mineral County

AURORA TOWNSITE CO. (Aurora)—A 10-stamp mill being built; will treat custom ores exclusively. About 20 sets of lessees working in district and considerable good-grade ore developed.

AURORA CONSOLIDATED (Aurora)—New mill now treating 350 tons daily. Expected within 30 days will be running to capacity. Last filters being installed. Development work being done on 100-, 200-, 300- and 400-ft. levels. Stated 600,000 tons ore, assaying $4.81, developed above 300-ft. level. Thirty 4-, 5- and 6-room cottages being built.

Nye County

NORTH STAR (Tonopah)—Milling will be resumed soon

JIM BUTLER (Tonopah)—Wandering Boy shaft being retimbered and enlarged. A 7-ft. shoot of good-grade ore opened in south vein on 700-ft. level of Desert Queen workings, and drifting under way in shoot of rich ore in eastern extension of MacNamara vein on 700-ft. level of Wandering Boy shaft.

Ormsby County

L. P. L. RECOVERY CO. (Brunswick)—Old tailings in Carson River being successfully re-treated for amalgam and quicksilver. Crew of 14 men employed, and may be increased soon.

Storey County

WORK ON COMSTOCK LODE greatly reduced in amount recently, about one-half usual number of men being employed. Chief work in Gold Hill district, where considerable development work is under way and regular production made; Several mines milling 1100 tons weekly, and Duval lease on Chollar, 200 tons daily.

SIERRA NEVADA (Virginia City)—Control changed. Herman Zadig resigned as president and A. F. Coffin and W. H. Meise resigned from board of directors. W. J. Morrow was elected president; James Newlands, Jr., and W. E. Sharon, directors. W. E. Sharon will succeed F. E. Julihn as superintendent. This regarded as important step toward resumption of development work and mining on lower levels.

NEW MEXICO

Grant County

GUDGER & McSHERRY (Silver City)—Thirty-four-pound silver nugget 60% native silver taken from stope in Silver Cell mine. Development work being pushed.

STAUBER & WRIGHT (Pinos Altos)—High-grade gold ore being taken from Pacific vein and deposited in Silver City bank prior to shipment to California refinery.

SILVER HILL MINE (Pinos Altos)—Company to be incorporated by J. W. Bettes and T. B. Fisher, for $50,000. Lower workings under lease to Frantom & Templeman.

CHINO (Santa Rita)—Additional ore train put into schedule between mine and Hurley mill. Pumping plant at Apache Tejo again in operation; 600,000,000 gal. water per month consumed by company.

PHELPS, DODGE (Tyrone)—New flotation unit to be installed in experimental mill. Three churn drills in operation. First of two Diesel engines successfully started at power plant. Second engine will be started in a few weeks, it is hoped.

Sierra County

OVERLOOK MINE (Kingston)—Twenty-five burros transporting silver ore 18 miles from mine to railroad at Lake Valley.

LAS ANIMAS PEAK GOLD MINES CO. (Hillsboro)—Company took over seven claims formerly property of Hillsboro Consolidated Mines. Intended to begin systematic shaping of property for operation as soon as possible. Company incorporated in Arizona for $1,000,000. General offices, Dallas, Tex.

NORTH CAROLINA

Union County

HOWIE (Waxhaw)—Eight men at work remodeling mill and power plant. Rolls to be discarded as unsatisfactory for this ore and stamps will be put in their place, 10 now, and 10 more later. Slime filter to be installed, Dorr agitators to take place of present air-jet agitators, and eventually another tube mill to be added, increasing capacity to 75 tons, according to statement of management. Main shaft to be sunk 125 ft. deeper, which will give two additional levels, as there is now sump 85 ft. below 255-ft. level. Another shaft to be sunk 100 ft. deeper.

PENNSYLVANIA

PITTSBURGH MANGANESE (Pittsburgh)—Company at 345 Fourth Ave. offers manganese ores mined near Elkton, Rockingham County, Va., where company owns site of 150 acres and controls 229 additional acres of ore lands. Mine has shaft and washing plant and has been producing 100 tons weekly. Analyses show 46.3 to 48.9% manganese, 0.155 to 0.185% phosphorus and 6 to 7% silica.

UTAH

Beaver County

KLONDIKE (Newhouse)—Copper ore carrying iron opened short distance from surface. About 12 tons taken out. Claim surrounded on three sides by Cupric ground.

MAJESTIC (Milford)—Hoosier Boy property recently visited by J. M. Dick, president of company. Good showing on 200- and 400-ft. levels. Probable work will be resumed soon.

CUPRIC (Newhouse)—Company owns 225 acres of patented claims south of Newhouse. Shaft down about 400 ft., and drifting is being done in mineralized ground on levels above. Iron "blowouts" on surface carry bunches of copper.

SHEEP ROCK (Beaver City)—Lessees have ready for shipment gold ore, mined from 300 level. Marketing delayed, pending agreement between lessees and the company as to settlement terms. Company has let contract for sinking new shaft. In meantime, work through old shaft will continue.

Juab County

MAY DAY (Eureka)—Orebody followed in Chief ground holds out well. Twelve cars shipped in September, and earnings for month stated about $25,000. Talk of 3c. dividends being declared. Zinc orebodies turned over to lessees, and four blocks of ground being worked.

KNIGHT-CHRISTENSEN MILL (Silver City)—Work resumed Oct. [illegible] at this plant, closed a short time for changes. Two shifts employed, later to be increased to three, bringing output up to capacity, or 100 tons daily. Ore from Iron Blossom, Black Jack, Dragon Consolidated has been treated; Iron Blossom ore being milled at present.

EAGLE & BLUE BELL (Eureka)—September output, 1600 to 2000 tons; during first six months of 1914, 12,000 to 15,000 tons shipped. When shaft, now down 1625 ft., reaches 1700, drifting will be done; and as soon as connections with 100-ft. winze from 1550 are complete, all ore will be dropped to 1700, and from there raised to surface. Annual stockholders' meeting held Oct. 3, and directors in office reëlected. J. P. Graves, of Boston, president.

Salt Lake County

OHIO COPPER (Bingham)—F. Augustus Heinze directed to appear before Special Master Alexander Gilchrist, Jr., in New York, to give testimony regarding bankrupt company. Receivers says they have had difficulty in securing sufficient information to proceed with collection of company's assets, and believe Heinze has information of value to them.

Summit County

NEW YORK BONANZA (Park City)—Henry Fares, assignee, has issued notice to creditors to file claims against company with him at Park City, Utah, within three months from Sept. 19, 1914; claims must be sworn to before they can be properly entered.

DALY WEST (Park City)—Machinery for new mill being installed. Steel headframe going up and compressor expected shortly. Expected to have mill in condition for tryout by middle of October, and within month to have normal force of 250 to 300 men at work. Operations at first will be carried on with one shift, treating 200 tons of ore daily.

MINES OPERATING (Park City)—About 150 tons treated daily. Holt-Dern roasters to be installed throughout, and while this work is in progress, no ore will be treated. Present costs will be reduced about $1 per ton by new roasters. Experimental furnace has been in operation some time, and accurate data got. Roasters are automatically fed and shaken down, and roasted ore automatically discharged. Losses in dust and by volatilization reduced.

SILVER KING CONSOLIDATED (Park City)—September output, the largest in history of company, was 1770 tons of first-class ore, as compared to 1033 tons in August. New orebody followed from 1500- to 1700-ft. level, 800 to 1000 ft. on dip of beds; being developed away from fissure to north and south. About 45 tons daily being produced from development. Pipe line being laid from old Comstock mine in Thaynes Cañon, to furnish adequate water supply; distance somewhat over a mile.

WASHINGTON

Ferry County

LAST CHANCE (Republic)—Mine passed into possession, under lease and bond, of Western Union mines, recently organized by J. L. Harper, Spokane associates and West Virginia capitalists. Consideration, $187,500, first payment of $8000 made, remainder to be paid on graduated royalty basis, depending upon value of ore extracted. Owners of Last Chance are Charles P. Robbins, Charles Theis and other Spokane men. Western Union mines plans to take over all important properties in Republic; already in control of Lone Pine, Pearl and Surprise, formerly held by the Republic Mines Corporation, and mine and mill of San Poil Consolidated. Negotiations under way for acquisition of other Republic mines, according to members of company, who say they have sufficient capital available to carry plans through successfully. First bar of bullion turned out by San Poil mill, now under supervision of Harry W. Newton, formerly superintendent of North Washington Power & Reduction Co.'s plant at Republic, passed through Spokane last week, en route to Selby refinery at San Francisco. Contained approximately $5000 and came principally from ore of San Poil mine, averaging about $6.50 per ton. From this grade of ore, San Poil mill recently has been producing about $15,000 to $20,000 monthly, but milling low-grade product is to be discontinued until Western Union Mines has constructed 1000-ton plant which it plans. Arrangements now being made to treat high-grade output of Surprise, Last Chance and lower workings of Lone Pine at San Poil mill. Pending installation of large crude-oil-burning power unit at Republic, to furnish light and power current for entire district, Western Union Mines company piped air into Surprise and Last Chance mines from the San Poil compressor, both properties now being unwatered. Diesel engine installed several months ago at Republic mine purchased by new corporation and will be moved immediately to Surprise shaft to drive tandem compressors placed there, and electric hoist is being put in underground to lift Lone Pine and Last Chance ores.

Okanogan County

PEACOCK (Conconully)—Operations by water power will commence shortly, according to R. A. Hutchinson, of Spokane, chief owner. Power will serve to handle all work.

CANADA

British Columbia

GRANBY CONSOLIDATED has divided properties into four operating units: Southeastern British Columbia, British Columbia coast, southwest Alaska, from Skagway west, and southern Alaska. Each district will have a local superintendent. Policy of expansion, adopted several years ago, will be continued. In addition to acquisition of Midas, Mamie and Dean mines and working option on It mine, near Dean, company has other properties under examination, some expected to develop satisfactorily. Midas and Mamie mines could have been prepared for shipments by Oct. 1, but work was suspended pending improved copper conditions.

Ontario

NORTH DOME (South Porcupine)—G. T. Clarkson, Toronto, appointed liquidator to wind up company affairs. Assets to be distributed.

PORCUPINE PET (Porcupine)—A. C. Palley, formerly manager of Cobalt Townsite and Townsite Extension mines, placed in charge of this property, formerly known as Little Pet.

HOLLINGER (Timmins)—Regular four-weekly statement for period ended Sept. 9 shows gross profits of $152,821 from treatment of 19,456 tons; approximate extraction, 93.1%. Working cost per ton milled, $3.86, compared with $4.16 for preceding period. Grade of ore treated lowest since milling began. Manager Robbins reports company successful in providing against shortage in chemicals and other foreign-made supplies; good stocks of all necessaries on hand. As soon as three new 4500-cu.ft. compressors are in operation, present force of 700 men will be largely increased.

The Market Report

METAL MARKETS

NEW YORK—Oct. 14

Declining prices and depression of sentiment have been the characteristics of the metal market all around during the last week.

Copper, Tin, Lead and Zinc

Copper—Sales have been made at 11.50@11⅝c., regular terms, during the week, but business has been erratic and prices uncertain. Early in the week there was some hopefulness about the development of a good domestic demand, but this petered out, and during the latter part of the week everything was shrouded in doubt and pessimism.

The London Metal Exchange has ruled that no forward delivery contracts for standard copper are permitted, either privately or publicly, for more than 14 days, except in the case of continuations of existing contracts.

Base price of copper sheets is now 17c. per lb. for hot rolled and 18c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 13¾c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 3040 long tons. Our special correspondent gives the exports from Baltimore at 946 tons copper.

Visible Stocks of Copper in Europe on Sept. 30 are reported by Henry R. Merton & Co., of London, as follows: Great Britain, 18,610; France, 5536; Rotterdam, 950; Hamburg and Bremen, 3973; other European ports, 500; total, 29,569 long tons. The estimates for German ports are based on stocks there at the opening of the war. In addition to the stocks above, 475 tons are reported afloat from Chile and 5050 tons from Australia, making a total of 35,094 tons.

The official average price of best selected copper in London for September has been fixed at £58 7s. 2⅝d. per ton.

Brass Prices, Base, are announced by the American Brass Co. as follows, dating from Oct. 1: Sheets, high brass, 14c. net per lb.; low brass, 15⅝c. Wire, high brass, 13¾c.; low brass, 15⅝c. Rods, high brass, 13¾c.; low brass, 16⅛c. Tubes, both brazed and open seam, 18¼c. Angles and channels, 18¼c. Scrap allowances are 8½c. net per lb. for high brass and 9⅜c. for low brass.

Tin—This metal weakened owing to a disappearance of demand and the anxiety of some sellers to move quantities. London reported that trading on the Metal Exchange for spot delivery has been permitted. This tended to weaken the market, as it is feared that some weak contracts will have to be closed out.

Visible Stocks of Tin on Sept. 30, including tin afloat, were: London, Straits and Australian, 4006; other kinds, 2744; afloat, 3555; total, London, 10,305; Holland, 375; United States, excluding Pacific ports, 3933; total, 14,613 long tons, an increase of 161 tons during September. Shipments from the Straits and Australia in September were 5023 tons. Total deliveries to England, Holland and United States were 6351 tons.

Lead—The reduction in price to 3.50c., New York, which occurred last week, failed to develop any greatly increased volume of business. Consequently, independent interests began again to shade the price.

Spelter—The market has declined steadily during the week, finally reaching the point where some producing interests themselves turned buyers. Spelter was offered in large tonnages for export at £23, c.i.f., but England bid only £22½@22¾, and no business in ordinary spelter materialized so far as we know. However, there were some export sales of brass spelter and intermediate grades.

DAILY PRICES OF METALS

NEW YORK

Oct.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
8	4.9650	52⅛	*	30½	3.50	3.35	4.75 @4.80	4.60 @4.65
9	4.9688	51¾	*	30¼	3.50	3.35	4.70 @4.75	4.55 @4.60
10	4.9650	51¾	*	30¼	3.50	3.35	4.70 @4.75	4.55 @4.60
12	......	..	*	.	...	3.35	......	4.50 @4.55
13	4.9650	51⅜	*	30	3.45 @3.50	3.30 @3.35	4.65	4.50
14	4.9675	51½	*	29¼	3.45 @3.50	3.30 @3.35	4.65	4.50

*No quotations.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

Other Metals

Aluminum—There is more inquiry reported, but it has not resulted in much actual trading. Quotations are still 18@19c. per lb. for No. 1 ingots.

Antimony—Business has been moderate, but the position is strong and supplies are decreasing. Ordinary brands are selling around 11c. per lb., while 13c. is asked for Cookson's.

Quicksilver—The market is steady and rather strong. The New York quotation is unchanged at $55@60 per flask of 75 lb. The latest London quotation is £9 per flask.

Nickel—Shot, blocks or plaquettes are 40@45c. per lb. Electrolytic is 5c. per lb. higher.

Minor Metals—Quotations for **Bismuth** are $2.85@3 per lb. —**Magnesium**, $1.50 per lb., New York.—**Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, $5 per lb. for small quantities.

Exports from Baltimore for the past week included 110 lb. selenium to London.

Gold, Silver and Platinum

Gold — The export of $4,420,500 gold to Ottawa, Canada, was made Oct. 9, and more is ready for shipment by the Gold Pool, as required.

Gold in the United States, Oct. 1, is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, $973,777,869; in Treasury current balances, $230,116,202; in banks and circulation, $657,944,193; total, $1,861,838,264, an increase of $17,235,582 during September.

Platinum—Conditions are unchanged and the market is still uncertain. Quotations continue $50 per oz. for refined platinum and $57.50 for hard metal; but these prices are largely nominal.

Our Russian correspondent writes that no business can be noted on the home market. The export of platinum has ceased for the present. The platinum mines have generally stopped working except the dredges, which continue in operation. In default of business at Petrograd no quotations can be given. From Ekaterinburg it is reported that small lots have been offered at 9 rubles per zolotnik—$33.84 per oz.—for crude metal, 83% platinum, and even lower; but there are no buyers at the reduction.

Silver—The market continues very quiet. Owing to the war conditions, there is no widespread demand for silver on the Continent or for India. If the opportunity offered, it is thought there would be a good demand for the metal.

The official London quotations for silver for the week were: Oct. 8, 23[illegible]d. per oz.; Oct. 9, 23⅝d.; Oct. 10, 23¾d.; Oct. 12, 23⅝d.; Oct. 13, 23½d.; Oct. 14, 23½ pence.

Coined silver in the United States, on Oct. 1, is estimated by the Treasury Department as follows: Standard dollars, $565,878,478; subsidiary coins, $183,059,092; total, $748,937,560 Of the silver dollars, $493,367,000 are held in the Treasury against silver certificates outstanding.

Exports of silver from London to the East, Jan. 1 to Oct. 1, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£6,189,000	£4,521,500	D. £1,667,500
China	652,000	42,000	D. 610,000
Total	£6,841,000	£4,563,500	D. £2,277,500

Shipments to India continue on a very limited scale, and no business is being done with China.

Zinc and Lead Ore Markets

JOPLIN, MO.—Oct. 10

Blende, high, $42; assay base, $35@40; metal base, $35@36 per ton of 60% zinc. Calamine base $20@22.50 ton of 40% zinc. Average, all grades of zinc, $37.20 per ton. Lead declined $6 to a base of $40 per ton of 80% metal content. As fully half the ore shipped was on the previous week's purchase the average of all grades is $43.18 per ton. Base offerings of $40 were made Thursday, dropping to $38 by evening and still dropping to the week-end.

SHIPMENTS WEEK ENDED OCT. 10

	Blende	Calamine	Lead	Value
Totals this week	8,643,040	524,660	2,051,120	$214,790
Totals this year	408,810,960	30,690,060	70,933,140	$10,147,550

Blend value, the week, $163,650; 41 weeks, $8,113,640.

Calamine value, the week, $6860; 41 weeks, $358,290.

Lead value, the week, $44,280; 41 weeks, $1,675,620.

PLATTEVILLE, WIS.—Oct. 10

The base price paid this week for 60% zinc ore was $40 per ton.

SHIPMENTS WEEK ENDED OCT. 10

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	3,552,400	80,000	1,033,700
Year	124,862,000	4,120,700	27,485,570

Shipped during week to separating plants—3,135,780 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Oct. 14

The iron trade continues to report unsatisfactory conditions. New orders for finished steel are not plenty, and there are no signs yet of an immediate increase.

There is plenty of talk of export trade, but the actual results so far are not large. The many difficulties in the way are being gradually smoothed out, however.

The United States Steel Corporation reports unfinished orders on its books on Sept. 30, at 3,787,667 tons of material, a decrease of 425,664 tons during the month.

Pig Iron Production in September showed a marked decrease. The reports of the furnaces, as collected and published by the "Iron Age," show that on Oct. 1 there were 176 coke and anthracite stacks in blast, having a total daily capacity of 60,450 tons; a decrease of 3850 tons from Sept. 1. Making allowance for the charcoal furnaces the estimated make of pig iron in the United States in September was 1,911,600 tons; for the nine months ended Sept. 30 it was 18,297,600 tons. Of the total 12,959,400 tons, or 70.8%, were made by furnaces owned or operated by steel companies.

PITTSBURGH—Oct. 13

The Steel Corporation's statement of 3,787,667 tons of unfilled business at the close of September indicates a loss of 425,664 tons during September, the second month of the war, against an increase of 54,742 tons in August, the first month. The buying during the war scare early in August must have been of considerable proportions. The September loss in unfilled business was equivalent to about 38% of the capacity for the month, and estimating shipments at 62% of capacity the bookings appear to have been about 24% of capacity. The bookings considered, however, are of contracts rather than of specifications against contracts.

The past week has been the dullest the steel market has seen for many years. In plates, shapes and rails there has been scarcely any business. In tubular goods, wire products, merchant bars and sheets there has been scarcely any new business, but there has been specifying against old contracts to an amount equal posibly to 35 or 40% of capacity.

Steel mill operations are dropping below 50% of capacity; the few mills that have been operating at above that rate having practically no hopes of maintaining the gait. Pig iron production is at the rate of about 22,000,000 tons a year, the best rate in the past having been 31,000,000 tons, while the best year's production was 31,000,000 tons. The pig-iron rate is certain to decrease as it is proportionately too high for the rate of finished steel production, and that is decreasing.

An improved demand is reported for steel products among some manufacturers of goods for export, including agricultural implements, but in direct iron and steel export trade there is no improvement.

In most steel products there is hardly enough business being done to establish market prices, the limited tonnage booked being almost entirely against old contracts. Quotations have shown no important change in the past week or two, bars, plates and shapes being 1.15c. to 1.20c., black sheets 2c., wire nails $1.60 and tinplates about $3.25 per box.

Pig Iron—Production of pig iron by merchant furnaces is at the lowest rate since the middle of 1911, and the trend is distinctly downward as many furnaces are accumulating iron. Fresh sales are extremely light and against old contracts buyers are taking less than the tonnages involved. The market may still be quoted as follows: Bessemer, $14; basic, $13; No. 2 foundry and malleable, $13@13.25; gray forge, $12.50@12.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market is very quiet both as to resale and as to contract material. The English makers continue to quote $68, Baltimore, for contract material, with $2.16 freight to Pittsburgh.

Steel—The turnover in sheet bars in the past two or three weeks has been very light. As noted a week ago, some Youngstown mills would sell sheet bars down to $20.50 at mill, and this week sellers have appeared at the same figure at Pittsburgh mill. We quote billets at $19.50 and sheet bars at $20.50, maker's mill, Youngstown; billets at $20 and sheet bars at $20.50, maker's mill, Pittsburgh. Rods are $26, Pittsburgh.

COKE

The Connellsville coke trade for the nine months ended Sept 30, according to the figures collected by the "Courier" reached totals of 15,602,569 short tons in 1913, and 11,302,541 tons in 1914; a decrease of 4,300,028 tons, or 27.6%, this year.

Anthracite Shipments in September were 6,246,192 long tons, an increase of 673,913 tons over September, 1913. For the nine months ended Sept. 30, the total shipments were 51,281,885 tons in 1913, and 50,067,581 in 1914; a decrease of 1,214,304 tons, or 2.4%, this year.

Export Fuel Trade of the United States eight months ended Aug. 31, in long tons:

	1913	1914	Changes
Anthracite	2,847,443	2,666,969	D. 180,474
Bituminous	11,834,511	9,045,260	D. 2,789,251
Coke	607,767	456,661	D. 151,106
Breaker coal	5,079,189	5,027,956	D. 51,233
Totals	20,368,910	17,196,846	D. 3,172,064

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. By far the greater part of the trade, both exports and imports, is with Canada.

CHEMICALS

NEW YORK—Oct. 14

The general market is quiet and business is on rather a moderate scale in most lines.

Arsenic—The market is still very quiet. Quotations remain at $4.50 per 100 lb., but that price is largely nominal.

Copper Sulphate—The market is quiet, but steady, on a moderate business. Quotations are unchanged at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business continues quiet, with only moderate sales. Quotations are 1.87½c. per lb. for spot and November-December; 1.90@1.92½c. for 1915 deliveries.

Pyrites—Imports at Baltimore for the past week included 6014 tons pyrites from Huelva, Spain.

Imports and Exports of Chemicals in the United States eight months ended Aug. 31, in pounds:

	Imports		Exports	
	1913	1914	1913	1914
Arsenic	5,301,887	2,861,891	66,000	700
Bleach	42,861,542	27,004,166	13,260	12,651
Potash salts	34,166,931	24,732,795	950,499	459,302
Acetate of lime	....	....	52,159,647	39,946,187

Exports include reëxports of foreign material. Imports of soda salts are not given in quantities; values were $222,306 in 1913, and $136,705 this year.

The Engineering and Mining Journal

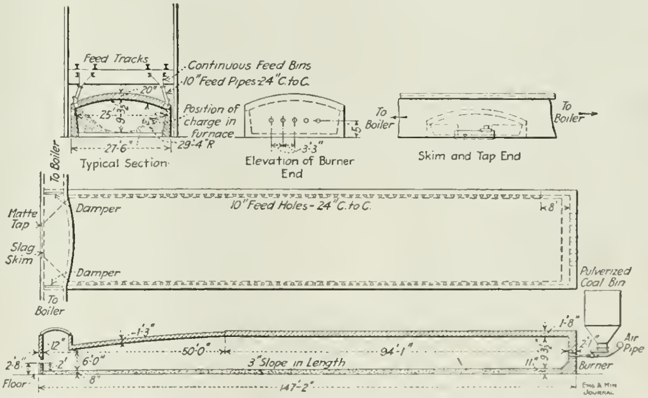
VOLUME 98 OCTOBER 24, 1914 NUMBER 17

Coal-Dust Reverberatory Firing

By E. P. Mathewson*

SYNOPSIS—An account of the brilliantly successful introduction of coal-dust firing in connection with the copper matte smelting reverberatory furnaces at Anaconda, Mont.; an advance in copper-smelting practice that will result in tremendous savings to all smelting companies that can apply the process.

About 10 years ago, S. Severin Sörensen, then in charge of the Highland Boy works, at Murray, Utah, made several runs with a small reverberatory matting furnace, using coal dust as fuel, and claimed successful operation. For some reason not given, the experiments were abandoned. At this time the matter was considered by the management of the Washoe works, Anaconda, Mont., and an expert was sent to investigate the use of pulverized fuel in the cement industry. The report was not favorable to the introduction of the process in reverberatory matte-smelting, so it was dropped.



Sketch Plan and Sectional Elevations of the Proposed No. 5 Reverberatory at Anaconda

The late Charles F. Shelby, a few years afterward introduced pulverized fuel in reverberatories at Cananea; it ran fairly well, but was abandoned in favor of fuel oil, which then came on the local market. Copper smelters considered the question settled and ceased further experimentation, taking for granted that coal-dust firing was not economical in copper-matte smelting, for three reasons: namely, the amount of dust from ashes accumulating in flues and downtakes: the addition to the charge of the siliceous ash, in pulverized form; and the blanketing of the charge by unburnt coke from the pulverizers.

David H. Browne, of the Canadian Copper Co., studied the question a few years ago and came to the conclusion that coal-dust-fired reverberatories would meet his requirements at Copper Cliff, Ont. He had, at that time, basic ore to smelt, and he believed that the addition of the siliceous ash from the pulverized coal would be beneficial, rather than otherwise. He investigated the modern application of coal-dust firing in the cement and steel industries; and then, fully convinced that he was right, built a reverberatory furnace at Copper Cliff, to use coal dust as fuel. His investigations of the subject proved to his satisfaction that the drying of the coal, previous to pulverization, and the fine pulverization of the coal, were essential to success.

The apparatus selected by Mr. Browne was a Ruggles-Coles drier and a Raymond pulverizer, Sturtevant fans, a centrifugal separator and screw-conveying machinery for the pulverized product.

The reverberatory roof was raised to nearly 8 ft. above the bottom at firing end. The charge was dropped through holes in the roof along the sides, being conveyed from the hoppers on tram-cars, running on tracks over the furnace roof. It was found that the best way to feed the charge was to pile it up to the roof, along both sides, very little being dropped from the old central hoppers.

Mr. Browne's furnace was a success from the start and soon attracted the attention of Western copper smelters, who sent their experts to study the problem at Copper Cliff, Mr. Browne most kindly giving them every facility for so doing, and furnishing them with figures showing the results of his operations.

Early in 1914, both the Garfield plant of the American Smelters Securities Co. and the Washoe Reduction Works of the Anaconda Copper Mining Co. equipped a reverberatory furnace with apparatus similar to that at Copper Cliff, for a trial of the process on Western ores

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*Manager, Washoe Reduction Works, Anaconda, Mont.

The G[illegible] was not remodeled and the charging arran[illegible] as theretofore; but the Washoe furnace [illegible] entirely and hoppers were provided along [illegible] also down the middle and across the firing end.

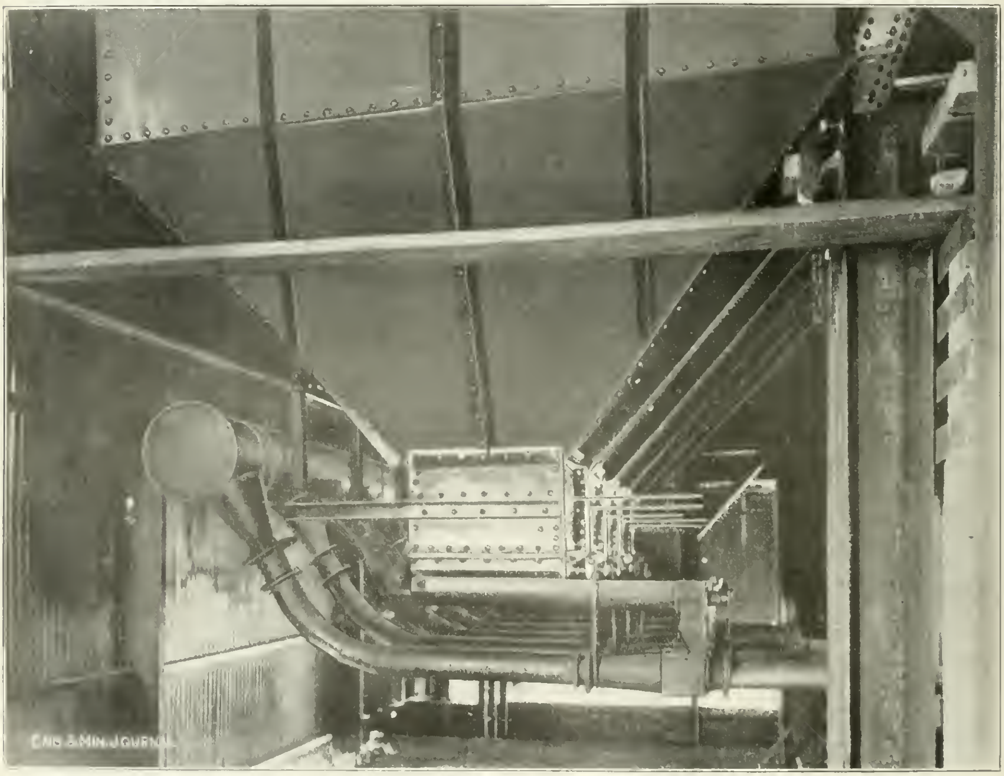
The Garfield furnace, according to W. D. Leonard, superintendent, has smelted approximately 400 tons of ore [illegible] average, using 11.5% coal. The slag has [illegible] 42% SiO₂, 38% FeO and 13% CaO. Analy[illegible] the coal used at Garfield is 7% moisture, 6% ash, [illegible] volatile combustible matter and 48% fixed carbon. Dry, it is of 13,500 B.t.u. in calorific value. The result reported with coal-dust firing is compared with oil-fired furnaces averaging 365 tons daily, with a fuel-oil consumption of 0.63 bbl. per ton of charge.

At Anaconda, the results for the entire month of September, 1914, were 475 tons of ore smelted daily, with coal consumption of 13.8%, including that used in the drier, against 260 tons and a coal consumption of 24.1% in the natural draft coal-fired furnaces.

Tests [illegible] using Lochray coal, Bear Creek coal and [illegible]lle coal. Analyses of these coals and the smelting [illegible] are given in the accompanying tables:

ANALYSES OF COALS

	[illegible]	[illegible] M.	F. C. %	Ash %	B.t.u. (Dry)
Lochray	8.0	[illegible]	[illegible]	20.9	10,350
Bear Creek	[illegible]	[illegible]	[illegible]	12.7	11,500
Diamond	[illegible]	[illegible]	[illegible]	8.1	12,960



Firing End of No. 8 Reverberatory Furnace at Anaconda, Mont.

SMELTING RESULTS

	Duration of Test Days	Tons Smelted per Day	Fuel Ratio	Content of Slag				Matte	Analysis of Ash from Flue			
				% SiO₂	% FeO	% CaO	% Cu	% Cu.	% SiO₂	% FeO	% CaO	% Cu
Lochray	12	409.4	5.38	37.8	42.1	5.0	0.41	39.5	39.8	13.4	5.6	1.7
Bear Crk	18	406.7	5.57	38.8	40.8	4.7	0.42	38.9	38.5	11.5	7.2	1.8
Diamond	30	475.8	7.24	38.1	40.8	5.2	0.42	39.8	36.5	10.3	7.0	3.1

SCREEN ANALYSIS OF PULVERIZED COAL TO NO. 8 REVERBERATORY

	% Plus 100	% Minus 100	% Plus 200	% Minus 200
Lochray	2.3	97.7	12.1	85.6
Bear Creek	4.4	95.6	21.8	73.8
Diamond	6.1	93.9	18.5	74.4

Under the new method of charging, the furnace has no appreciable bath of molten matte; the Anaconda furnace holding only about 40 tons, as compared with 150 tons and over in the old furnaces. The matte is tapped at the front of the furnace instead of at the side, because the matte is held in the front of the furnace by a dam of charge across the bottom; and also because more smelting surface of charge is exposed to heat. It should be noted also, that the charge protects the sidewalls so that no fettling is required.

New 114-Ft. Furnace to Be Built at Anaconda

The results at Garfield and Anaconda are so satisfactory that both companies have arranged to fit all their reverberatory furnaces for coal-dust firing without further delay. The Anaconda Copper Mining Co. is designing a longer furnace, with hearth 114 ft. by 25 ft.

inside measurements. It expects to smelt in this furnace 800 tons daily, with a fuel consumption of 13.33%, or better.

Western smelters are agreed that the work of David H. Browne, in reintroducting coal-dust firing, in reverberatory copper-matte smelting, will result in tremendous savings to all smelting companies that can apply the process.

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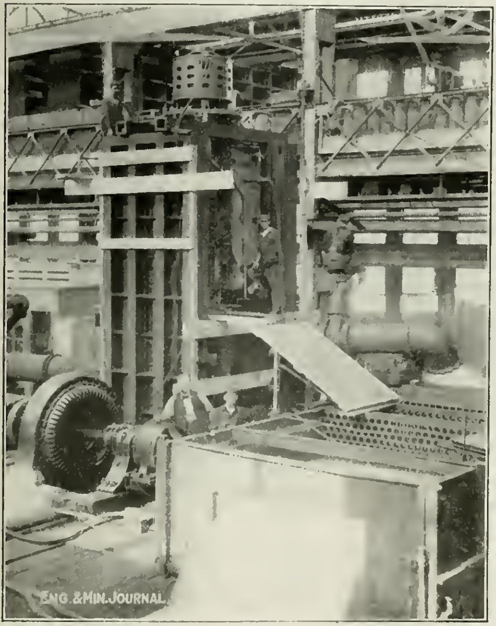
Pumping Machinery for Leaching at Chuquicamata*

The Chile Exploration Co., at Chuquicamata, has installed a novel pumping equipment to handle the acid solution in this plant, in which it is planned for the electrolytic refinery to handle 340,000 lb. of copper per day.

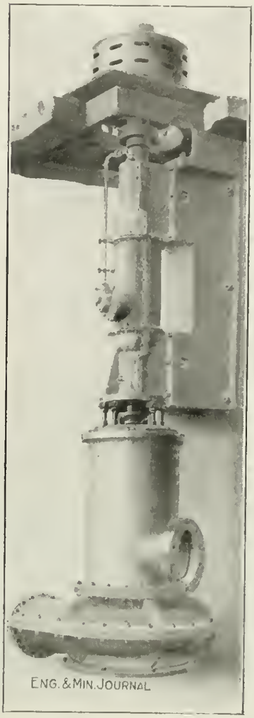


9-In. Acid-Solution Pump

The ore is handled by steam shovels and transported about 2½ miles to the mill. At the plant, the ore is crushed and put through rolls until product is about 4-inch. From the crushing plant the ore is carried by belts to the leaching vats. The size of each vat, of which there are six, is 110x160x16 ft. high. The leached and washed residue is handled by buckets and finally disposed of by belts to the dumps.

The tanks are of reinforced concrete and lined with mastic asphalt. The main solution is pumped through 9-in. and 16-in. lead-lined pipes and from the bottom of the leaching tanks the solution will be removed through 6-in. lead-lined pipes. The pumping plants consist of 13 H. R. Worthington vertical centrifugal boot-type pumps: three 15-in.; six 9-in.; and four 6-in. pumps. Each 15-in. pump will handle 5500 gal. per min. against a total head of 52 ft., and is fitted with a 200-hp. synchronous motor.

Each 9-in. pump will handle 1200 gal. per min. against a total head of 60 ft. and is fitted with a 50-hp. synchronous motor. Each 6-in. pump will handle 250 gal. per min. and is fitted with a 15-hp. synchronous motor.



Details of 9-In. Pump

These pumps are of special interest, owing to their novel design, in that they contain no stuffing-boxes. All parts of the pumps are lined with antimonial lead. The type is a single-suction vertical acid-pump, fitted with self-adjusting oil-pressure thrust bearings. The pressure of the oil for balancing and lubricating is maintained by special oil pumps, driven by bevel gears from the main shaft. The entire thrust arrangement and alignment are adjustable, as well as is the position of the impellers, from the outside. Before shipment, each pump was run by its own motor for 48 consecutive hours in order to develop any weakness or defects in motors and pumps.

The general cycle of operations, as now planned, is given in the Journal of Apr. 25, 1914, page 865.

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Metal-Mining Accidents in the United States

"It is gratifying to note that the fatality rate in the metal mines of the United States was lower in 1913 than in 1912," says Albert H. Fay, engineer of the Bureau of Mines, in a technical paper just issued. The total number killed in the metal mines in 1913 was slightly greater than in 1912, but the number of men employed during 1913 was 193,088, as compared with 169,199 for 1912. The fatality rate was therefore 3.54 per 1000 men employed as against 3.91 per 1000 for the year 1912 and 4.19 for 1911.

The important mining states showing a continuous reduction of fatality rates during 1911, 1912 and 1913 are Idaho, Michigan, Montana, Nevada, New Jersey, South Dakota and Utah, representing in 1913, 38% of the mining industry. Of the states showing a decreased fatality rate during 1913, as compared with 1912 only, may be mentioned Alaska, Alabama, Colorado, New York, Oklahoma, Tennessee, Wisconsin and Wyoming.

"This gradual reduction is to be accounted for largely by the introduction of safety appliances, better supervision and a more strict enforcement of rules and regulations of the mining companies, and a closer observance of the state laws. Practically all of the larger companies and many of the smaller ones, have done much in safeguarding their employees. By first-aid treatment many slight injuries have been cared for, pain relieved, and a cure effected in a short time, so that many of these injuries have been of short duration and kept out of the 'serious injury' or 'fatality' class."

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*From data furnished by the manufacturers.

The number of men employed and the number of men killed in and about the metal mines in the United States during 1911, 1912 and 1913 is shown in the accompanying table.

Year	Metal Mines Number Employed	Total	Number Killed Per 1000 Employed
1911	165,979	695	4.19
1912	169,199	661	3.91
1913	193,088	683	3.54
Average for three years	176,089	680	3.86

⁂

Fatal Cave in Prospect Shaft

Special Correspondence

The carelessness of the prospector in his mining operations is a matter of common knowledge. In his haste to accomplish a maximum amount of telling work with the least expenditure of energy and money, he is prone to take chances which, were he working for an employer or a company, would lose him his job, though he be a most competent and skillful miner.

An example of this carelessness and its attendant hazard was had recently near Butte. As described in the mining-news columns of the Journal, Oct. 3, three men, Martin, Rodda and Bailey, were killed by a caving prospect shaft at Maiden Rock. They were all skillful miners and the accident was the direct result of practices of which they would never have been guilty when working for a large company.

The manner in which the men lost their lives cannot be known positively, there having been no eye-witnesses. The prospect at which the accident occurred is situated on a steep hillside. A short distance from the mouth a previous landslide had choked up the tunnel leading to an incline sunk on the vein. This necessitated the sinking of a vertical shaft 25 ft. to meet the incline. The men were working at the bottom of the incline; they had failed to timber it properly or to protect the collar from the loose rock and dirt left by the old landslide. This was apparently loosened by the jar of the drilling and blasting, so that it fell on the men without warning.

The rescuers were six Butte boys who were camping near the prospect, and during their stay cooked for the prospectors. On the day of the accident, the latter failed to return to camp at the usual time for the evening meal. The boys went to the prospect, about a mile and a half from their camp, and saw at once that a cave-in had taken place and had buried the miners. Using a windlass and a bucket, they began the rescue work, and after laboring nearly all night recovered the bodies. When found, Martin held a hammer in his hand. He had evidently been drilling when the fall of ground occurred. Rodda had on a glove and apparently was turning the drill. Bailey was found close by in an upright position, caught against the hanging wall.

Rodda, the owner of the prospect, was a familiar figure on the streets of Butte, and was known as the blind miner. He had lost his sight 24 years ago by a premature blast in a limestone quarry, near the prospect where he later lost his life. In spite of this misfortune, he had kept on mining. Bailey was connected with the Clark properties for 12 years and was at one time foreman of the Original mine in Butte. Martin had been mining all his life and had worked in the Butte mines four years.

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United States Gold and Silver Production

The Director of the Mint, in connection with the Geological Survey, has completed the revision of the statement of gold and silver production in the United States in 1913. As compared with the preliminary statement issued early in January last, the revised figures are larger by $583,377 in gold, and less by 799,611 oz. silver, the differences in both cases being smaller than might be expected in an early estimate. The figures by states are given in the following table, comparisons being made with the corrected figures for 1912:

U. S. GOLD AND SILVER PRODUCTION

State:	Gold (Value) 1912	1913	Silver (Fine Oz.) 1912	1913
Alabama	16,400	9,200	200	100
Alaska	17,198,600	15,201,300	539,700	366,700
Arizona	3,785,400	4,101,400	3,445,500	3,912,000
California	20,008,000	20,241,300	1,384,800	1,421,500
Colorado	18,741,200	18,109,700	7,933,100	8,989,700
Georgia	10,900	13,300	200	100
Idaho	1,401,700	1,244,300	7,862,900	9,477,100
Illinois	....	....	1,800	2,300
Maryland	1,200	700	700	....
Michigan	....	......	543,500	333,700
Missouri	....	....	30,000	38,900
Montana	3,707,900	3,320,900	12,524,000	12,540,300
Nevada	13,575,700	11,977,400	13,851,400	15,657,400
New Mexico	754,600	892,000	1,460,800	1,666,900
North Carolina	156,000	115,200	2,300	1,700
Oklahoma	....	....	....	800
Oregon	759,700	1,477,900	54,000	172,200
South Carolina	15,400	4,100	....	....
South Dakota	7,823,700	7,214,200	205,800	172,600
Tennessee	11,500	7,700	112,000	109,000
Texas	2,200	200	379,800	429,800
Utah	4,312,600	3,570,300	13,076,700	11,282,300
Virginia	300	200	700	200
Washington	682,600	657,500	350,800	218,700
Wyoming	24,300	17,500	300	1,200
Continental U. S	$92,989,900	$88,176,100	$63,761,000	$66,796,200
Philippines	461,600	707,200	5,800	5,300
Porto Rico	....	1,100	....	....
Total	$93,451,500	$88,884,400	$63,766,800	$66,801,500

The total decrease from 1912 in gold won was $4,567,100, or 4.9%. California and Colorado, both with small changes from 1912, remained first and second among the gold producers. Alaska's gold output decreased nearly $2,000,000, but it still held the third place. Nevada was fourth in rank, South Dakota fifth, Arizona sixth, Utah seventh and Montana eighth. The losses, as compared with 1912, were distributed over a number of states, those of Alaska—$1,997,300—and Nevada—$1,598,300—being the largest. The only large proportional gain was in Oregon, which nearly doubled its production last year.

The production of silver in 1913 shows an increase over 1912 of 3,034,700 oz., or 4.8%. Nevada remains the largest silver producer, Montana being second, Utah third, Idaho fourth, Colorado fifth and Arizona sixth. Nevada showed a larger increase than any other state, and Utah reports the greatest decrease of the year.

As is well known, silver is produced in combination with other metals for the most part, lead, copper and gold being the chief argentiferous ores. Thus the large production of copper in 1913 was doubtless chiefly responsible for the increase in silver.

The Uwarra Mill, Candor, N. C.

By Percy E. Barbour[*]

The Uwarra Mining Co. owns and is operating a gold mine about 2½ miles from Candor, Montgomery County, N. C., and has just completed and put in operation a modern fine-grinding and cyaniding plant of 50 tons capacity, which has several interesting points of divergence from general practice. Not the least interesting feature of this property is its location in an agricultural, cotton and peach-raising country. The points of technical difference are considered by the company to be strides forward in the practice of the treatment of gold ores; the extraction now obtained, which varies from 94 to 97%, is mentioned here to anticipate any hasty criticism of the details to be given.

Ore Occurrence

The ore occurs in fissure veins in a hard greenish-black diabase, which latter has been much broken by jointing and along the zone of fissuring has attained a slaty cleavage so distinct as to give the name of slate to the country rock as a whole, which, however, is properly diabase.[1] There are two veins on the property, which in places are 6 ft. wide, but which will average about 2 ft., and one of these has ore of commercial value developed by underground works for over 800 ft. on the strike. The ore is a hard quartz, pearly gray in one vein and streaked with red in another, but in both cases hard and tough. The walls are in places well defined, but in others they are frozen to the vein and, either way, much slate is unavoidably broken down while stoping, so that hand sorting has to be resorted to both underground and on top. Of the rock as broken underground, 10% is sorted out by the muckers and sent up as waste. Later on this will be left in the old stopes, but conditions prevent it at present.

General View of Uwarra Property

Completed Frame of Mill

The mine cars leave the cage at the landing station, about 8 ft. above the collar of the shaft, and are trammed across a trestle 117 ft. long to the crusher bin and are there dumped on to a flat grizzly with bars set 1½ in. apart. There are four ore pickers here who pick out 16 to 20% more of the coarse slate, which goes into the waste pocket of this crusher bin. This bin was the stamp-mill bin in the former company's old Montgomery mill, and because of its perfect condition was removed and utilized in the new plant, though not exactly what would have been provided if a new one had been built; however, it serves the purpose very well.

Handling the Ore

The ore is drawn from this bin through a standard 24x24-in. single rack-and-pinion steel-plate gate and passes over an inclined grizzly with 1-in. opening to the crusher. The material through the grizzly drops directly to the loading hopper of the conveyor, to which also comes the product from the crusher, which is of the standard Blake type, size 15x9 in., set for 1¾-in. product. The jaw plates are of chrome steel.

This crusher is separately driven by a 7x10-in. Chandler & Taylor medium-speed throttling engine, horizontal type, and the engine and crusher are housed together in a crusher building separate from the mill but connected with it by the conveyor structure.

From the crusher and last grizzly, all ore is carried by a 14-in. wide trough belt conveyor, 88-ft. centers, traveling on an incline of 20° and at a speed of 250 ft. per min. This conveyor has a capacity much in excess of present needs, but was provided for future expected increase in tonnage from the mine. The belt is a four-ply S. A. special conveyor belt with ⅛-in. rubber cover on the carrying side.

This conveyor is driven from the main mill shafting and discharges the ore into a cylindrical steel ore bin, 12 ft. in diameter by 20 ft. high, which is the only ore bin of this type in the East. This bin is without top or bottom, but is reinforced around both top and bottom with angle irons. The bin is supported on a concrete foundation, which was made duodecagonal in shape, instead of circular, to save the cost of circular concrete forms, and with walls 12 in. thick and 6 ft. 6 in. high. It was intended to reinforce this wall with expanded metal, but a long delay in its arrival made a substitute necessary and heavy hog-wire fencing, secured from a local hardware store, was used in its stead with entire satisfaction. Inside of this duodecagonal foundation was filled with loose rock from the dump and a 2-in. layer of cement grout on top made the bottom of the bin. This bin is just outside of the main mill structure. The ore from this bin is [illegible] 18x[illegible]-in. rack-and-pinion gate and fed by a 16x6-in. plunger feeder with adjustable [illegible] to the crushing rolls.

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[*] Mining Engineer, 887 Middle St., Bath, Me. (Recently manager, Uwarra Mining Co.)

[1] Private communication from Joseph Hyde Pratt, State Geologist, Chapel Hill. N C.

Crushing Methods

We think this is the first modern all-sliming cyanide plant to use rolls exclusively for wet crushing between the rock breaker and tube mill. A great deal of study, of course, was given to the selection of these crushing units. I have long been of the opinion that the stamp was out of place for this particular kind of stage crushing for various reasons. To H. W. Dennison, of the Allis-Chalmers Manufacturing Co., who collaborated with me in the design of this plant, belongs no little of the credit in the choice of these rolls. However, the adjoining mine, the Iola, owned by the Candor Mines Co., has been operating a mill[2] using 1750-lb. stamps, the heaviest in this country. The use of heavy stamps in our mill would have been objectionable also because our only mill site was on the hanging wall of our vein, not far from the shaft; this was one more argument in favor of a rotary crusher. Various types were considered, but rolls were finally adopted, and while at this writing the mill has been in operation but 90 days, our judgment in the installation of rolls seems to have been fully justified.

Two sets of 24x10-in. Allis-Chalmers, style B rolls were installed and operate under real wet-crushing conditions, five tons of solution to one of ore going through the rolls. The roll shells are of low-carbon steel. These rolls are not provided with automatic fleeting devices[3], which were carefully considered but finally omitted.

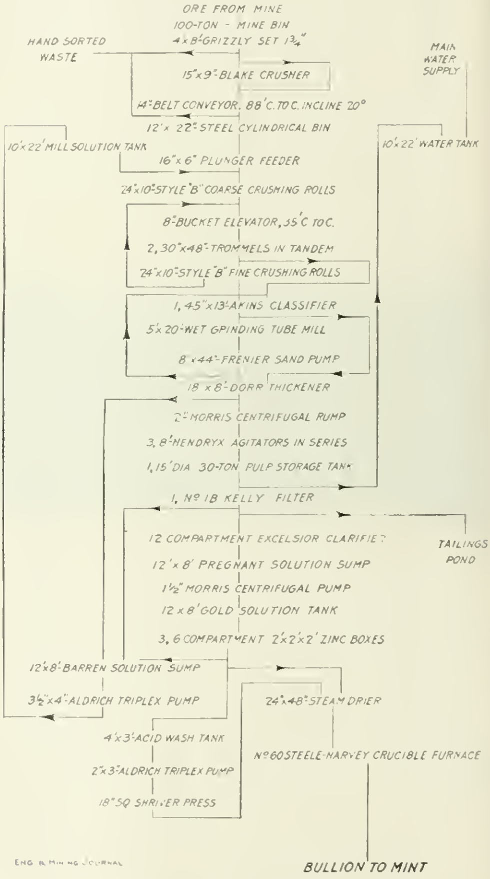
Our first set of coarse rolls getting the product from the Blake crusher set at 1¾ in. naturally gets a very variably sized feed; the slate and slaty ore break into pieces, some of which may be 3 or 4 in. long and 2 or 3 in. wide, although only 1¾ in. thick. It is severe service to feed such material to rolls. However, some of our rock goes to the rolls thus, and we have little or no trouble from them now that the feeders, both mechanical and mortal, have been properly adjusted.

Quoting from Mr. Holthoff's article, "Without abrasion there can be no corrugating. Abrasion is due to two causes, first, if the material fed is coarser than the rolls can nip without slipping; second, if the roll faces are running differential." Some of our feed, on account of the cleavage of our rock, is probably too coarse from the above standpoint, and we expected corrugations, but at the end of 90 days we have only very slight corrugations on our coarse rolls; but on our fine rolls, where the feed is more uniform and none is too coarse, our roll shells are as smooth and straight as can be desired. In this connection it must also be considered that our labor supply is drawn from local circles and we are operating with men who never saw a set of rolls before. Considering this and the tough and abrasive character of our quartz ore, we consider this a satisfactory result and we expect to take these corrugations out by band adjusting and by regulation of [illegible] without the necessity of machining the shell. We cannot tell yet what the steel consumption will average per ton of ore, but present indications are that it will be satisfactorily low.

Screening and Classifying

The product from both sets of rolls is elevated by an 8-in. bucket, vertical-belt elevator, 35-ft. centers, which discharges it into a set of two 30 in. diameter by 48 in. long standard trommels set in tandem: the first screen of $\frac{3}{16}$ metal has ½-in. round punched holes and the second of No. 10 steel is perforated with $\frac{3}{16}$ round holes.[4]

All oversize is returned by launder to the coarse rolls. All the screen product goes to the fine rolls and the fine material through the last screen goes to an Akins classifier 15 in. diameter by 13 ft. long. The choice of this classifier was influenced largely by the fact that it had so few bearings to care for, oil and maintain, compared to some others, and as for results accomplished, it has seemed to us that honors were pretty evenly divided. This classifier is giving satisfactory results as to classi-


ORE FROM MINE
100-TON - MINE BIN
4x8"-GRIZZLY SET 1¾"
HAND SORTED WASTE
MAIN WATER SUPPLY
15"x9"-BLAKE CRUSHER
14"-BELT CONVEYOR, 88' C. TO C. INCLINE 20°
12'x 22'-STEEL CYLINDRICAL BIN
10'x22' MILL SOLUTION TANK
10'x22' WATER TANK
16"x 6" PLUNGER FEEDER
24"x10"-STYLE "B" COARSE CRUSHING ROLLS
8"-BUCKET ELEVATOR, 35' C TO C.
2, 30"x48"-TROMMELS IN TANDEM
24"x10"-STYLE "B" FINE CRUSHING ROLLS
1, 45"x13'-AKINS CLASSIFIER
5'x 20'-WET GRINDING TUBE MILL
8"x44"-FRENIER SAND PUMP
18' x 8'-DORR THICKENER
2"-MORRIS CENTRIFUGAL PUMP
3, 8'-HENDRYX AGITATORS IN SERIES
1, 15' DIA 30-TON PULP STORAGE TANK
1, Nº 1B KELLY FILTER
12 COMPARTMENT EXCELSIOR CLARIFIER
TAILINGS POND
12'x 8' PREGNANT SOLUTION SUMP
1½" MORRIS CENTRIFUGAL PUMP
12 x 8' GOLD SOLUTION TANK
3, 6 COMPARTMENT 2'x2'x2' ZINC BOXES
12'x8'-BARREN SOLUTION SUMP
3½"x4"-ALDRICH TRIPLEX PUMP
24"x48"-STEAM DRIER
4'x3'-ACID WASH TANK
Nº 60 STEELE-HARVEY CRUCIBLE FURNACE
2"x3"-ALDRICH TRIPLEX PUMP
18" SQ SHRIVER PRESS
ENG & MINING JOURNAL
BULLION TO MINT

Flow Sheet of Uwarra Mill

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[2] Iola cyanide mill by Percy E. Barbour, "Engineering and Mining Journal," [illegible], 1912.

[3] Mr. Holthoff, in "Engineering and Mining Journal," Vol. XCV, p. 1302, 1913, argues strongly against any fleeting device. Mr. J. Parke Channing, in "Bull. 31" of the Mining and Metallurgical Society, states that the Miami has finally developed a fleeting device which fleets the roll once in 30 min., and by this slow movement entirely eliminates all the previous troubles had with various devices of this kind.

[4] This screen will be changed for one of woven wire, ¼-in. mesh, in order to get a coarser feed for and put more work on the tube mill.

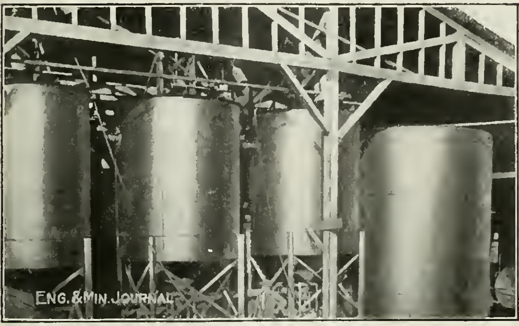
fication and is giving a tube-mill feed so dry that it is necessary to add solution.

The coarse sands from the classifier discharge directly into the feed box of the tube mill, which is of the gear-driven trunnion type, equipped with spiral feeder and reversed screw discharge. It is lined with Montana Tonopah iron bibbed lining. Danish flint pebbles are used.

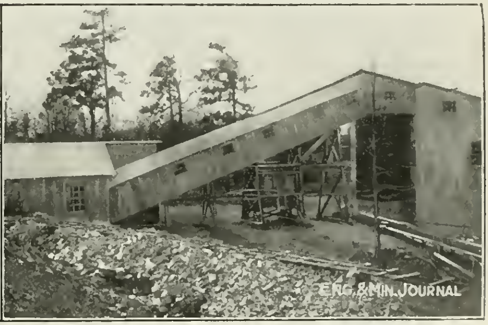
The tube-mill product is raised to the Akins classifier by an 8x14-in. standard Frenier pump, thus forming the usual closed circuit at this point in the flow sheet.

The overflow from the classifier goes to a Dorr thickener with steel tank 18 ft. diameter by 8 ft. deep, the overflow solution from which goes to a sump tank 12 ft. diameter by 8 ft. deep on the lowest bench of the mill, and is pumped back to the solution-storage tank 10 ft. diameter by 22 ft. deep, located on the roll bench inside the mill building. For this service a 3½x4-in. Aldrich triplex pump, belt-driven, is used.

The thickened pulp from the Dorr is handled to the agitators by a 2-in. Morris centrifugal pump. We are considering the replacement of this pump by a Frenier because the abrasiveness of this ore is so great as to cause excessive wear on the rapidly revolving centrifugal and the latter cannot be operated satisfactorily on this small tonnage to give continuous flow to the agitators, which is necessary for continuous agitation.



The Agitating Tanks



Back of the Mill, Showing Incline

The Agitators

There are three Hendryx 8-ft. diameter steel-shell agitators, arranged for continuous agitation. This type of agitator was selected after an exhaustive series of tests in small agitators of the Hendryx type. A mechanical agitator was preferred to any other because it was desirable to eliminate the use of compressed air, first on account of certain local conditions and second on account of the cost of compressed air, not only considered *per se*, but also considered as to its compression in a steam-driven straight-line machine versus agitation by mechanical power from the Corliss engine of the mill. These tests, which I hope to publish later, demonstrate the efficacy of this type of agitator for these ores and the actual operation thus far bears out the result of the tests very closely. The agitation period is about eight hours to obtain the extraction as given, varying from 94 to 97%. These agitators have steam coils inside the tank and the pulp is kept heated to about 90°, since our tests showed that this degree of heat was a decided advantage in accelerating extraction. The steam main from the boiler plant to the mill engine is a long one, and is carried in an insulated buried box on a considerable incline. The heating pipe for the agitators is taken off from this steam line in the engine room in such a way as to trap all the water of condensation in the line and we thus save much heat which would otherwise be lost. The power consumption of these three agitators, as shown by indicator cards, is 10.9 hp., which is certainly satisfactorily low.

The Filters

Owing to the fact that the filter works only during the day shift, a pulp-storage tank between it and the agitators is necessary to hold the accumulation of the night-shift mill run. This pulp-storage tank is 17 ft. in diameter by 10 ft. high, with a conical bottom 9 ft. 6 in. high from the inverted apex of which the pulp is drawn to the filter. This pulp-storage tank is provided with an overflow launder and a decantation device, which not only allows for sending a thick pulp to the filter, but also allows the removal immediately of a large amount of the pregnant solution without sending it through the filter.

The filter is a No. 1, type B, Kelly press, and it handles in one 12-hour shift the 50 tons of dry slime ground per day. The operation of this filter and the results have been quite unusual. The solution is expelled from the cake until it contains only 8% moisture and the cake is then discharged as tailings without any washing whatever. The tailings as discharged, including both dissolved and unextracted values, often run as low as 20c. and for the current month will average about 36c. per ton of ore.

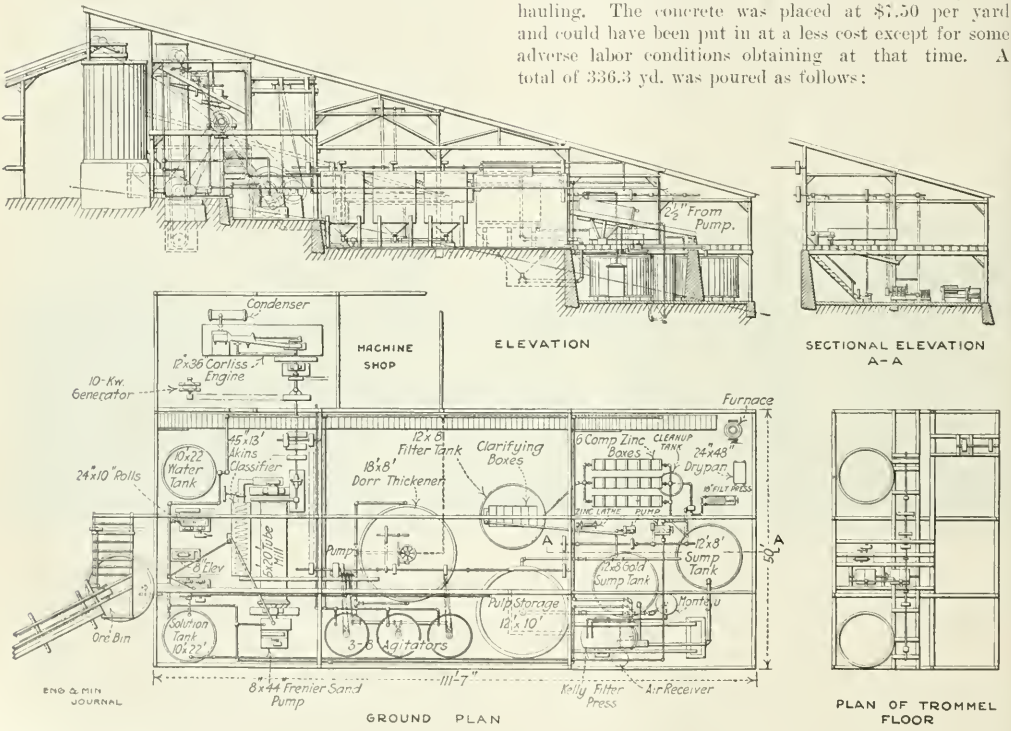
The pregnant solution from the filter goes to a 12-ft. diameter by 8-ft. gold sump tank and is then pumped by a 1½-in. Morris centrifugal pump through an 18 in. square-frame Shriver filter press for classifying, from which it goes into a 12-ft. diameter by 8-ft. gold tank, from which it flows by gravity to three 6-compartment zinc boxes, each compartment of which is 24x24x24 in., filled with zinc shavings, which are cut in the mill.

The barren solution flows to the 12x18-ft. sump tank previously mentioned. The precipitate is handled in a 4-ft. diameter by 3-ft. deep clean-up tank, served by a 2x3-in. Aldrich triplex pump and the precipitate is then dried in a steel-plate dry pan 24 in. wide by 40 in. long, heated by steam, and is finally smelted to bullion in a No. 60 Steele-Harvey tilting furnace fired by kerosene.

Every tank in the mill is of steel plate and besides those enumerated there is a water tank on the roll bench 10 ft. diameter by 22 ft. high, a duplicate of the solution tank. The only use for water in the mill is for flushing the cake from the hopper of the filter to the tailing dump down the branch.

The circulating solution in the mill is 1.2 lb. KCN and the alkalinity about 2 lb. CaO per ton. No lead salts are used.

The mill is driven by its own engine of the Reliance-Corliss type, 12x36-in. stroke, running 150 r.p.m. with steam at 100 lb. at the throttle. A Wheeler 300-sq.ft. surface condenser, with combined air and circulating pump under a grating in the engine-room floor, gives 25 to 27 in. vacuum and the engine with maximum mill load indicated 93.7 hp. The flywheel of this engine is 10 ft. in diameter, has a square cross-section and weighs 7500 lb. In the engine room and driven from the main shaft by a friction-clutch cutoff pulley is a 10-kw., 120-volt, direct-current generator, running at 1150 r.p.m., which furnishes lights for the entire job—mill, surface, houses and underground stations. A model switchboard of black slate, 32x54 in., is furnished with a voltmeter and ammeter, ground detectors, rheostat, main switch and eight current switches.



Arrangement of Uwarra Mill, Candor, N. C.

Details of Construction

The framing of the mill is of oak, not because oak had any special advantage, rather the other way, but because it was the only timber available. This was secured at prices ranging from $12 to $15 per thousand feet at the mills, and the hauling thence to the plant cost from $3 to $5, depending upon the mill from which it was hauled, the weather conditions, etc. The roofing was No. 24 gage galvanized corrugated and the siding was No. 26, and averaged in cost $3.70 per square. This light-weight corrugated is plenty heavy enough for the favorable climatic conditions here.

All retaining walls and machinery foundations and mill floors were of concrete, mixed in the proportion of one of cement, three of sand and six of rock. Cement costs $2 per bbl., f.o.b. Candor. The rock was taken from the mine-waste dump and the sand was secured nearby at a sole cost of shoveling and hauling. The concrete was placed at $7.50 per yard and could have been put in at a less cost except for some adverse labor conditions obtaining at that time. A total of 336.3 yd. was poured as follows:

	Cu.Yd.
Building and retaining walls	126.3
Steel ore bin foundation	11 0
Column pedestals	4.1
Tube mill foundation	13.6
Corliss engine foundation	35.5
Outboard bearing foundation	10.8
Condenser pit walls and floor	9.5
Condenser pier	0.6
Rolls foundation	8.9
Elevator pit walls and floor	7.7
Surface bottom of mill bin	0 2
Crusher foundation	5.1
Conveyor pit, walls and floor	13.6
Crusher engine foundation	2.6
Line shaft pedestals	5.2
Generator foundation	1.2
Wheel pit mould	0.3
Crusher outboard bearing	0.7
Pedestals for storage tank	2.5
Agitator pedestals	7.3
Buckstay footings for new boilers	0.3
Kelly filter foundation	8.1
Thickener pedestals	4.3
Pump foundations	2.5
All floors, 4 in. thick	56 5

Cost of Mill

The total estimated cost of the mill was $15,000, and the mill was built complete for $12,796.48, distributed as follows:

SUMMARY OF COST OF MILL

Concrete walls and foundation	$1962.12
Engineering	2658.85
New boiler house addition	135.33
Foundation bolts and sundries	67.34
Boiler settings	637.92
Mill lumber and timber	1237.07
Mill construction, sundry material	1627.86
Mill pipe line	1067.51
Mill general expense	875.01
Mill labor	7788.62
Mill excavation supplies	3.30
Freight on machinery	1916.73
Machinery erection, superintendency	340.48
Mill wiring	4.09
	$20,322.23
Machinery contract	22,893.00
Machinery sundries on open account	657.82
	$43,873.05
Credit masons included in both items "Boiler setting" and "Labor"	$144.90
Compressor foundation at $7.50 per yard	76.00
Compressor excavation	4.90
Compressor hauling	26.65
Compressor installing	71.54
	$323.99
	$43,549.06
Total credit from machinery contractor a/c extras	752.58
Final total cost of mill	$42,796.48

The distribution of the labor item in the above summary is given below:

Removing bin at old mill	$ 52.21
Building temporary stable	12.27
Moving dwellings from mill site	37.96
Building garage	20.25
Taking down part of old mill	53.16
Grading millsite	511.02
Grading boiler house site	44.21
Grading crusher house site	22.56
Foundations	974.13
Framing and erecting crusher bin	87.07
Framing and erecting crusher and conveyor plant	327.33
Framing and erecting main mill	1116.68
Hauling lumber	290.32
Hauling corrugated, castings, pebbles, pipe, windows, etc.	31.20
Hauling brick for boiler setting	79.27
Hauling fire clay, sand, and lime for boiler setting	51.30
Hauling fixtures and stacks	24.58
Moving small boiler and stack	25.12
Hauling boilers, including unloading and placing	77.50
Connecting and raising stacks	28.47
Laying brick work of boiler setting	222.39
Connecting boilers	4.70
Building boiler house extension	65.02
Hauling mill machinery	298.58
Hauling new compressor	26.65
Installing compressor	71.54
Excavations for compressor	4.90
Repairing and raising dam at cooling pond	49.81
Building launder from condenser discharge to cooling pond, 500 ft	152.32
Building ore trestle, shaft to crusher bin	102.93
Installing mill machinery	727.04
Erecting steel ore bin	32.14
Erecting agitators	101.68
Erecting mill tanks	808.23
Installing pond pump and supply tank	172.11
Main steam line	196.12
Mill piping	121.73
Wiring	9.19
General surface labor and teaming throughout period	612.03
Labor for contractors' account	142.59
Total	$7,788.62

Labor conditions were very unfavorable. In the first place the labor was inexperienced on construction and secondly it was composed more or less of farm hands. Laborers received $1.50 for 10 hours; carpenters, $2 to $3; mechanics, $2 to $2.50. All tank erection and riveting was done by men instructed here, who had never done any of this work before.

On a basis of a 300-day year and 50 tons per day, the mill cost $2.85 per ton of annual capacity.

⁂

Victoria Mineral Output 1913

The mineral output of Victoria for 1913, according to the report of the Secretary for Mines, was £2,171,477, of which £1,847,475 was due to 434,932 oz. of gold. Other items, in descending order of value, were: Coal, 593,912 long tons; antimony ore, 6151; tin ore, 57; copper and copper ore, 36; gypsum, 1676 long tons; silver, 16,671 oz.; all else, £3982.

⁂

Utah Ozokerite

Special Correspondence

Deposits of ozokerite or mineral wax near Soldier's Summit and Colton in Wasatch and Utah Counties may be worked, on account of advancing prices. The deposits have been opened in a limited way but not commercially exploited as yet. They are practically the only ones available outside of those in Galicia, Austria, from which at present no shipments can be made. Dr. David T. Day and T. Robinson, of the U. S. Geological Survey, have been inspecting the deposits, some of which carry as high as 3% ozokerite. The government is reported anxious to have the deposits opened, and will endeavor to encourage production. The principal properties are the Hobson mine near Tucker, the Soldier's Summit property, the James Peak group near Soldier's Summit, the Utah Ozokerite Co. at Colton, and the P. V. group about two miles from Colton. The district is 14 miles long by three miles wide.

The country rock is sandstone and shale, which trend east and west, and are cut by the ozokerite veins, trending north and south. The veins range in thickness from a few inches up to 12 ft., and consist of fractured zones more or less impregnated with ozokerite. Occasionally there are lenses of pure ozokerite from 1 to 2 ft. thick and 5 or 6 ft. long. Masses of pure material weighing 175 lb. have been obtained. The deposits have been worked only to a depth of 100 to 200 ft. Ozokerite is used in the manufacture of paints, insulation for electrical material, phonograph records, patent leather, and other products. The present price is 40c. per pound. North of Sunnyside in Carbon County there are large deposits of Utah rock asphalt in sandstone, from 400 up to 700 ft. thick. The material carries from 9 to 12% of bitumen, and there is a question whether it also carries ozokerite or other valuable hydro carbons. Material from these deposits has been collected by the U. S. Geological Survey for analyses and tests. Other deposits of hydrocarbons are found in Wasatch, Grand and Uinta Counties.

⁂

New Technology-Harvard Joint Professors

In accordance with the agreements for coöperation between the Massachusetts Institute of Technology and Harvard University, 15 of the Harvard professors are to be added to the instructing staff of the Institute this year. The names and departments of those concerned with mining and metallurgy are the following: Henry Lloyd Smyth, A. B., C. E., professor of mining and metallurgy; Edward Dyer Peters, M. D., Gordon McKay professor of metallurgy; Albert Sauveur, S. B., professor of metallurgy and metallography; George Sharpe Raymer, A. B., M. E., assistant professor of mining; Charles Henry White, S. B., A. M., assistant professor of mining and metallurgy; Louis Caryl Graton, S. B., professor of mining geology.

⁂

The Production of Natural Asphalt, including also asphaltic sandstone and limestone, in 1913, in the United States, was 92.604 tons.

Men and Machinery of the Comstock --The Barclay and Davey Engines

By G. W. Dickie

SYNOPSIS—The Barclay engine which was to revolutionize pumping in the Comstock was turned over to the Union Iron Works and transformed into a flywheel engine. A single-cylinder flywheel engine which was unable to stand speeding up. The valve gear of the Davey engine gave a constant load at all times and reduced shocks to a minimum. The first compound differential engine used on the Comstock was built by the Risdon Iron Works, and is fully described.

⁂

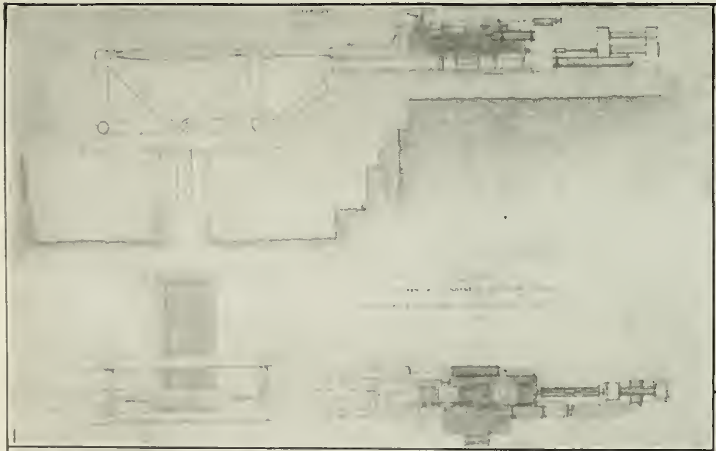
A good deal of speculation as to the final destination of the Barclay pumping engine was indulged in by the engineers of the iron works interested. Finally about the time the engine should arrive it began to be whispered among those who should know that the Barclay engine would be installed at the Virginia mine and that Mr. Fair had bought the engine from Mr. Thompson. Being at Virginia City about this time, I spoke to Mr. Thompson about this rumor and he admitted that, there being no other place offering, he had turned his contract with Barclay over to Mr. Fair at a small profit. "Now we will see," he said, "the superior economy that will result from the use of this type of engine on the Comstock deep mines." We were all very much interested in the final outcome. The engine arrived and was taken to the Union Iron Works whence nothing was heard of it for six months except that they were busy there with something big.

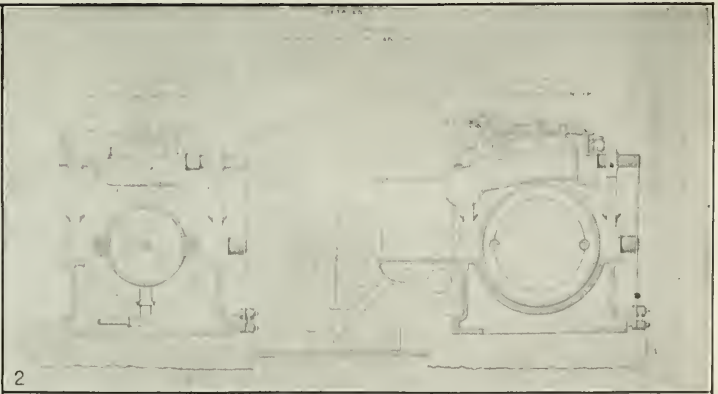
Finally the big thing materialized. Mr. Scott had persuaded Mr. Fair to let him convert it into a flywheel pumping engine. The cylinders were disposed diagonally and worked on a disk of about 14-ft. diameter, keyed to a 22-in. shaft which, by the way, was a spare paddle shaft for the Pacific mail steamer China which Mr. Scott had bought as scrap, the China having been lost; in the middle of this shaft was a flywheel 30 ft. diameter, weighing 100 tons, on the other end of the shaft was a disk 14 ft. diameter, to which the pitman working the pump bob was attached. The arranging of the Barclay cylinders into this design showed great engineering skill on the part of Mr. Scott and his associates for it did not look like a patched job. Fortunately there was not a great deal of water to pump and from five to six revolutions was the regular working speed and this set up no serious stresses in the engine work of the pit work. This ending of the Barclay engine scare was a disappointment to me as I considered this engine well suited to the deep pumping work that was beginning to assume rather serious proportions, especially in the North End mines.

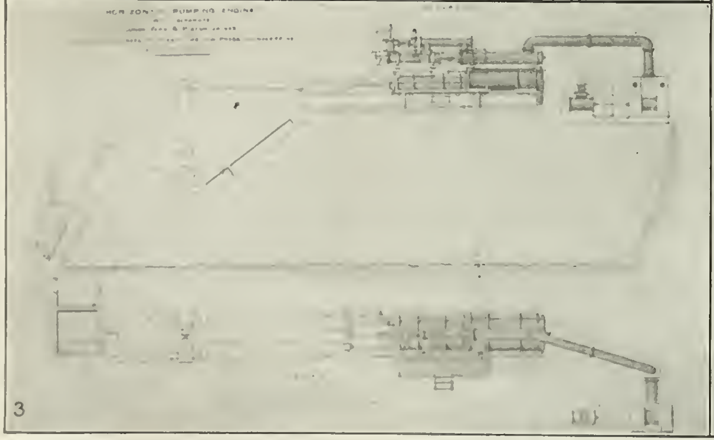
One of the North End mines, the Yellow Jacket, found that the water was beyond the control of their pumping plant and asked proposals for a new plant. I proposed a direct-acting compound condensing Davey differential engine having 30-in. high-pressure cylinder, 60-in. low-pressure cylinder, 120-lb. steam pressure, 10-ft. stroke for the engine, and 8-ft. stroke for the pumps. The pumps were to be a double line balanced as shown on the illustration of the Alta pumping engine taken from my original drawing. My plan, however, was rejected as the cooling pond proposed for the condensing water was considered then impracticable and a plan proposed by Mr. Scott was adopted. This plan showed a single 48-in. cylinder with a stroke of 10 ft. using steam at 120 lb. pressure. The cylinder was set horizontally on a heavy bedplate which carried the slides and the bearings for the flywheel shafts. The pitman extended from the center of the crosshead direct to the pump bob while two side rods, one on each side of the pitman, connected to pins on crank disks on separate shafts projected from each side of the bedplate; the shafts were 20 in. diameter and 10 ft. long with their outer ends carried in pillow blocks supported on solid masonry. The flywheels, of which there were two, running in pits between the bearings, were about 30 ft. diameter and each weighed about 50 tons. This engine ran about six months at 8 strokes per min. and was considered a success. I noticed, however, a suspicious tremble in the rods connected to the crank disks. A slight increase in the quantity of water required that the engine be speeded up to 9½ revolutions and shortly after this change of speed both flywheels burst and a general wreck of the engine was the result. The engine part of this pumping works was rebuilt with a compound condensing engine having differential valve gear and no rotating parts. This experience settled the pumping question in favor of the differential engine, always directly connected to the pit work, the engine compound, and condensing where possible.

During 1875 and 1876, several notable pumping engines were built for the Comstock mines; fortunately, I am able to give one or two illustrations that will show the character of this work. Fig. 1 shows the plan and elevation of a Davey pumping engine designed by me and built in 1875 for the Alta Mining Co. Fig. 2 shows cross-sections of the same engine. This was, I think, the first of the many differential engines built for the mines; it attracted considerable attention among mining men and was the only one built with two lines of pumps, the one line balancing the other. The illustration shows the double right-angle bobs and how they were arranged. This engine was condensing, the air pump being worked by a tail rod from the low-pressure piston. The high-pressure cylinder was 24 in. diameter and the low-pressure 48 in., with a common stroke of 8 ft. The back end of the high-pressure cylinder formed the front end of the low-pressure cylinder as shown in the sections. There were two piston rods to the low-pressure piston which passed through tubes cast on the sides of the high-pressure cylinder as shown in the sections. The two low-pressure rods and that of the high-pressure piston between them were all fixed to one crosshead to which was attached the connecting-rod or pitman for working the pump bobs. The cylinders were bolted down upon a massive bedplate 6 ft. wide and 32 ft. long, the front end of which formed the guides for the crosshead.

The chief peculiarity of the Davey pumping engine was the simple manner in which the engine was made







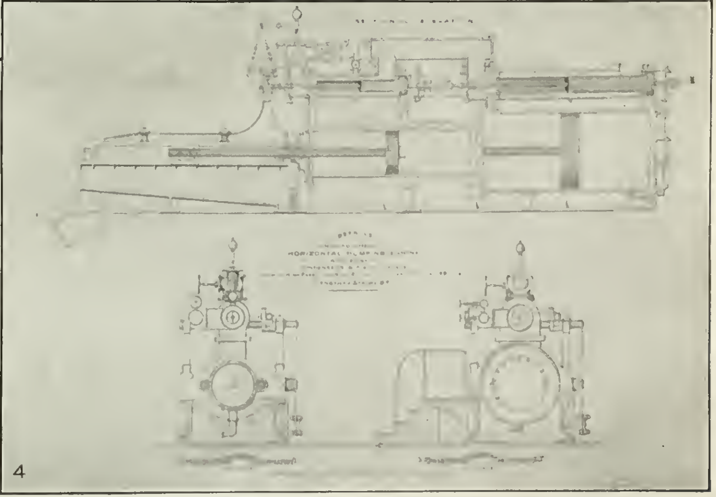


Fig. 1. Plan and Elevation of Davey Engine
Fig. 3. Plan of Horizontal Pumping Engine

Fig. 2. Cross-Section of Davey Engine
Fig. 4. Cross-Section of Horizontal Engine

perfectly safe in working under all conditions of load, automatically and instantly varying its supply of steam with every minute increase or decrease of resistance: the distribution of steam was such that the pumping was performed without shock even when the resistance varied suddenly and greatly. I think it best to describe the differential valve gear at this point so as to obviate the necessity of doing it again in telling of other engines of this type.

The Differential Valve Gear of the Davey Engine

In this, our first engine of the Davey type, the main steam valves which were balanced D-slides, received their motion from a horizontal lever between the two valve chests to the center of which the valve stems were connected. This lever received two motions; one end derived its motion from the engine crosshead by another lever of the first order which receiving the full motion of the piston at its long end, imparted from its short limb the amount of motion suitable for the correct working of the valves. The other end of the horizontal lever derived its motion from a small subsidiary piston which received its motion from the steam admitted by means of a small slide valve. This motion was controlled by a cataract piston working in a cylinder filled with water or other fluid which escaped from side to side through small openings that could be regulated at will. The motion of the little slide valve of the subsidiary was in its turn governed by the movement of another steam cylinder and cataract which is shown on the cross-section placed above the subsidiary cylinder. The action of this gear upon the motion of the engine will be best understood by an illustration.

Suppose the main engine to be nearing the end of its stroke, the small arm on the left-hand end of the rock shaft, see Fig. 2, will engage with one of the tappets on the small valve rod of the upper or pausing cylinder, the tappet being so placed that the requisite motion will be given to the small valve before the main engine comes to rest; steam being thus admitted on the piston of the pausing cylinder, it will begin its stroke; everything else being at rest, its rate of movement will depend on the amount of opening given to the cataract plug which would be adjusted to the required amount of pause or rest at the end of each stroke. As the pausing cataract nears the end of its stroke, an arm attached to its piston rod engages with one of the tappets on the small valve rod of the subsidiary cylinder and effects the required movement in this valve admitting steam on the piston. Motion would thus be communicated through the main horizontal lever to the valves and the main engine would begin its stroke. As it moves, however, it is giving motion to the other end of the main lever, as already described, in a contrary direction to the motion communicated by the subsidiary piston and cuts off the steam. The main valves, therefore, have a differential motion compounded of the motion derived from the motion of the main engine and an opposite motion from the subsidiary piston. Now the motion of the subsidiary piston is rendered constant by means of the cataract. Seeing then that the cataract end of the lever has a constant motion independent of the engine itself, and that the other end must needs have a varying motion depending on the varying load on the engine, then, the resultant motion of the main valves being taken from the center of the lever and compounded of a varying and a constant motion, must also vary with every variation in the motion of the main piston. At the beginning of the stroke, the cataract end of the lever has a lead in advance of that of the opposite end, with a constant load on the engine this lead will be constant, and the cut-off constant: but the slightest variation in the load causes a corresponding instant variation in the lead and, as a consequence, the cut-off takes place earlier or later as the load is increased or diminished. Thus the engine automatically varies the expansion to suit the varying conditions of resistance. The pause at the end of each stroke is of great importance in a pumping engine as it allows time for the valves of the pump to fall by their own weight alone to their seats, preventing the possibility of shocks from sudden closing under pressure and also preventing a loss of efficiency from slip. I have gone thus carefully into the operation of the Davey valve gear so that my readers will understand it as there is little opportunity now to study this gear in operation except in Great Britain where it is extensively used.

The Arrangement of the Alta Pumping Engine

In the plan and elevation, Fig. 1, of the Alta pumping engine it will be noticed that the pumps are actuated through two right-angle bobs or bell cranks. This was the first and only arrangement of this type. In nearly every other case the engines were built to replace others that had become too small for the work and the existing pit work as far as it went had to be utilized. But in the case of the Alta, I had to design a pumping engine for a new shaft which had to be 1500 ft. deep; all the conditions were known and I had a free hand. Two strong girders, as shown in the plan, cross the shaft in such a way as not to obstruct the shaft opening; these girders were united to the engine bedplate by a heavy cast-iron fork piece so that the whole forms one continuation of the engine frame making it one machine with all the stresses within itself. The angle bobs are of cast iron in box form, cast in one piece, the ends of the arms being joined by heavy wrought-iron straps. A connecting-rod ties the vertical arms of the bobs and this, being always in compression was made of cast iron. The bob farthest from the engine was fitted for a balance, the sinking or lift pump being attached to that bob. By this arrangement the one spear rod balances the other thus dispensing with balance bobs in the shaft and the cost of stations to receive them. As the plunger pumps were double discharging both on the out and in strokes of the engine, the pump column did not need to be so large as usual. We had this engine, its condenser, air pump, pump bobs, and connecting girders, weighing in all 134 tons, set up in the shop, the total length was 102 ft. and the height 15 ft., and on a certain day steam was turned on and it was operated for several hours in th presence of a large company of mining superintendents and company directors. To prove to these men how accurately the stroke could be adjusted and depended upon, I put my finger in the clearance of the guides, which at full stroke was one inch, to show that there was no danger of its being crushed. This demonstration had a wonderful effect on the mining men who had been somewhat skeptical about the success of the new pumping engine.

Another Horizontal Differential Engine

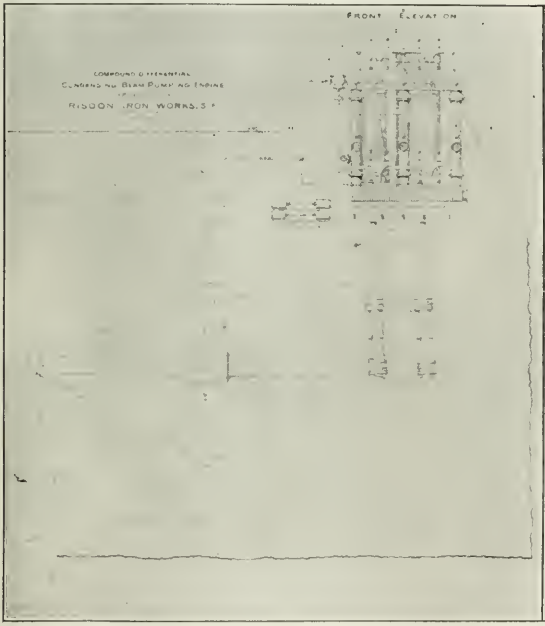
There was another type of the horizontal differential pumping engine that should be mentioned in this narrative. This engine was designed by me for the Meadow Valley Mining Co. and was to work a single line of 14-in. plunger pumps, the shaft being a straight incline 62 deg. from the horizontal starting from a depth of 1400 ft. on the incline. Fig. 3 shows an elevation and plan of this engine and Fig. 4 shows a longitudinal section and two cross-sections of the engine alone. The dimensions were: diameter of high-pressure cylinder, 28 in., of low-pressure 56 in., and stroke 8 ft. This engine had piston valves the object being to reduce the friction to place the engine more under the control of the cataract. The angle bob like those of the Alta was of cast iron in box form with heavy wrought-iron straps but having to transmit the push as well as the pull of the engine, it had heavy cast-iron struts fitted and keyed between the straps. The center or rocker shaft of the bob was carried in heavy bearings resting on massive foundation plates which were connected by heavy castings to the main bed of the engine.

By this means one continuous frame was formed that embraced both the engine and pit-head work, thus relieving the foundations of most of the lateral stresses and on this account it was not necessary to make the foundations as massive as when the foundations were the only connection between the various parts. This was a matter of great importance on account of the excessive cost of stone foundations on the Comstock. This engine was also fitted with an independent or separate air pump which was operated by a direct steam cylinder controlled by differential valve gear. This plan enabled the engine to be started with a vacuum. Before this engine left the shop, the Meadow Valley Mining Co. got into financial difficulties and shut down for good. The contract price for the pumping engine and pumps was $90,000, of which $45,000 had been paid. Fortunately for the Risdon Iron Works, a mine in Arizona found water just at the time that the Meadow Valley Mining Co. lost ore. The Arizona mine needed a pumping plant so this pump was sold to them for, if I remember correctly, $80,000; some changes had to be made to suit the requirements of a vertical shaft. I understand that it is still doing good work.

There were other pumping engines of the horizontal, differential type built. At least three large sets, known as Patten designs, although the designing was chiefly by I. M. Scott, were built by the Union Iron Works; there were also several others by the Risdon Iron Works from my designs; those already described had all the features that claim attention at present.

The First Compound Differential Beam Engine

The first compound, differential beam engine built for any of the Comstock mines was that built from my design by the Risdon Iron Works for the Lady Bryan mine. Fig. 5 is a side elevation of this engine and Fig. 6 a plan and end view. The dimensions of this engine were—high-pressure cylinder, 26 in. diameter and 8-ft. stroke; low-pressure cylinder, 42 in. diameter and 10-ft. 7½-in. stroke; the pumps had a stroke of 8 ft. This I considered the finest engine I had designed and both its working and its appearance were much admired by the mining men of that time. The beam was placed below the cylinders, the center and arms being of cast iron trussed with wrought-iron straps as shown, with cast-iron compression members between the straps. The high-pressure cylinder was placed nearest the center of the beam and had the same stroke as the pumps. The longer stroke of the low-pressure cylinder kept down the diameter and preserved the symmetry of the design. All the valves



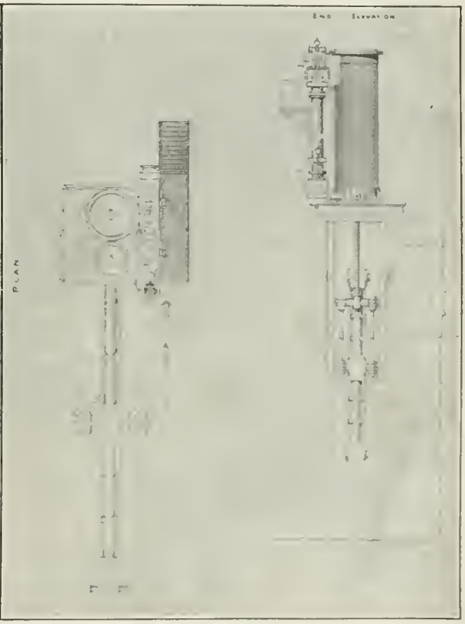


Fig. 5. Elevation—Lady Bryan Pumping Engine—End View Fig. 6.

were of the double-beat Cornish type. The top set for both cylinders was in one valve chest and the bottom set in another. These chests were joined by three columns, the one nearest the beam center being the steam column, the middle one the receiver, and the outside one the exhaust. This arrangement gave the engine a fine appearance and kept all the valve gear on one side in view of the engineer in charge. The condenser and air pump were independent and also served the hoisting engine. This was certainly a fine engine and I am still proud that I designed it for not only did it look and work well, but it was also the most economical engine on the Comstock.

There were three other beam engines built, one by the Risdon Iron Works and two by the Union Iron Works, the valves of which were operated by the differential valve gear. A brass plate on these engines gave the information that they were designed by Mr. Patten, Consulting Engineer, Virginia City. The engines, however, were designed by I. M. Scott, the brass plate only being designed by Patten. They were of larger dimensions and differed somewhat in arrangement from the one described above. The positions of the cylinders were reversed, the low-pressure cylinder being nearest the beam center. Each valve had a separate chest, four valve chests being on one side of the engine and four on the other, the levers and lifters for operating the valves being all on top of the cylinders. The beam was placed under the cylinders and was double, of rather peculiar construction, having no compression to the trusses. My recollection of the dimensions of these engines is that the high-pressure cylinder was 28 in. diameter with a stroke of 11 ft. and that the low-pressure cylinder had a diameter of 60 in. and a stroke of 8 ft. The one at the combination shaft of the Chollar, Norcross and Savage mines worked a double line of 15-in. pumps to the 2600-ft. level discharging into the Sutro tunnel. Fourteen-inch plunger pumps were practically a standard size and often a double line was used, worked by strong cast-iron brackets bolted on each side of the pump rod; for that size of pump the rods, if of wood which they generally were on the Comstock, were 14 in. square in lengths of 50 or 60 ft. The strap plates which held them together were 12 in. wide, 1 in. thick, and 20 ft. long; square bolts usually 1 in. square and 12 in. apart were used, being made square to give a better resistance to pulling apart. Where the pit work was very long, as in the Ophir which had a long incline, the total length of pit work being 1000 ft., experiments were made to determine the extent of the lost motion. In the case of the Ophir, W. R. Eckart, who made the experiments, found that the pumps at the far end of the rod had 2 in. less stroke than those nearest the engine. In the Comstock mines the water was hot, averaging 150 deg. F., which added to the physical obstacles we had to overcome, such as ground slips, but we never let go of any undertaking until we had accomplished more or less successfully what we had begun.

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American Manganese Mfg. Co.'s Dunbar Furnace

At the plant of the American Manganese Mfg. Co., Dunbar, Penn., No. 1 stack was put in blast at noon, Oct. 14; the drought, broken on Oct. 13, had caused some delay. The plant will operate on ore from the mines of the company on the Cuyuna range in Minnesota. The coke is made in Semet-Solvay byproduct ovens adjoining the furnace. The products will be high-manganese pig irons of various percentages, spiegeleisen and ferromanganese.

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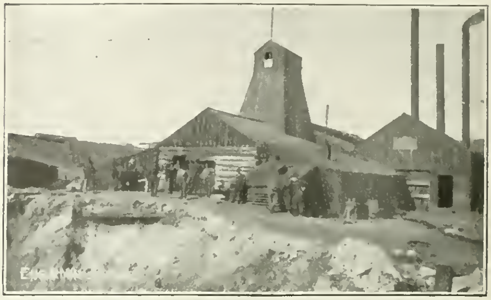
An Old Photograph from Butte

The accompanying photograph is interesting, showing the type of shaft house in use at Butte 30 years ago. The men who are operating the great hoisting engines of today would consider this a petty affair. However, "great oaks from little acorns grow," and in Butte the great headframes grew very fast.



Gagnon Shaft House, Butte, in 1885

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Rio Tinto Operations

The short interim report of the directors, usual at this time of year, states that a strike prevented work at the mines during January and part of February. Partial strikes also caused interruption of work in March and April. Excepting, however, as regards some men at the smelting plants, the agitators lost all influence after April and for the following four months operations were on a larger scale than ever before.

The chief markets of the company, however, being on the continent of Europe, the outbreak of war at once cut down the greater part of the company's business, restricting it to the United Kingdom and America. After July, sales and shipments of ore and copper were consequently reduced to comparatively small figures, and are likely to remain small during the war.

In the interests of employees, the company is keeping up the whole of its establishment at three days' work per week. This is more than is required to mine the ore for which there is a demand, but it provides a living wage for the men, and those not actually getting ore are employed on development work in anticipation of future output.

The property is in excellent condition, and as soon as access to markets is restored, a speedy return of prosperity is expected. In view, however, of the great temporary reduction in income, the directors do not consider it desirable to declare an interim dividend on the ordinary shares. They will pay on Nov. 2 the usual half-year's dividend on the 5% preference shares.

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Carnotite-Ore Production in 1913 in the United States was 2269 tons of dry ore, according to F. L. Hess of the U. S. Geological Survey, containing about 81,900 lb. of U_3O_8, and calculated to contain about 8.5 grains of recoverable radium This all came from Colorado and Utah. About 100 lb. of uraninite was also produced in South Carolina as a byproduct of feldspar and mica mining.

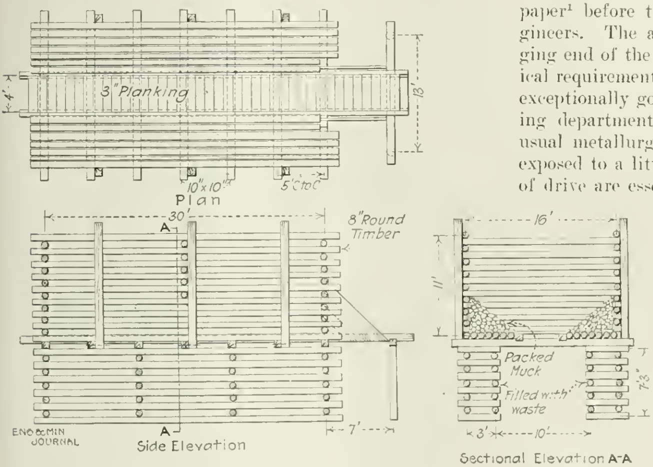
Details of Practical Mining

Round-Timber Bin with Novel Emptying System

By E. S. Shaw*

A bin recently constructed on the dumps of Stratton's Independence, Ltd., is of interest because of its unusual design. It is filled from the top by ore brought in mine cars from the scattered dumps. The ore is then taken to the mill crusher in five-ton cars drawn by a cable attached to an electric hoist.

The bin foundations are two cribs built 10 ft. apart on the surface of the loose rock and filled with waste rock. Waste from the mine is dumped around the sides of the bin to insure greater stability.



Plan and Elevations of Bin, Showing Packing of Ore in Corners

The bin timber is chiefly 8-in. round, with the crevices around the sides filled with 3-in. and 4-in. round pieces. The stringers are of 10-in. square material and the flooring of 3-in. planks.

The method of emptying the bin is its novel feature. The car to be filled is run under the first planks that are covered with ore. The loader stands on the platform outside of the bin so as to be safe from falling rock and loosens the first plank, pulling it ahead with his pick. By doing this with each plank in turn until he reaches the ore, he has a space sufficiently large to allow it gradually to fill his car. The ore will run until the sloping face reaches an angle of about 45°, the angle of repose of loose rock. The loosening of more planks provides a greater quantity of material.

The capacity of the bin is 220 tons. The entire costs of construction were as follows: Labor, $215; material, $269.

The illustrations show the construction of the bin and indicate the method of operating.

This same type of construction ought to be applicable to chutes underground. One man could load for several trammers and keep them moving all of the time. There would be no chance for a boulder to block the opening; the loader could get up above and break it with a hammer, bulldoze it or even blockhole it if necessary, without danger to himself or the chute.

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Dredge Digging Motors

The characteristics of electric motors suitable for gold dredges were discussed by Girard B. Rosenblatt in a paper[1] before the American Institute of Electrical Engineers. The application of electric power for the digging end of the dredge is of most interest as the mechanical requirements are severe and the speed control must be exceptionally good. The motor applications in the washing department do not differ much from those of the usual metallurgical plants, except that the equipment is exposed to a little more abuse and that compact methods of drive are essential.

The driving of the bucket chain is the real problem of electrical application on the gold dredge and no system that has yet been devised has proved itself free from all objections. Power requirements are at times excessive and vary through a wide range; accurate control is essential, and good economy is also important on account of the size of the digging motor compared with the rest of the electrical installation, from 35 to 15% of the power used on the dredge being required for driving the bucket line. The greatest difficulty encountered is that of an adequate mechanical connection between the motor itself and the bucket chain. If the bucket line encounters a boulder of larger size than it can handle, the demand on the motor is immediately increased and protective devices must be installed. Also when the buckets run into particularly sticky clay, the load on the digging motor increases. As such a condition is seldom momentary, the continuity of the overload may burn out the motor unless the speed of digging is reduced. In addition to handling such overloads, the motor drive must be capable of revolving the bucket chain slowly at no load for the purpose of repairing the buckets or chain.

The transmission of power from the driving motor to the tumbler has been the subject of much study by dredge designers. The tumbler shaft usually has two pinions, one on each side, which engage two gear wheels carried on a common shaft. This shaft is connected through an adjustable slipping friction to another drive shaft by means of gearing and the motor drives the last-named shaft. It may be either belted or geared to this shaft.

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*Assistant mine superintendent, Stratton's Independence, Ltd., Victor, Colo.

[1] Proc., A. I. E. E., August, 1914.

Belting the motor is, of course, easier on the electrical apparatus, but on the other hand, has some disadvantages. A very large and expensive belt is required on account of the tremendous torques involved; there are sometimes difficulties of maintenance due to the moisture that is often present on board a dredge. A belt may slip just when maximum torque is wanted; occasionally under heavy stress, due to the slipping friction having rusted, a belt will break. A belt transmission suitable for the torques involved takes up considerable space, and space on a drege is valuable.

Gearing, while economical in space and entirely positive in action, has the disadvantage that it imposes very severe service on the electrical equipment, in that every strain and vibration on the bucket chain finds its way back to the revolving part of the motor. Flexible couplings have been tried between the motor and the driving gear, but without success. The large variation in torque met with, sooner or later, ruins any type of flexible coupling that has yet been tried. The gear drive has proved successful where a motor has been secured that will adequately withstand the stress. Both belt and gear drives have their adherents.

From these considerations it will be apparent that the motor for digging service must have the following characteristics:

(a) It must be a varying-speed machine, and if in addition it can be made an adjustable-speed machine, this will be an advantage.

(b) It must be capable of being revolved at light loads and very low speeds.

(c) It must be capable of developing a maximum torque at any speed from zero to approximately full-load speed of several times its normal rated torque.

(d) It must be capable of carrying for prolonged periods of hard digging a torque overload of approximately 25% at a speed reduction of probably 25%.

(e) It must be of substantial mechanical construction, particularly as to shaft and bearings, in order to resist a heavy belt pull when belt drive is used, or repeated shocks of severe gear thrusts when gear drive is used.

(f) It must be reasonably efficient.

It has often been suggested that direct-current motors of the type used in steel mills, with possibly variable-voltage speed control, might prove advantageous for digging service on large gold dredges. Investigation in most cases has developed the fact that the losses in efficiency due to the conversion from alternating current to direct current practically offset the advantages gained by more flexible control under the ordinary cycle of operations, and further that the first cost of such an installation is prohibitive. Accordingly, the only type of motor left available is the moderate-speed, wound-rotor induction type, and for the most successful application the motor should be designed with special reference to the work it has to do. From experience with the troubles of a dozen dredges, Mr. Rosenblatt recommends specifications embodying the following:

(1) The motor should be capable of carrying its rated load continuously with a rise not to exceed 40° in any part.

(2) The motor should be capable of developing a torque 25% in excess of its rated full-load torque at a speed of 75% of its synchronous speed for a period of two hours, with a rise not to exceed 7[illegible]

(3) The motor should have a maximum torque and a starting torque of not less than 2½ times its full-load torque.

(4) The shaft should be of such material and dimensions that strains due to developing of maximum torque will not appreciably affect the dimensions of the air gap on any side of the motor.

(5) The bearings should be designed to resist an upward thrust, and should preferably be of the design known as rolling-mill bearings, furnished with stud bolts and lock nuts, instead of the usual design employing capscrews.

(6) The lubrication of the bearings should be adequate. On motors of 200 hp. and over, at least two oil rings per motor are recommended. On motors of 500 hp. and over, the use of gravity-feed lubrication should be considered.

For small dredges, say employing a digging motor of 100 hp. or less, the ordinary drum-type controller proves adequate. For larger installations a combination of magnet switches, controlled by a master controller, has been used in a large number of installations, but for the larger motors the ideal control seems to be the liquid rheostat.

The digging motors of some of the important American dredges are listed in the accompanying table, together with the size of the bucket, speed per minute, and average horsepower input; the last, of course, will vary with the kind of ground to be dug.

DATA ON DREDGE DIGGING MOTORS

Place or Owner	Size of Buckets, Cu.Ft.	Buckets per Minute	Motor Rating, Hp.	Average Hp. Input
Oroville	5	18	75	65
Marysville	7	20	150	140
Marysville	7½	19	200	155
Conrey	9	18	150	185
Natomas	14	21	400	285
Folsom	13½	20	300	202
Boston & Idaho	15	..	300	285(?)
Conrey	17	22½	550	460

*

Chart for Plotting Dips

It frequently becomes necessary in geological and mine mapping to make vertical sections through veins and other inclined orebodies which are not parallel to the dip of the vein, that is, not at right angles to its strike. The calculation involved in plotting the dips of a good many veins thus projected is tedious. The accompanying chart is intended to expedite such calculations.

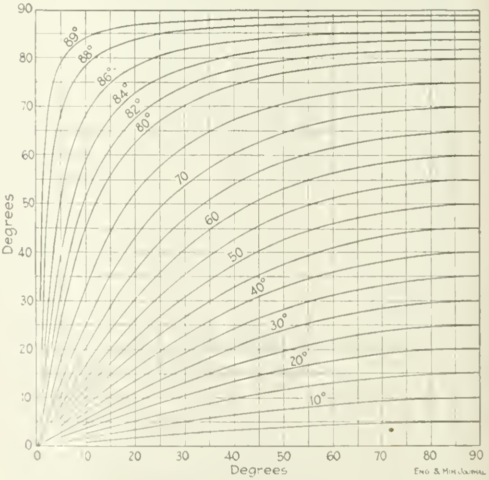

CHART FOR ASCERTAINING DIP PROJECTIONS ON DIAGONAL SECTIONS

On the chart, the angles indicated along the bottom are those made by the plane of the section with the strike of the vein. The curves are dips of various degrees. The vertical figures represent the apparent dips at which the veins are to be plotted.

Suppose a vein dipping at 86° to be intersected by the vertical projection plane at an angle of 25° with its strike. Find the intersection of the vertical line corresponding to 25° along the bottom of the chart with the curve marked 86°, and follow along the horizontal line from the intersection to a point on the left marked 80½°, which is the apparent dip at which the vein should be plotted on the vertical projection plane.

If the acute intersection angle be termed A, the dip angle B and the desired apparent dip C, then the formula on which the dip is constructed is $\tan C = \sin A \tan B$.

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Lining the Palms Shaft*

The recently sunk Palms shaft of the Newport Mining Co. is vertical, lined with steel and concrete. It is divided into five compartments, as shown in Fig. 1. The skip compartments are 4 ft. 10 in. by 6 ft., and the cage compartment is 6 ft. 2 in. by 10 ft. The outside dimensions of the shaft are 10 ft. 10 in. by 17 ft. 6 in. The 17-ft. 6-in. wall plates, the end pieces and the two dividers, each 10 ft. long, are 5-in. 18.7-lb. H-section steel members. The other two dividers are 4 ft. 10 in. long and consist of 4-in. 13.6-lb. H-sections. The eight studdles are 3x3x¼-in. angle irons. Most of the sets are spaced 8 ft. center to center, but in heavy ground some sets are spaced 6 ft., and a few of them 4 ft. The wood guides are 5¾ in. by 7¾ in., and two of them, as shown, are strengthened by 7-in. channels.

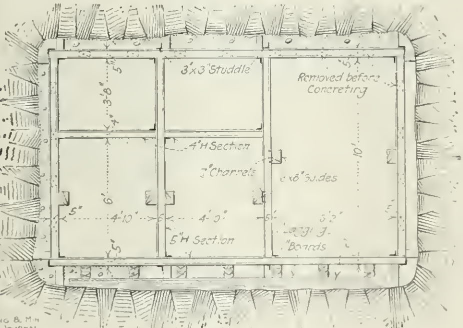

FIG. 1. PLAN OF SHAFT

Hoisting was done with two 26-cu.ft. buckets weighing 900 lb., operated by an electric hoist. Another single-drum electric hoist handled a light cage for timbermen running in the middle compartment of the shaft. The shaft passes through quartzite for part of its distance; the broken quartzite was saved and crushed for concreting purposes.

It was found possible when the rock would stand for 14 ft. below the lowest set, to rivet the steel members together on the surface, lower the set intact and swing it into place. Shoes on the two lower corners guided it to the shaft. Four one-ton duplex chain blocks were used for swinging it into position. To each corner of the set was fastened a ½-in. sling chain about 3 ft. long, with a 5-in. ring on one end and a 3-in. ring on the other, to which the hooks of the chain blocks were attached. When a 14-ft. space could not be maintained, the sets were riveted in parts and bolted together below.

When the rock walls were more than 8 or 9 in. from the sets, 4-in. tie timbers were placed vertically 4 in. outside the sets and about 2 ft. apart. Between the steel sets and these timbers, 4-in. wood blocks 12 in. long were placed. Ouside the verticals, 1-in. rough boards were set horizontally to act as outside forms when it came time to pour the concrete lining. Between the boards and the solid rock, lagging was filled in. When the rock was less than 8 or 9 in. from the sets, 4-in. flat timbers were placed between the flanges of the wall plates and end plates, and lagging was placed behind these up to the rock. This lagging was left in place until concreting time, when it was removed from the shaft.

During the process of sinking, at every 75- to 100-ft. point, two or three adjacent sets were filled in solid to the rock with concrete, eliminating the necessity of bearers set in hitches. This concrete was mixed on the surface and lowered in a hopper, from the bottom of which a flexible spout extended. The hopper is shown in Fig. 2 and the spout in Fig. 3.

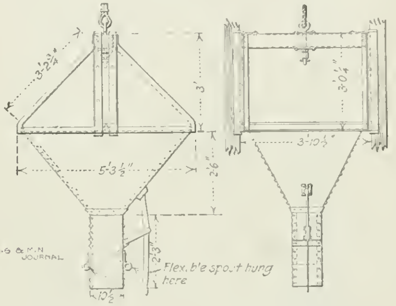

FIG. 2. HOPPER FOR LOWERING CONCRETE

When a depth of 1207 ft. was attained, it was thought necessary to complete the concreting, because of the approach of cold weather. This concreting was started at a depth of 1170 ft. The concrete was mixed on the surface in the proportions of 1 : 3 : 5 and carried through a launder to a 4-in. flanged pipe down the shaft, which telescoped into a 5-in. branch, shown in Fig. 3. The branch took the blow of the concrete, and at its bottom it was connected with a reverse bend having its lower end vertical. An 18-ft. flexible spout fitted over this directed the concrete to the proper place behind the form. While the concreting force was filling one set, other men were removing the blocking from the set above, hanging strands of old wire rope vertically 1 ft. apart and horizontally about 3 ft. apart, to be used for reinforcement, and placing the outside forms. For an 8-ft. span, 2-in. hardwood planks were used, and for the 4-ft. and 6-ft. spans, 1⅝-in. hardwood planks. The planks were cut on a bevel at the upper end, so that the concrete came out underneath the steel set to act as a support. At the bottom end, in passing into the outside flange of the H-sections, 2-in. strips of wood about 12 in. long were laid 1 in. apart between the bottom end of the plank and the inside flange of the section. When these strips were removed, the planks were easily taken out.

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*An abstract from an article presented before the Ishpeming meeting of the Lake Superior Mining Institute, Aug. 31, 1914.

The corners were left open for concreting, so that a solid column of concrete was obtained in each corner over the entire depth of shaft. Furthermore, where lagging and timber were left between the concrete and the rock, openings for the concrete were left directly back of the wall plates and end plates to the solid rock, so that in all cases the concrete extended from the steel set to the rock. A 6x8x12-in. block was laid in the concrete midway between the 8-ft. sets, to serve as a support for the two end guides.

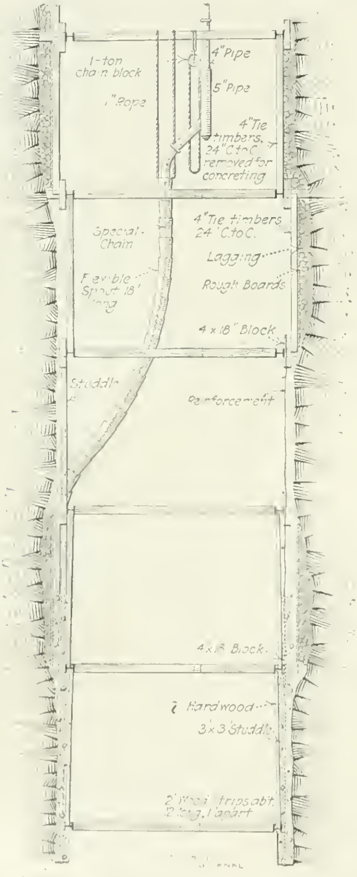


FIG. 3. VERTICAL SECTION OF SHAFT, SHOWING SET AND FORMS AND FLEXIBLE SPOUT

Nine miners and one foreman per shift did the drilling, blasting and mucking and assisted the timbermen in placing the sets, concrete bearers and 12-in. ventilating pipes. Three timbermen per shift, with two foremen for the 24 hr., lagged the sets, put in the guides, extended the air lines, placed the ladders and substituted for absent miners. There were, furthermore, for each 24 hr., four engineers, two toplanders, two men to handle rock, etc., and two blacksmiths.

The concreting required the 10 miners for removing lagging, placing reinforcement and placing plank forms. The four timbermen attended to the distribution of the concrete to the forms. On the surface, three men wheeled rock to the mixer, two men the sand and cement, one poured water and attended to the securing of the proper mixture, one discharged the mixer, one looked after the launder from the mixer to the 4-in. pipe and two men worked the concrete down the 4-in. pipe. All the men worked 8-hr. shifts on the concreting.

The speed of sinking the shaft, including the placing of steel sets and lagging, occasional concreting, etc., averaged from 4 to 4.56 ft. per day during several months. For the last three weeks in August, 1913, it averaged 5 ft. per day.

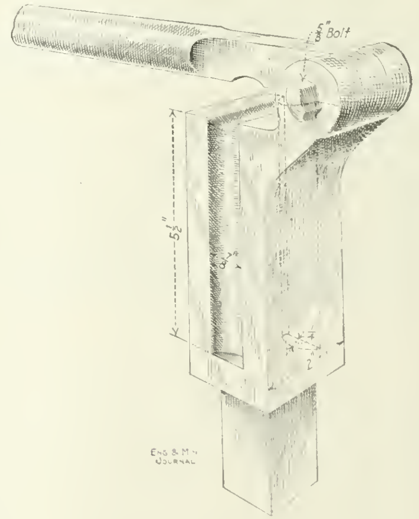
The speed of final concreting was from 35 to 48 ft. per day. For the total distance concreted, 78 gondolas of sand and 15,695 sacks, or 21 carloads, of cement were required.

⁂

U-Bolt Bending Tool

By DAN FIELDS*

The accompanying illustration shows a device for bending piston-machine U-bolts without battering the threads. The machine shown is adapted for making bolts for a 3⅛-in. drill, although it can be used for smaller bolts, if they are given one blow on the anvil.



DEVICE FOR USE ON THE ANVIL IN SHAPING MACHINE-DRILL U-BOLTS

To use the machine, the bolt is heated, placed on the center, clamped with the handle and bent down with a wood or rawhide mallet. The square-section projection on the bottom should be of the proper size to fit the anvil hardy-hole. The handle is about 3 ft. long and made of 1-in. round mild steel. It gives sufficient leverage to hold the bolt firmly.

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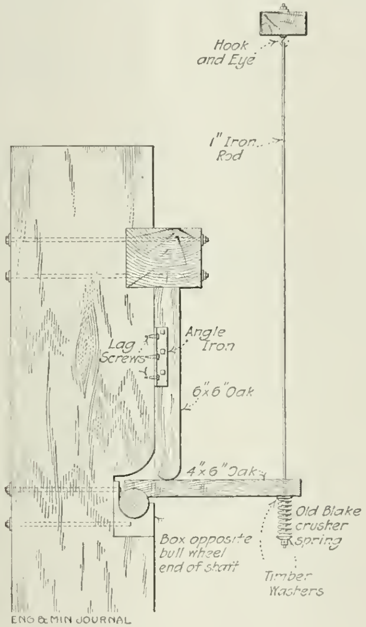
*Eureka, Utah.

Details of Milling and Smelting

Cam-Shaft Damper

By A. B. Parsons*

The accompanying sketch shows a simple contrivance for reducing cam-shaft vibration, which has proved effective in the Iola mill of the Candor Mines Co., at Candor, N. C. There are five 1750-lb. stamps with a 7-in. camshaft, and there has always been a tendency toward excessive vibration. The shaft has broken and been replaced several times, and the unbabbitted box at the end opposite the bull wheel suffered likewise and has been replaced once. Incidentally not a single stem has been broken in three years of continuous operation.



Cam-Shaft Damper

The installation of this damper has materially lengthened the life of the camshaft, has eliminated most of the wear of the box, and makes a noticeable difference in the smoothness of operation of the entire battery. The sketch needs little explanation. Two short pieces of oak, the iron rod, and any suitable spring is all that is required. The 6x6-in. piece must be fastened in some convenient manner to the front of the battery post, while the other piece is held in place by being fitted to the camshaft. The pressure is easily regulated by the nut at the bottom end of the rod, and by taking off this nut the entire device can be removed and gotten out of the way. A roof-truss member, or some other substantial support, is required for the upper end of the rod.

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*Mining engineer, Salt Lake City, Utah.

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Concrete Lining for Steel Bunkers

The Minnesota Steel Co., in building its plant at Duluth, Minn., has aimed to make it the best and the most economical steel-making plant in the world.

For supplying coal to its coke plant, there is provided a large circular steel tank. This tank is approximately 55 ft. in diameter, 40 ft. high and holds 2100 tons of coal. For furnishing coal for the gas producers of the openhearth furnaces, 33 parabolic bunkers, approximately 20 ft. wide, 12 ft. deep and 17 ft. long, are provided in a line in the gas-producer building.

In order to protect these steel tanks against the corrosive action of high-sulphur coal, it was decided to line the coke-oven bins with 5 in. of concrete and the producer bins with 2 in. of concrete.

Iron lugs were provided at numerous places on the inside of the tank. To these, vertical rods were securely wired, and to these rods triangular-mesh wire cloth was secured in horizontal bands, the wire mesh being held away from the steel by a distance of approximately $\frac{3}{4}$ in. Gunite was then applied by means of the cement gun. The first layer is shot through the mesh and serves to hold the wire cloth in place and thoroughly covers and protects the steel plate. The second layer, bringing it to a total thickness of 5 in., is then applied.

When the work is finished, the concrete is monolithic in construction and the surface is smooth and even.

Something should be said about the character of gunite. It consists of a mixture of portland cement and torpedo sand in the proportion of 1 : 3. This is mixed dry. It is then shot through a hose by the cement gun with an air pressure of from 40 to 60 lb. Immediately before emerging from the nozzle, the dry mixture is hydrated, the water coming through a separate and smaller hose. The quantity of water is under the control of the operator. Gunite is therefore simply a 1 : 3 cement and sand that is shot into place under pressure and hydrated immediately before it is deposited into its final resting place.

Several effects are produced. In the first place, the sand contained in the first mixture which strikes a hard surface like a steel plate, rebounds, falling clear of the work to the bottom in the form of clean sand and leaving a coating of neat cement on the surface. As soon as this coating has attained an appreciable thickness, it acts as a matrix, into which subsequent deposits of material imbed themselves. The gunite in immediate contact with the steel plate is clean cement. As a result of this, and of the pressure under which it is applied, the adhesion of the gunite to the flat steel plate, either painted or unpainted, runs as high as 500 lb. per sq.in.

The second effect of the application of concrete by this process is that the material is exceedingly dense. By ac-

and tests, made by competent engineers, it has been found that its porosity is only one-seventh that of ordinary concrete. It is practically waterproof and airtight. Furthermore, the bond between freshly applied gunite and a surface of gunite that has already set, is perfect, so that there is no possibility of air or moisture penetrating through the layer of gunite and reaching the steel.

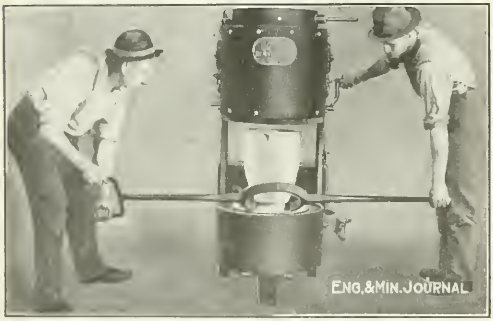
The thickness of gunite applied in this case was made 5 in. on account of the large size of the tank and the severe duty to which it would be subjected. In the case of the parabolic bins, which are much smaller and where the drop of the coal against the bottom and sides could never be great, the lining was reduced to 2 inches.

⁂

The Iler Crucible Furnace

This type of melting and refining furnace is designed to burn crude oil or gas. It is specially adapted to metallurgical plants, foundries and wherever crucibles are used at high temperatures, as in refining, small smelts, or melting brass, bronze or even steel. It is manufactured by F. M. Iler, 242 W. Florida Ave., Denver, Colorado.

The furnace is cylindrical and in two main parts. The lower part is the combustion chamber; the upper is the crucible chamber. A tight seal is formed between the two parts by rings upon the lower edge of the upper chamber that drop down into a bed of sand spread about the circumference of the lower chamber. Both parts have refractory linings in which are embedded coils of iron pipe through which air circulates from a blower to the burner, which is attached near the bottom of the furnace. This air conduit is provided with a slip-joint between the two units.



The Iler Crucible Furnace

The combustion chamber contains a stool for the crucible. The lining of this chamber is somewhat barrel-shaped to fit standard makes of crucibles, which may be either clay or graphite. A swinging lid on top of the furnace permits stirring and addition of charges or fluxes. Mounted at the rear of the base are column guides with sheaves for cables to lift and lower the upper chamber by rack-and-pinion mechanism, a counterweight being provided at the back. The furnace is easily opened and the crucible removed by an open-sided shank, as shown in the accompanying photograph.

Air, after traversing the coils, reaches the burner at a comparatively high temperature, thus giving thorough atomization to the fuel (if it be oil) and assuring a most effective mixture of the fuel and air, an essential point in the production of a short flame. As the flame enters the chamber tangentially, it swirls about the stool and crucible, completely filling the space between the crucible and the walls, but not passing out in the flue. In one pyrometer series of tests, the air coming from the coil showed temperatures from 458° to 550°, F., while the temperature of the melt was 2100° F. Much higher temperatures are possible. Mild steel, requiring heats of from 2400° to 2700° F., may be melted. Experiments have been made to determine the increase in efficiency due to the preheating of air. With gas, there was shown to be a saving in fuel of 19.7%, while with oil a greater economy is indicated.

The furnace is portable. The No. 60 size requires a floor space of 3x4 ft., and weighs about 1600 lb. It may be obtained in any size to accommodate a standard crucible of corresponding number. The only auxiliary equipment required is a blower that will deliver 180 to 250 cu.ft. of air per minute at a pressure of 10 to 16 oz. When desired, it is built as a tilting furnace. During the last 15 months, one of these furnaces has been in steady use and has proved efficient, economical in operation and furnishes increased comfort to its operatives.

⁂

Separation of Bismuth and Copper

The separation of bismuth and copper as they occur in various metallurgical byproducts, particularly those from electrolytic lead-refining, is covered in a recent patent of William Thum (U. S. pat. 1,098,851). The metals are supposed to have been brought to the state of oxides, as they would occur, for instance, in a cupeling-furnace slag.

This oxide slag crushed to 4-mesh or finer, is mixed with sodium sulphate carrying an amount of sulphur in excess of that required to matte the copper, and carbon in excess of that required to reduce the salt cake to sodium sulphide, and all of the oxides to metal. This mixture is then smelted at a temperature between 2500° and 3000° F., giving three layers, metallic bismuth, copper matte, and a soda slag.

It is obvious that this process would work, using sodium sulphide instead of salt cake and the carbon to reduce it, but sodium sulphide is more expensive than salt cake, and is deliquescent, which constitutes a source of danger if the charge be put in the furnace a little at a time.

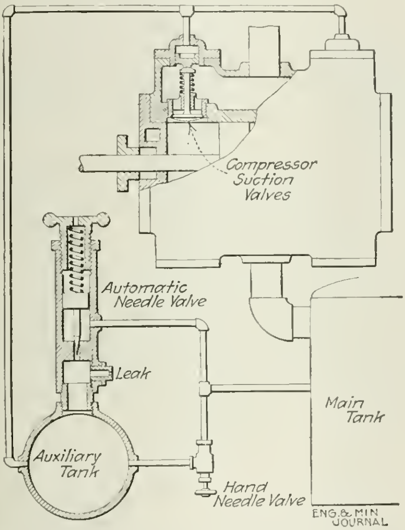
Most of the silver and gold in the oxide slag will go with the bismuth. Most of the arsenic and antimony go with the soda slag, tellurium enters the copper matte, alumina slags as sodium aluminate, silica also, but large amounts of silica are detrimental, while lead enters the slag to the extent of 40%, 10% enters the matte, and 50% goes with the bismuth.

In the smelting process, after the charge ceases to boil the slag is tapped or skimmed off, and the charge is then allowed to cool from 10 min. to half an hour, the matte is removed, and a calorimetric test made on the bismuth for copper. If the copper is less than 1% and the original material was not too rich in silver and gold, the bismuth can then be cast into anodes. If the copper exceeds 1%, it is best to reoxidize the metal by compressed air blown through the charge by iron pipes inserted in it, and then repeat the original separation.

Mining & Metallurgical Machinery

Hall Volume Regulator for Compressors

The Hall Steam Pump Co., Pittsburgh, Penn., has brought out a new device which can be applied to any kind of air compressors with automatic inlet or outlet valves, or both, and makes it possible to control the amount of intake air so as to: (1) Correspond exactly to the amount of compressed air consumed at any time, thereby keeping the receiver pressure absolutly constant; (2) decrease with increasing receiver pressure, thereby keeping the power required to operate the compressor constant; (3) deliver any desired constant volume within the capacity of the compressor, or fill almost any other requirement which the conditions of operation of an air compressor may impose.



Hall Regulator Applied to Poppet Inlet Valve

The application of this regulator to an ordinary poppet-valve air compressor, acting upon its suction valves so as to keep the receiver pressure constant, is shown in the illustration. The suction valves are provided with springs which tend to close them and with small pistons which are acted upon by the air pressure. The cylinders in which these pistons work are connected to an auxiliary tank. This tank communicates with the atmosphere through a leak and with the main air receiver through an opening closed by means of an automatic pilot needle-valve as soon as the force of the spring above overcomes the receiver pressure acting on the bottom of the valve piston.

A hand needle valve can be arranged so as to obtain a constant leak from the receiver to the auxiliary reservoir, thereby preventing the pressure in the latter from decreasing below a certain value.

When the compressor is working at a constant partial load, the automatic valve will allow some air to enter the auxiliary tank and the same quantity of air will escape through the leak, thereby keeping constant the pressure in the reservoir and the pressure acting upon the suction-valve pistons. The suction valves will close at such a point of the discharge stroke as to compress exactly the quantity of air consumed, the pressure in the receiver remaining constant.

A change in the consumption of air will cause a slight momentary increase or decrease of the pressure in the receiver and the quantity of air entering the auxiliary reservoir through the automatic valve opening will increase or decrease, thereby changing the pressure in the reservoir and the cutoff of the suction valves until new conditions of equal supply and consumption of compressed air are established at exactly the same pressure as before.

For a certain pressure in the auxiliary tank the compressor will work at its maximum capacity, and the object of the hand needle valve is to admit constantly so much air to the auxiliary tank as to produce said pressure. If more air is admitted through the valve, the capacity of the compressor will be reduced and the volume of the intake air will vary with the consumption only as long as the latter remains below the reduced capacity.

The application of the same principle to the regulation of the discharge valves of a piston inlet type of compressor involves only some changes in detail. Applications of electrical control to the operation of the regulator are also possible.

⁂

Jackhamer Auger Drill on Mesabi Range

The Ingersoll-Rand Jackhamer Auger drill has recently been introduced on the Mesabi range, and Charles H. Claypool, superintendent of the Cavour Mining Co., at Virginia, Minn., reports some interesting results from its use. No special tests were made with the drill, but a good comparison was possible between results from the air auger and hand auger.

Previous to the introduction of the air auger, the system employed at the Cavour mine was that generally used on the Mesabi. The miners drilled and blasted their own ground, put in their own timber with the help of a timber man, mucked up the ore and trammed it to the pockets. Hand augers were used in drilling, and two miners could drill a round of five 6-ft. holes in about two hours, the Cavour ground being somewhat harder than the usual Mesabi ground. The average drilling speed was about 1 ft. in 8 min. Blasting was done at the noon hour and at the end of the shifts, and occasionally during the shift. In places where the air circulation was not good, considerable time was lost in waiting for the air to clear up. When working two shifts, five gangs of miners each, the production ran about 3.75 tons per man for every man employed, this low figure being due to the small number of producers compared to the number of nonproducers employed.

The introduction of the air auger permitted the system to be changed so that muckers were employed instead of miners. Under the new scheme, all the drilling and blasting are done by two men and the timber is all handled and put in by regular timber men. The muckers simply shovel ore and tram it to the pockets. All drilling, blasting, timbering, track work and underground repairs of all kinds are done on the night shift, so that nothing interferes with the tramming and hoisting which is done only on the day shift.

The advantage in this system of working is that there are special men for each kind of work and each man becomes an expert in his particular duty. As a result, it has been found at the Cavour mine that the powder cost has been reduced over 50%, because the drill men become proficient in placing holes and using powder. The cost of timbering has likewise been greatly decreased. Under the new system, the production per man is about 5.25, compared with 3.75 tons per man, with the old system, the total production remaining the same. The drilling speed has increased from 1 ft. in 8 min. to 1 ft. in 1 min. The muckers tram an average of 26 tons per shift per mucker.

The item of labor in drilling has been greatly reduced by the air machines, and while the increase in production per man is probably due largely to the new system of operation, the latter has been made possible only by the use of the air auger.

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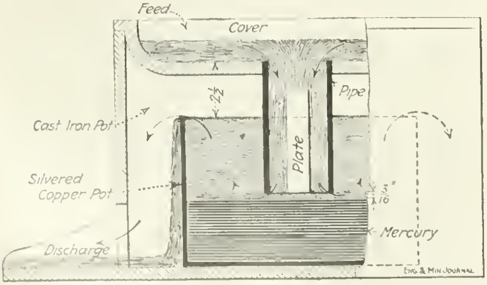
The Kuehn Amalgamator



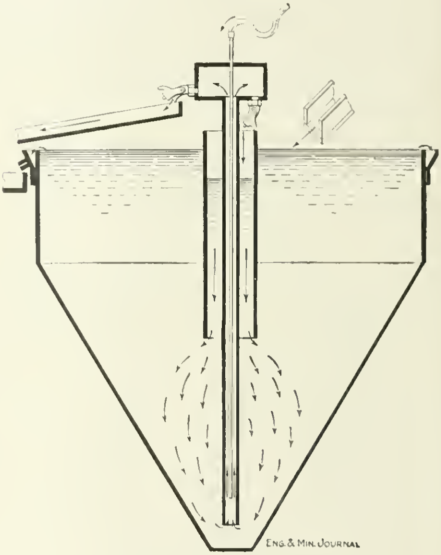
Kuehn Amalgamating Device

A new device which is being offered to mill operators for recovering free gold from pulp or tailings, is known as the Kuehn amalgamator. It consists of a cast-iron pot about 12 in. deep, and the same in diameter. Inside of this there is another pot made of silvered copper plate, which is charged with about 24 lb. of mercury. Covering the inner pot is an iron cover, in the center of which is a short length of 3-in. iron pipe, reaching to within $\frac{3}{16}$ in. of the surface of the quicksilver. The pulp travels vertically down this pipe and impinges upon the surface of the mercury. There is a longitudinal division in the pipe to prevent swirling of the pulp. The pulp does not pass through the mercury but the gold is expected to be thrown against it by its own momentum. There is no special pressure on the column, the head being only about 2½ in. Too much pressure might tend to flour the mercury. The accompanying sketch shows the arrangement of the essentials of the device.

⁂

Rothwell Pulp Thickener

A new pulp-thickener device has been designed by John E. Rothwell, of Butte, Mont., and granted U. S. Pat. No. 1,099,396, which has been assigned to the Colorado Iron Works, of Denver. The device is designed after the ordinary cone, but has no opening at the apex. The accompanying drawing shows the features and operation of the machine.



Rothwell Pulp Thickener

Pulp is introduced into the cone through the launder, the clear solution overflowing into the peripheral launder, and the solids set toward the apex. Upon reaching that point, the thickened solids are taken by an air lift and elevated into a chamber at the top of the device. Here part of it is taken away through a gate and launder, while part of it can be returned to the central cylinder, thus settling into the bottom of the tank again. By this means, the air lift can be operated at a capacity much greater than the output of thickened slime, the excess going back into the cone again. The operation tends to prevent the accumulation of heavy, hard solids at the bottom of the cone. There appears to be no reason why this device should not work satisfactorily, although its advantages over other thickening devices are not yet perfectly defined.

⁂

A New Self Contained Portable Motor-Compressor Set has been put on the market by the Westinghouse Company It runs on either alternating or direct current. There is 15 hp. required, and it blows off at 100 lb. per sq.in. The compressor is furnished by the Sullivan Machinery Co.

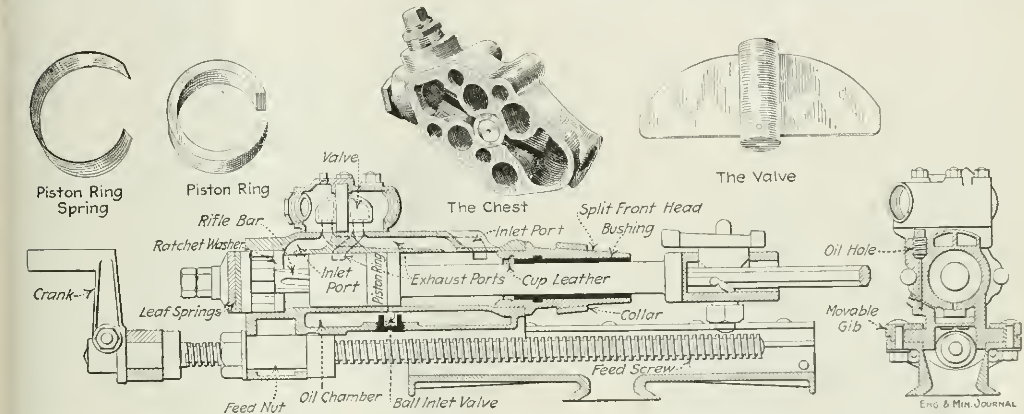
Modern American Rock Drills--II

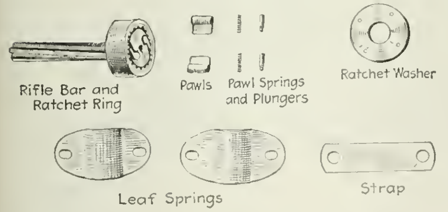
By L. O. Kellogg

SYNOPSIS—Ingersoll-Rand butterfly-valve drill has oscillating valve, short piston, adjustable gibs. Sullivan Liteweight has air-thrown spool valve, may be fitted with hollow piston and hollow steel to carry water to bottom of hole. Sullivan Hy-Speed has auxiliary valve, may also be fitted with water attachment.

⁂

The most modern machine put out by the Ingersoll-Rand Co. is the butterfly-valve, one-man type. Its most interesting feature is the butterfly valve itself. This consists of a trunnion having two wings. The trunnion rests in suitable bearing holes in the chest, and by an extremely slight oscillation moves the wings to open and close air inlet and exhaust ports. Four ports are thus taken care of, an exhaust and an inlet for each end of the cylinder. The valve chest is mounted diagonally on the back of the cylinder and has connections for air inlet and exhaust. This operation is best represented by the diagrams *A*, *B* and *C*. In *A* is shown the beginning of the forward stroke. The butterfly valve is in a position to admit air back of the piston through *S*2 and permit exhaust from in front through *E*1. The other two ports, *S*1 and *E*2, are closed. As the piston moves forward, it uncovers the port *E*2. The only effect of this is to bring the full air pressure on two faces of the valve, so that it is balanced and is held to its original position only by the excess pressure through the impact of the entering air at *S*2.





Ingersoll-Rand's Butterfly-Valve Piston Drill. Sections and Details

In diagram *B*, the piston has almost completed its stroke, the exhaust port *E*1 is closed, and the air is now being trapped in front of the cylinder and compressed; pressure is thus exerted against the valve in *S*1 and before long the effect of this pressure in conjunction with that of *E*2 overcomes the pressure of the incoming air and throws the valve over. By this time the piston is at the end of the stroke, as in diagram *C*, and an exactly similar cycle for the back stroke is about to begin. The air passages from the valve ports to the cylinder lie in the thicker portion forming the top cylinder wall.

The front head of the cylinder is unusually long and consists of a sleeve or collar outside, a split head inside with a split bushing bearing on the piston. A cup leather held in the bushing serves as packing against air leakage. The inside of the sleeve and the outside of the halves of the head are tapered so that as the sleeve is drawn back by the side rods or through bolts, the head and bushing halves are forced tightly together. The piston ring is of fiber and is in one piece; it is forced out against the cylinder wall by a thin leaf spring bent almost to a complete circle.

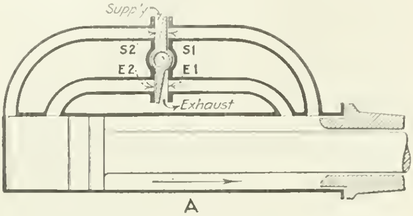
Three styles of chucks are furnished; one consists of the U-bolt loosened and tightened by the nuts on the end; the other consists of the U-bolt with wedge tightening; and in the third style the wedge and the key which bears on the shank of the drill steel are combined in a single piece. The half bushing for the chuck is prevented from turning by lips which engage in slots in the chuck; it is reversible when worn. This type of bushing is designed to take steel of various section and somewhat varying in diameter; octagon or round steel will fit without difficulty.

In the rotation mechanism the rifle bar carries the pawls, and the teeth of the ratchets are cut internally in a ring which remains held by friction between the rotation washer and the back head. The ratchet ring can slip if the torsional stress becomes too great on the rifle bar, and thus the danger of breaking the rifle bar is reduced.

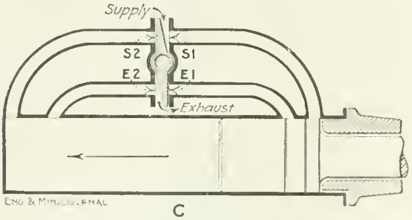
The side rods or through bolts work against two nearly flat, oval leaf springs across the back of the machine.

both rods passing through both springs. The effect of this is to equalize the pressure on the two sides, thus preventing either bolt from taking the entire stress of a blow and consequently making breakage less liable.

The shell has adjustable gibs to allow taking up in case of wear. The lugs on the cylinder and the guide ways of the shell are right angled. Wear is taken up in either direction by the use of separate shims. The shell rods or studs extend the full length of the shell.

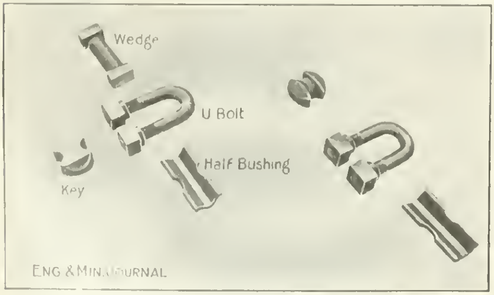


A



C

Lubrication is taken care of by a chamber cast in the bottom of the cylinder. An oil hole from the top of the cylinder communicates with this. A port opening upward from the chamber to the cylinder is alternately covered and opened by the piston; it is closed by a spring-actuated ball valve which opens and closes according to whether it is subjected to the full air pressure or to exhaust. A minute quantity of oil is thus sent to the cylinder at each stroke.

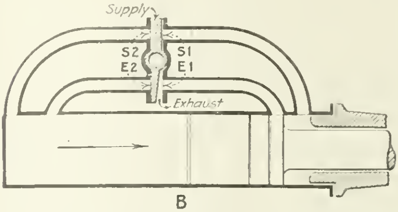


Parts of Two Types of Ingersoll-Rand Chucks

The original butterfly-piston machine has the following dimensions: Cylinder, 2¾ in. in diameter; stroke, 6¼ in.; overall length, 42 in.; weight, 180 lb. Other sizes are now made.

The Sullivan Liteweight

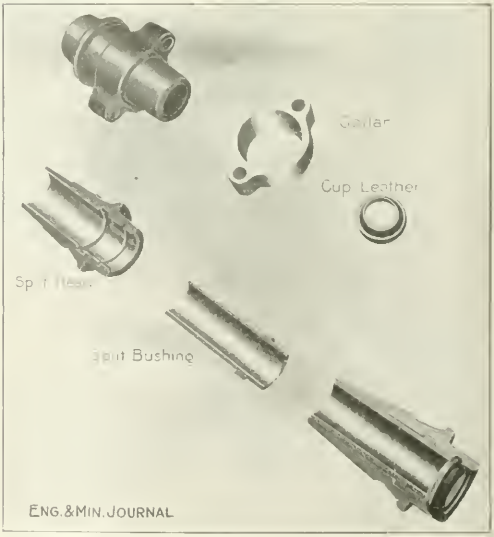
The Sullivan company makes for mining use two piston drills, the "Liteweight" and the "Hy-Speed," the former equipped with a differential spool valve, the latter with an auxiliary-type spool and tappet valve. Either type can be fitted with hollow piston and hollow steel for cleaning the hole by water and air under pressure. The Liteweight model has a relatively short piston and cylinder.



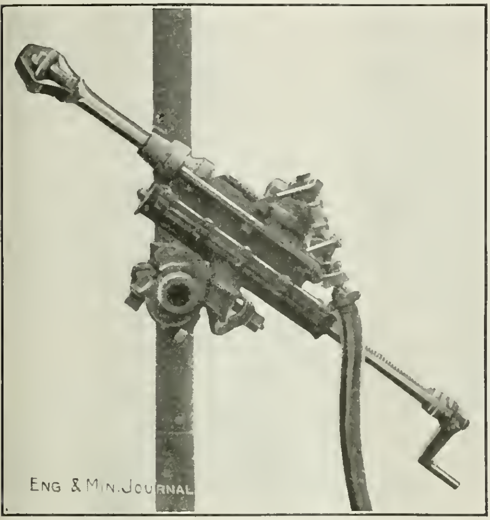
B

Diagrammatic Representation of the Butterfly-Valve Operations

The center portion of the piston head is turned smaller and this is always open to exhaust. As the piston reciprocates it alternately covers and uncovers small cross-ports, leading to the ends of the spool valve. These may be thus open to exhaust, open to live air, or closed entirely by the piston head. Differential pressures are thus created which throw the valve. Toward the end of any stroke the piston head opens to live air the cross-ports to the end of the valve chest toward which it is moving, and opens to exhaust those to the other end. This throws the spool valve in the direction opposite to that in which the piston has been moving and thus opens to exhaust the end of the cylinder formerly receiving live air, and admits live air to the other end, so that the piston reverses its motion. At one point in the stroke, both of the cross-ports may be open to exhaust; this would tend to give an equal pressure in both directions on the spool valve, and a slight excess pressure in the



Ingersoll-Rand Butterfly-Valve Piston Machine Front Head wrong direction might cause it to leave its seat and flutter. To avoid this the center spool of the three-spool valve is made slightly larger than the end spools, so that there is always a little excess pressure in the right direction, due to the live air passing by. This excess area also tends to delay the throwing of the valve, and the time of reversal is thus controlled by the amount of excess. Furthermore, it compensates for any possible leakage of live air between piston and cylinder into the exhaust area around the center of the piston, which might produce a differential pressure in the wrong direction and throw the valve when not desired. The exhaust from around the central portion of the piston head takes place through a separate opening in the bottom of the cylinder as shown. If it were carried to the same exhaust opening as that of the cylinder ends, there would be danger that the back pressure might disturb the operation of the valve.



THE INGERSOLL-RAND BUTTERFLY PISTON MACHINE

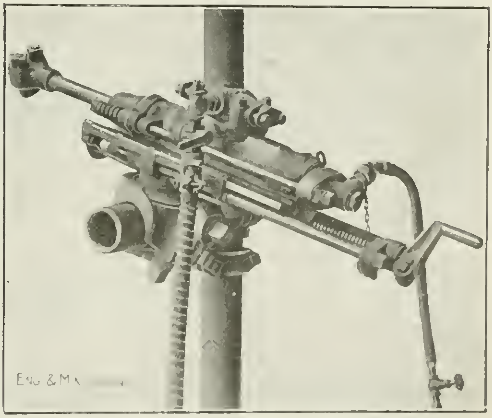
The valve chest is of what is known as the side-rod pattern. Plugs are held in the ends by leaf springs at each end, the springs being kept in action by two small through bolts contained in holes through the chest itself; these holes are lined with seamless steel tubes to prevent air leakage. The shock of the valve striking the end plug and buffers is taken up somewhat by the spring. The buffers are kept tight by bearing against end seats. The valve chest is provided with an exchangeable hardened steel bushing.

The piston rings are in three pieces, held out with circular leaf springs. Annular grooves are cut in the piston head between the piston ring and the smaller central portion, and these are connected with the small section portion by longitudinal grooves. The effect of this is to make the central reduced-section portion actually larger so far as the control of the valve is concerned, but at the same time give sufficient bearing surface on the cylinder wall.

The rifle bar has five flutes; this gives a large amount of bearing surface. The ratchet teeth are cut on the head of the bar and the pawls and springs are carried by the ratchet ring. The bar is extended into a rear bearing in the back head. Between the ratchet head and the cylinder is a collar with the inside corner beveled so that the pressure of blows on the front head transmitted by the side rod to the back head and thus to this collar is given an outward component and does not tend to upset the cylinder inwardly and thus cause the piston to bind.

The ordinary chuck is of the U-bolt type with a key working through a hole in the top of the bushing and a button between the ends of the drill shank and the piston rod. The back end of the bushing is split longitudinally on top to permit the speedy extraction of the chuck. When desired the key or clamp block is made with a flat back and a wedge key is provided to tighten the shank without screwing the bolt nuts. The V-pattern half bushing, which will accommodate almost any style of shank in several sizes, is also furnished, but is not recommended, since it is maintained that the steel, if too large or too small, may be eccentric with the axis of the piston when using this chuck and have a tendency to make the bit bind in the hole.

The front head for air consists of a housing conical inside and out; in this is a bushing split in half and itself containing a bronze lining and a packing ring. The housing is brought back over the end of the cylinder outside with a machined joint which is tight and is designed to decrease the tendency of the cylinder to be cracked off at this point when the piston rod is subjected to bending. The conical shape of the inside of the bushing and the outside of the bronze lining has the effect of bringing the bushing and lining to a tight fit by the natural vibration of the machine.

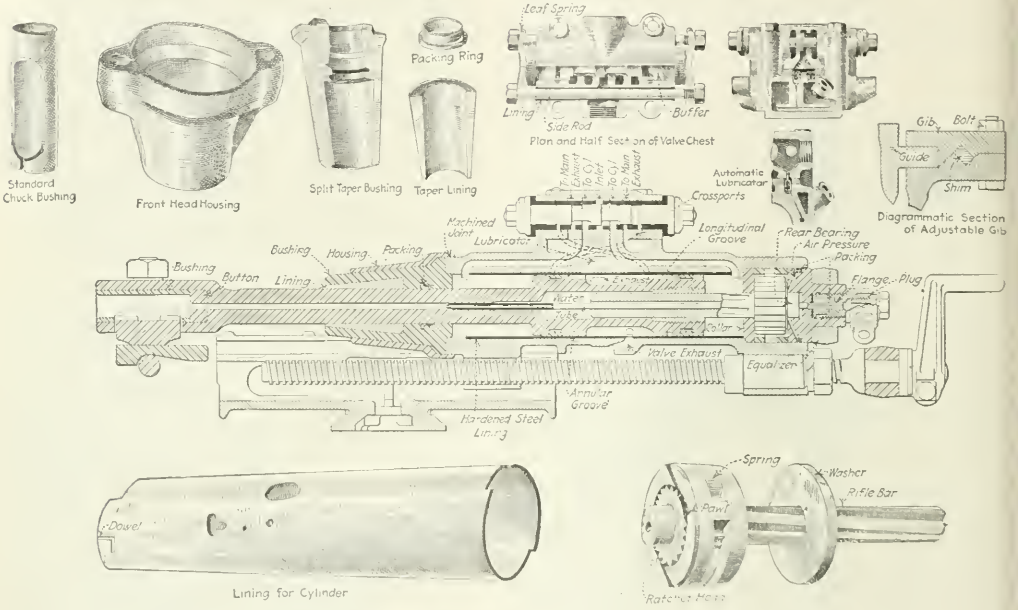


THE SULLIVAN LITEWEIGHT WITH WATER ATTACHMENT

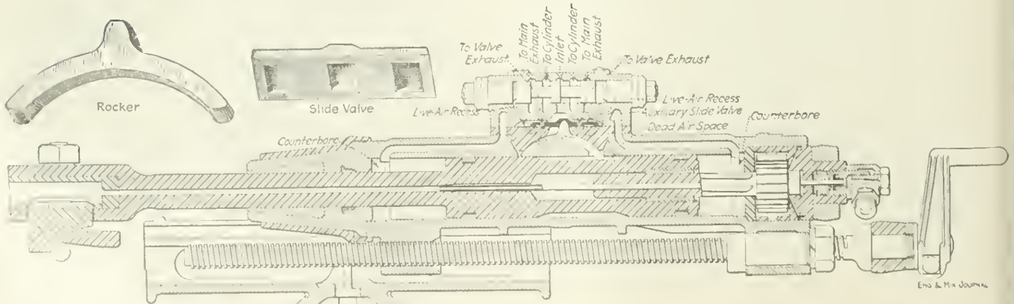
An innovation in rock-drill practice is the fact that the cylinder of the Liteweight drill is lined with a hardened-steel shell, which is pressed into the casting and held by slotting the end a short distance in and bending back a small portion as a dowel into a recess of the cylinder casting. This prevents motion of any sort. This lining is said to greatly increase the length and efficiency of service of the cylinder.

The back head is grooved outside to carry a packing strip in order to prevent leakage; this is held against the cylinder by live air through radial ports. Across the back there is applied an equalizer which consists of a transverse piece having a convex surface bearing on the back head. Its effect is, by rocking somewhat, to take up variations in tension on the two sides. The side-rod springs proper are of the helical type and are applied at the front-head end of the through bolts.

Lubrication is effected automatically by means of a chamber cast in the drill cylinder just below the valve chest and connected thereto. It is constructed as shown in the illustrations. In the oscillations of the spool valve as it passes its middle position, the inlet ports at both sides of the cylinder are shut off for an instant, the pressure in the valve chamber is raised so as to overcome the spring resistance in the right-hand ball valve. This admits a little high-pressure air to the oil chamber. When a cylinder inlet is opened to the valve chamber, pressure falls therein and the left-hand valve opens, allowing a little oil to enter the valve chamber and then be carried to the piston and cylinder.



The Sullivan Liteweight, Assembled and in Detail



The Sullivan "Hy-Speed" in Longitudinal Section with Details of Auxiliary Valve

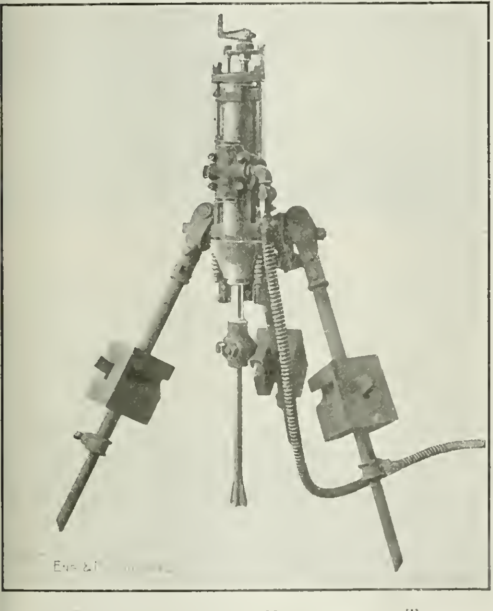
The shell is regularly of the solid-gib type. A shell with movable gibs is also furnished. These are bolted to the shell body on a bevel joint. By means of various thicknesses of shims introduced as shown, adjustment is obtained along this joint in both lateral and vertical directions.

The water attachment is not unlike that used in the familiar Leyner drills. A tube or needle runs through the hollow rotation mechanism and enters the hollow piston rod, so that water is carried to the hollow drill steel. On the back end of the tube a small flange is fastened as shown, and this being set in packing makes a water-tight joint when the plug is screwed down on it.

For down-hole drilling it is found sufficient to clean the hole with air alone, depending on water poured into the hole outside the drill steel to form a sludge of the cuttings when this is necessary to provide a proper cleaning effect. This is effected by omitting the water connections, but using a hollow piston rod. Live air then passes between the rifle nut and the rifle bar and so gains entrance to the piston rod and hollow steel. This takes place on the down stroke. While live air is thus consumed, it is stated that the additional consumption averages only 10%, being less on long steel than on short. Cylinder diameters are 2⅝, 3¼ and 3⅝ in.; the corresponding strokes are 5¾, 6½ and 7 in., respectively, and the unmounted weights of the three sizes of machine are 162, 295 and 325 pounds.

The Sullivan Hy-Speed

The Sullivan Hy-Speed differs from the Liteweight chiefly in its valve mechanism. A few other points of difference, however, also require attention. The valve arrangement is of the auxiliary type, the whole mechanism consisting of three moving parts, namely, the rocker, or tappet, the auxiliary slide or "D" valve, and the spool valve proper. The action in general may be described as follows: The bevels or shoulders on the piston, strike and move mechanically the rocker, which in turn moves mechanically the small slide valve: this raises differential air pressures in the spool valve, so that it is thrown and reverses the air feed and exhaust to the ends of the main cylinder. The slide valve is held to its seat by air pressure. The spool valve differs in design from that of the Liteweight, having all three spools of the same diameter. The arc rocker has a central projecting tooth which engages the socket in the bottom of the slide valve as gear teeth engage. The reduced section or spooled diameter of the piston head is a dead air space not open to intake or exhaust, so that there is no leakage taking place past the spool valve; furthermore, the live air from either end of the cylinder, in order to escape, must pass both sets of piston rings, so that leakage from this source is reduced to a minimum, on the principle of the labyrinth passage. Furthermore, the space acts as an accumulator of oil and aids lubrication.



The Sullivan Hy-Speed Mounted on a Tripod

The small slide valve works in a valve chest which is in permanent communication with live air through two recessses at the ends of the seat. Of the four ports in the seat, one in each side leads to exhaust and the other to an end of the spool-valve chest. As shown, live air is entering from the main valve inlet, passing over the right end of the slide valve into the recess, which is put into communication with the port to the right end of the spool valve; this latter is consequently held to the left. The slide valve in this position puts the left end of the spool valve in communication with exhaust. When the right bevel shoulder on the piston strikes the depressed end of the tappet, the slide valve will be thrown to the left, putting the air port to the left end of the spool-valve chest in communication with live air and the other in communication with exhaust air, and thus throwing the spool valve and reversing the direction of motion in the piston. The exhaust of the spool valve is independent of the main cylinder exhaust.

The cylinder of the Hy-Speed is not lined, but it is hardened to a glass-smooth finish. The ends are counterbored, a feature which presents two advantages; in the first place, it permits reboring of cylinders that may become worn out of true, so that it will take a new piston and will fit the old front- and back-head. It also tends to prevent upsetting and binding of the piston, besides providing a means for equalizing the inlet air pressure against the piston rings.

The piston has its ends reduced in section so that it will not strike the head and become upset, binding the rings and sticking in the cylinder. This is also true of the Liteweight piston.

The position of the bevels on the piston head determines the time of reverse and for hard rock a later reverse and a harder blow are made possible by changing the position of these bevels.

In other respects, the machine is made like the Liteweight. The Hy-Speed is made with cylinder diameters of 2¾, 3, 3¼, 3⅝ and 4¼ in.; the corresponding strokes are 5½, 6, 6½, 7 and 7¾ in.; and the weights unmounted are 250, 275, 330, 380 and 640 pounds.

(To be continued)

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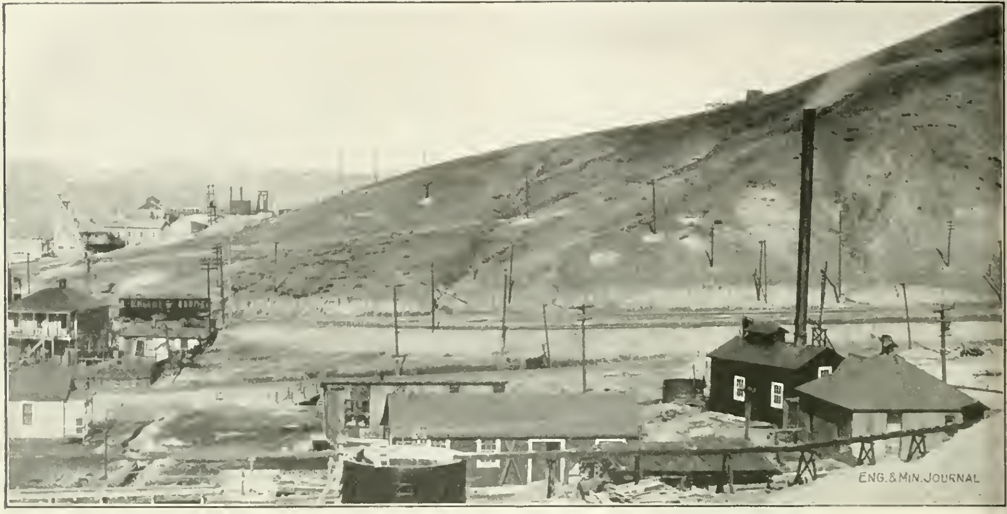
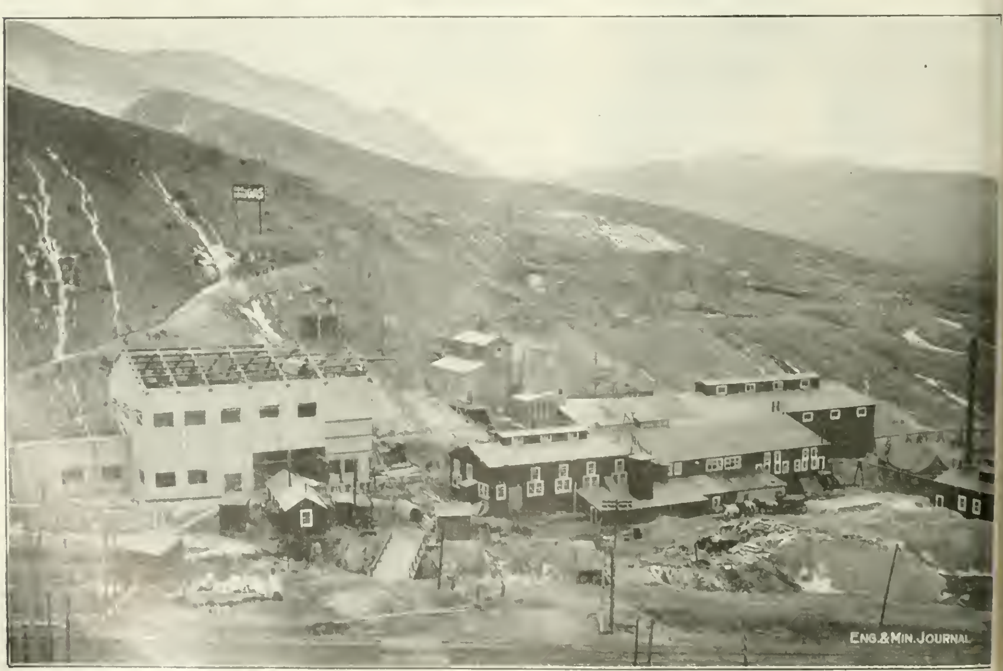
Argentine Mineral Exports

A U. S. consular report from Rosario, Argentina, says that the principal mineral exported from that district at present is wolfram. Exports from Rosario amounted to 637 tons in 1912, and 539 tons in 1913. This is exported by the Hansa Sociedad de Minas, a Germany company, which disposes of its output in Germany. It is not known whether any wolfram will be available for the American market. The subject is being investigated. Rosario also exports small quantities of borate of lime to Germany and Belgium. Exports have been small recently. Considerable quantities of copper ore and ingots were exported formerly, but since the closing of the Famatina mine in the spring of 1913, shipments have ceased.

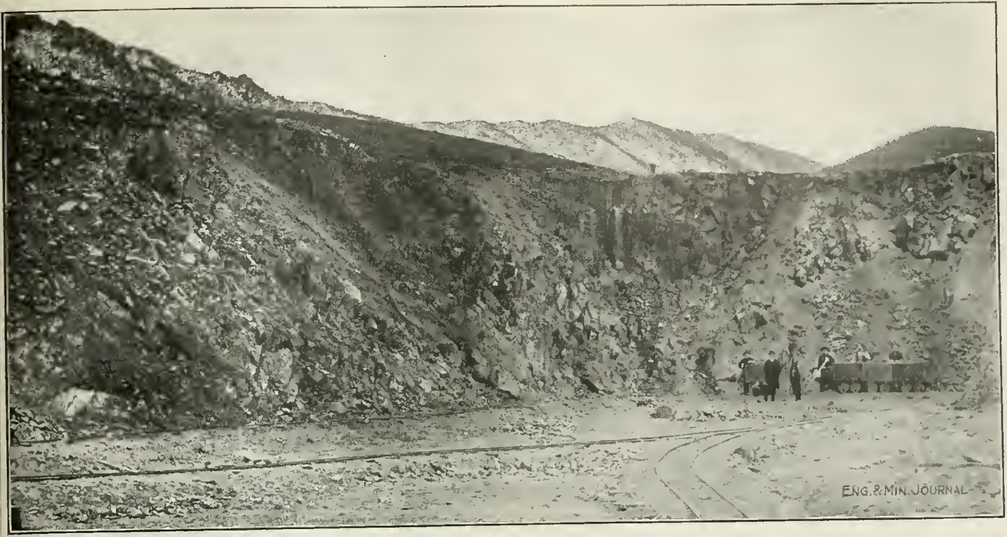
Photographs from the Field



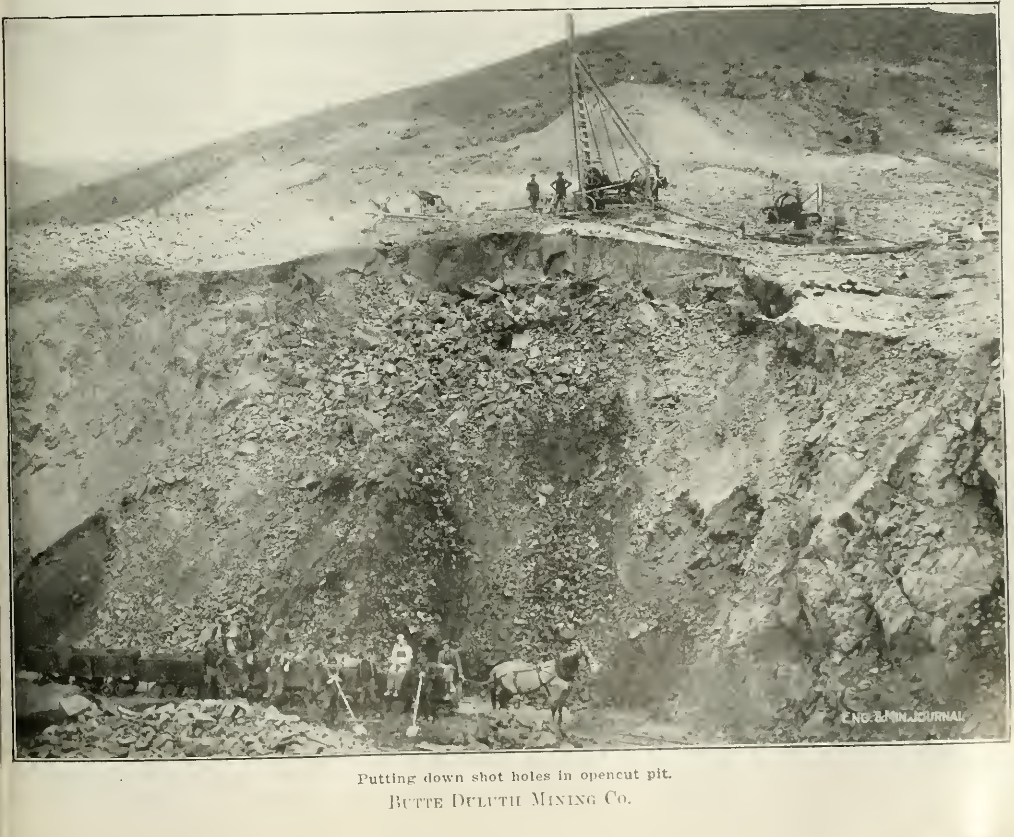
Montgomery shaft and buildings on far side of track.



The plant under construction.
BUTTE DULUTH MINING CO., BUTTE, MONT.



Opencut pit.



Putting down shot holes in opencut pit.
Butte Duluth Mining Co.

Correspondence and Discussion

Ore Treatment at the Argo Mill

In the JOURNAL of Aug. 22, A. H. Roller has seen fit to characterize as incorrect several statements made by me in a previous article. I wish to say that there are no mis-statements or exaggerations in that article. The statistics appearing therein were compiled from the office records, which are still available.

We do not begrudge Mr. Roller any credit due to him "For having taken off the rough edges," but we do sincerely resent the implication that the mill was brought by him to its present state of efficiency just on the eve of change of management.

JACKSON A. PEARCE.

Idaho Springs, Colo., Aug. 29, 1914.

⁂

The Burt Revolving Pressure Filter

Referring to our article in the JOURNAL of June 13, I should like to call attention to the following errors:

On the power diagram, Fig. 1, p. 1185, the following footnote was left off: "Discharge of rotary filter, showing peak load portion while six presses and pump are running." Without this note it appears that one filter takes 30 hp., instead of the six filters and one pump. A test on one filter alone showed a consumption of 3.7 hp. when running under normal conditions.

On p. 1189, line 9, an omission occurred. It should read: "Formerly it was the custom to acid-wash the mats while in the filter, and change only those which were worn through. Due to the acid solution falling on the cement floor, which always has a thick coating of lime salts, the acid consumption was high."

Owing to the disturbed conditions in Mexico and being unable to get at my papers, it has been impossible until now to call attention to these errors.

A. B. MYERS.

El Oro, Mexico, Sept. 26, 1914.

⁂

The Davey Mine Cave

I have just read an account of the cave-in at the Davey mines of the American Zinc, Lead & Smelting Co., Carterville, Mo., in the JOURNAL of Oct. 10. This article is a little sensational. The statement as to the area caved is correct. Owing to the geological formation, however, there was absolutely no danger of large loss of life. In fact, no [illegible] man was in a dangerous spot except the tub hookers who were exposed to 1x12-in. boards falling in the shaft.

The area caved was overlaid by a "soft-ground" formation, which developed a weak spot, causing the caving. Most of the ground mined is covered by 200 ft. of unbroken limestone. As soon as the caving ground reached this formation, it was effectively stopped. Fully 15% of the ore is left in pillars under the area in which men were working.

The mine is now operating at full capacity and the total cost of putting it into operating shape after the caving has not exceeded $4000. Anyone likes to make a good story of a bit of news, but we wish to go on record as contradicting the opening sentence of your article. All men were moved from the danger zone three days before the cave-in occurred.

J. H. POLHEMUS, Manager of Mines,
American Zinc, Lead & Smelting Co.

Carterville, Mo., Oct. 13, 1914.

⁂

Reversing Rope on Single-Drum Hoist

I note in the JOURNAL of Sept. 5 an article by R. S. Schultz, Jr., giving a method for reversing a rope on a single-drum hoist. I think there is a much easier way than that to change ends with a wire rope that is no longer than 2000 to 4000 ft., provided there is a space about 50 ft. square available outside of the engine house or shaft house. The method consists of starting a coil about 10 or 15 ft. in diameter and continuing coiling, working toward the outside until the rope is all off the drum; it is easy to lay three coils to a foot. With the rope off the drum, all that is necessary is to cut the socket end from the rope, fasten the socket to the other end, which will be at the outside of the coil, fasten the inside end to the drum and wind it up.

JOSEPH HOCKING.

Osceola, Mich., Sept. 28, 1914.

⁂

Company Stores

In John T. Fuller's article in the JOURNAL of Sept. 26, 1914, I note in regard to the De Beers compounds, that "no profit is made by the company's stores in the compounds. Everything is sold at cost." I have seen the same thing done in the Southwest, and it was cheaper to pay freight on retail lots of goods from Denver than to buy at the company store. Of course, De Beers may be different, but I wish we could get a Kafir's view on the question.

A. A. NASON.

New York, Oct. 5, 1914.

⁂

Clearing Dredge Buckets with a Monitor

Referring to the note under the above heading on p. 491 of the JOURNAL, Sept. 12, 1914, it may interest some of your readers to know that our suggestion to the Natomas company to use high-pressure jets of water for this duty, was based on our successful earlier application of the same principle to the clearing of elevator buckets. A small jet will dislodge the contents of a tightly packed bucket provided the pressure of the water be high enough.

ELMORE & ELMORE.

London, Eng., Oct. 7, 1914.

Imports and Exports of Lead

The exports of pig lead from the United States for the eight months ended Aug. 31 this year reached a total of 92,675,281 lb., an increase over 1913 of 17,613,323 lb., or 23.5%. This year, however, 78.5% of the total exports were of domestic lead; in 1913 and in previous years they were almost entirely of foreign lead imported in ores or base bullion and smelted or refined here. The exports of domestic lead had been almost a negligible quantity and had been confined to a small quantity of manufactures—pipe, sheets, etc.—sent chiefly to adjacent countries. The metal imported in ore and bullion has been chiefly from Mexico.

The exports of domestic lead reported were as follows for the eight months ended Aug. 31, in pounds:

	1913	1914	Changes
Six months to June 30	....	40,323,662	I. 40,323,662
July	....	21,787,779	I. 21,787,779
August	...	10,651,551	I. 10,651,551
Total eight mos.	....	72,768,992	I 72,768,992
Add re-exports of foreign	75,061,958	19,906,289	D.55,155,669
Total exports	75,061,958	92,675,281	I. 17,613,323

The exports of domestic lead reported in the first half-year were all made in the four months March-June, inclusive. The destination of the exports is not given in detail, but the general statement is that about one-half were to Germany, one-third to Great Britain and the rest to other European countries.

The imports of lead for the eight months ended Aug. 31 for two years have been as below, in pounds:

Imports of lead:	1913	1914	Changes
In lead ore	12,248,718	20,198,304	I. 7,950,086
In other ore	2,324,676	....	D 2,324,676
In base bullion, etc.	80,066,264	10,838,653	D.69,227,611
Pigs, bars, etc.	73,200	232,461	I. 159,261
Total imports	94,712,858	31,269,918	D.63,442,940
Re-exports of foreign lead	75,061,958	19,906,289	D.55,155,669
Net imports	19,650,900	11,363,629	D. 8,287,271

In 1913 the imports had already shown a drop from the previous year, when they were 123,190,379 lb. for the eight months. Of the imports this year 21,343,743 lb. were from Mexico, against 83,151,233 lb. for the eight months in 1913. Of the imports in 1913 there was 79.2% exported, but this year the proportion was only 63.7% of the smaller imports. The decrease in imports was wholly in lead contents of base bullion, lead in ore showing an increase.

*

St. Joseph Lead Co. Curtails

The St. Joseph Lead Co. issued the following statement on Oct. 19:

> The country-wide depression in business, evidenced in the lead industry by a price, since Jan. 1, 1914, lower than in many years, has been further accentuated by the catastrophe of a world war.
>
> In the early weeks of August, it was hoped that the lead industry might escape serious interruption. During the last six weeks however, it has been impossible for the St. Joseph Lead Co. to sell its product, even at the low prices prevailing, so that it has been accumulating a stock of unsold lead. As other companies are in a like position, it becomes evident that the production of lead is now exceeding the country's requirements.
>
> The directors of the St. Joseph Lead Co. and the Doe Run Lead Co., fully realizing the hardship such a course will impose on the district, feel constrained for the present to reduce the company's output 25%. Instead of closing one-quarter of the plant, which for the company would be the easiest and cheapest method of reduction, but which would unevenly distribute the burden on the communities, it has been decided to run five days a week, instead of six, at all mines except No. 9 Doe Run and No. 11 Hunt's, which will be closed entirely.
>
> The Bonne Terre mill will be closed temporarily, the St. Joseph Lead Co. having leased from the Doe Run Lead Co. two sections of its No. 3 mill, to handle the Bonne Terre ore. It will operate these sections by men taken from the Bonne Terre mill. The Rivermines Power Plant will be closed.

So far as possible married men will be given a preference in employment.

*

The New Strike at the Magma

The Magma Copper Co. has made an important strike on the 1000-ft. level of its Magma mine (formerly the Queen mine) at Superior, Ariz. About three years ago the Magma started development of the Queen vein below the 500-ft. level. The old shaft was continued down to the 800-ft. level and crosscuts were run north at the 650-ft. and 800-ft. levels to the vein, developing several rich copper oreshoots. The best showing was on the 800-ft., where a shoot 345 ft. long was found averaging 6.8 ft. in width and running copper 12%, silver 14 oz. The smelter returns on 9614 tons, made largely from development work, netted $168,245, an average of $47.22 per ton. In making these shipments, about 24,000 tons of ore, containing 5% of copper and 5 oz. of silver, was placed on the dump.

A winze was sunk from the 800-ft. level to the 1000-ft., and at the point where it was crosscut the vein was found to be 60 ft. wide and to contain a high-grade copper shoot, a high-grade zinc shoot and a large amount of low-grade copper ore carrying varying amounts of silver and gold. Drifting on the high-grade copper shoot has shown it to be 150 ft. long (with both east and west faces still in high-grade ore), and to contain copper 20%, silver 19.5 oz. and a fair amount of gold for the full width of the drift. Heretofore the best oreshoots have been found in the fissure along the quartzite-limestone contact, but the 1000-ft. shoot is entirely in the diabase which underlies the sedimentary rocks.

A 150-ton concentrating mill has been in operation several months and good recoveries are being made. Electric power for mine and mill is obtained from the Roosevelt dam.

The product is still being hauled 32 miles by team to Florence, a station on the Arizona Eastern R.R., but it is intended to construct in the near future a narrow-gage road from Superior to Webster, and it is expected that this road will reduce haulage costs about $6 per ton of product.

The equipment of a new working shaft is contemplated, as the present development shaft is too small and the equipment too light to handle the tonnage now available.

*

Boston & Corbin

The report of the Boston & Corbin Mining Co., Butte, Mont., for the year ended July 31, 1914, states that with the available tonnage in sight in the Bertha mine of 10,712 tons, with the knowledge that there is nothing in the working of the mine that might lead one to expect better results as to values or tonnages; with the cost of mining and milling remaining practically the same, there was no use in continuing operations.

The mine has been closed and some negotiations have been carried on for the purchase of adjoining property, but nothing definite has been accomplished. The company now has $51,713 in cash and loans secured by collateral.

Editorials

Coal-Dust Firing in Copper Smelting

The combustion of coal in dust form, instead of in lump form on a grate or in gas form from a preliminary combustion in a producer, has long been a very attractive subject. The combustion of coal gas is so great an improvement over the direct combustion of coal, because of the reduced quantity of air required, the less proportion of unburned carbon, etc., that the advantages of gas firing outweigh the losses experienced in the preliminary combustion in the producer. Now when coal reduced to exceeding fineness is blown into a hot chamber, combustion occurs almost instantaneously and almost completely, the fine coal dust in suspension behaving practically like a gas. Coal-dust firing consequently offers about all of the advantages of gas firing without its disadvantages.

In the cement industry of eastern Pennsylvania, and elsewhere, coal-dust firing has been in successful use for a good many years. In metallurgy, on the other hand, it has been repeatedly tried, but while there has been promise of success, there have been difficulties which have delayed a regular use of the system until lately. In reviewing some work that was going on at the Washoe plant at Anaconda last April, we made the following remarks:

> An interesting experiment is about to be tried in the smelting works, viz., the firing of one of the reverberatory furnaces with coal dust. This is no new idea. Some years ago it was tried by Mr. Sörensen at the Highland Boy works in Utah, and later by Mr. Shelby at Cananea. At neither of those plants was it successful. Mr. Shelby experienced trouble especially from the ash of the coal, which blanketed the slag in the furnace, choked up the throat, etc. Recently, however, coal-dust firing has been applied to a reverberatory furnace by the Canadian Copper Co., at Copper Cliff, Ont., with great success, it is reported, from the standpoint of fuel economy.
>
> There are, therefore, the above precedents for the experiment at Anaconda. As to the fuel economy of this method of combustion there is no question. That has been demonstrated in cement burning in which it has become the standard practice in the Lehigh Valley. In copper-smelting practice the doubt attaches to the accompanying metallurgical effects. Mr. Mathewson and Mr. Laist think that the previous failures were probably due to the imperfect way of doing tae thing, especially the failure to pulverize the coal sufficiently fine. Consequently at Anaconda arrangements are being made to grind the coal excessively fine. This seems to be logical. If the coal ash produced in the furnace be so fine that the draft will keep it moving and carry it out of the chimney there ought not to be much trouble from it. Anyway, that is reckoned upon. Not even are the waste-heat boilers to be removed. The coal dust will be blown directly into the firebox end of the furnace. If the expected results are realized the present coal consumption of about 20% may be reduced to something like 15%, basing this upon the Copper Cliff experience

In this issue of the JOURNAL we present a contribution by Mr. Mathewson, stating the consummation of the experiments that were inaugurated last April. It is quite unnecessary for us to repeat here anything that Mr. Mathewson has said in his article. It is evident that the Anaconda metallurgists have once more achieved a brilliant success, the percentage of coal consumption having been less than 14%, and it is certain that the new path that has been mapped out by David H. Browne at Copper Cliff, Ont., by W. D. Leonard, at Garfield, and by Mr. Mathewson and Mr. Laist at Anaconda, will lead to a further great economy in the metallurgy of copper. Indeed, this is the most important thing that has happened since the successful introduction of the basic converter. It is, perhaps, not too much to expect that the economy of the reverberatory furnace with the new system of firing will finally settle in favor of the reverberatory the old contest between the reverberatory and the blast furnace.

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Steel-Trade Conditions

Conditions in the iron and steel trades do not at present seem to improve, though they are hardly as bad as some people try to believe. The base of the industry, the production of pig iron, if followed through the year, shows that the sharp decline at the close of 1913 brought the make down to the rate of about 23,000,000 tons a year. From that it gained gradually until March and April, when a maximum was reached with production at the rate of about 28,500,000 tons. A rather sharp decline from that point was followed by three months of uncertainty, and in September we find that the output was at the rate of 22,800,000 tons yearly, or only a trifle below that of January. The loss in production in the past two months has been rather among the merchant furnaces than the steelworks stacks, so that it is fair to assume that the make of steel is now about where it started at the opening of the year.

Other observation agrees with this indication and there is more dullness in the foundry and other outside trades, than in the finished-steel business. Just at present affairs are not improving, and there are some indications that October and November will show smaller production again—possibly December also; so that the year may show a total not much over 23,000,000 tons; which is still a pretty substantial output. On the analogy of recent years the steel make should be about the same, or a little more than that of pig iron.

The depression of the earlier part of the year has been discussed on various theories, and it is not easy to make a choice of any one of them. The simplest and probably the most nearly correct is that it was largely due to a reaction from overproduction and expansion in the previous two years and a diminution of purchasing power, resulting from moderate crops.

It is no use, however, to get into this discussion now. The present position is plain enough; it is, of course, due to the general financial disorganization caused by the European war. It is useless to urge that our own position is strong, our crops large and other conditions good; as long as our chief foreign customers are stopped from trading with us to a large extent the result must be felt. The effect on sentiment is probably even greater than in reality, but the end is the same. There is no disposition to risk commitments for the future, and buying is necessarily limited to present needs, or to provision for the immediate future.

At the first outbreak of war we heard on many sides that there was a probability of a great demand for our steel from abroad; but it must be evident that this expectation was exaggerated. It must be remembered that while the demand for steel may be stimulated in certain special lines during a great war, it must be cut off in other and more important lines. And this would be the case even without taking into account the general disorganization of business and the temporary loss of purchasing power of a large part of the people. It was expected, for instance, that England would turn to our mills for most of the billets and other half-finished steel which has been bought from Belgium and Germany. But the demand for this material has been greatly diminished, because no one is buying building or construction material that is not absolutely needed. And there are other such instances. Production is reduced, but consumption is also cut down, even to a greater extent.

As to production, the iron and steel trade of Belgium is absolutely extinguished for the present and that of France seriously crippled. In Germany the industry is practically stopped in Lorraine and Luxemburg, and also in Silesia; in Westphalia and the Rhine districts it must be to some extent crippled by the loss of men and by short supplies of iron ore. In England there is less disturbance, and England also is able to carry on its foreign trade with comparatively little interference, while that of Germany is practically cut off.

The expansion of our foreign trade is dependent, not upon the nations now at war, but upon the other countries which have been buying from those nations. Efforts are now being made to extend business, but the results remain to be seen, and in any event they will be slow. The present revival of the iron trade depends upon the conditions of business and financial readjustment at home. How far that can progress with the larger part of the commercial world in a turmoil, it is not easy to say; we can only hope it will not be too long delayed.

The Manufacture of Zinc Dust

One of our metal industries that has been improved by the war is the manufacture of zinc dust or blue powder, which is used as a precipitant of gold and silver from cyanide solutions, in the process of sherardizing (coating iron and steel with zinc), and in the dye industry. Zinc dust is a byproduct of the zinc smelter, but only two American smelters have heretofore been engaged in producing it in commercial form. They have turned out 100 to 500 tons per annum, while we have been importing from European smelters at the rate of 2300 to 2100 tons per annum.

Before the war zinc dust was worth about 6c. per lb. Now it is about 15c. per lb. It is consequently much more profitable for the zinc smelter to make zinc dust than to make spelter. This has led the New Jersey Zinc Co. to resume the manufacture of zinc dust at Palmerton, and other smelters may do the same thing with the probable result of bringing the price down nearly to where it was in ante-bellum days.

The reason why this business has heretofore been left chiefly to the Belgian and German smelters is that the blue powder which can most easily be put in commercial form is that which is collected in the prolongs. Now, European smelters commonly use prolongs and American smelters do not, labor being relatively cheap in Europe and dear in the United States. Although the increased recovery of zinc by the use of prolongs may be as much as 2.5% of the zinc in the ore smelted, it is considered in this country that there is no gain in dollars and cents with normal conditions.

However, a smelting furnace may be run with such condensers as to produce chiefly blue powder, which we believe is done at Palmerton by means of the Convers & De Saulles apparatus. Also, blue powder may be readily made with an electric furnace, but unless special precautions be taken it will be too low in metallic zinc to be commercial. The chief criterion of blue powder is its percentage of unoxidized, metallic zinc.

Lead and Zinc Declines Halted

Some of the lead producers have at last read the signs of the times. The St. Joseph Lead Co., the largest individual producer, on Oct. 19, announced a curtailment of 25% in its output. This is frankly stated to be on account of the increasing accumulation of its stock of unsold lead. Desloge, another Missouri producer, has also curtailed. The chief producers of the Coeur d'Alene had previously made a curtailment estimated to be equivalent to 3500 tons of lead per month. The Hercules mine of that district has reduced its output 50%, and the Morning is shut down.

There is also to be a curtailment in the production of zinc ore, the Butte & Superior, the largest producer of ore used for spelter, having suspended production on Oct. 17. The reason assigned for this was the necessity of retimbering the shaft. It has been understood for some time back that that work would have to be done. Evidently the management decided, correctly, that the present is an auspicious time. The news of this checking of the production of zinc ore immediately had a favorable effect upon the price for spelter.

The Election in Mexico

We think that the current conferences at Aguascalientes are about the nearest that the Mexicans will come to having a free and fair election. The means whereby the Mexican knows how to express his wishes is not a paper ballot. It is a rifle. The campaigning is not done on the platform. It is done in the field. That is what has been going on in Mexico in recent times. The campaigning having been completed, the captains meet at Aguascalientes on the basis of one vote per thousand rifles. It does not matter what steps are taken to conform to the letter of the Constitution by first electing a provisional president and later a permanent one. The real election is about to take place at Aguascalientes.

Unfortunately, Mexican minorities have not yet learned to bow to defeat and go to work until the time for another election comes around. Consequently, the opposition may be expected to express itself through the operations of many honest bandits who are the captains of hundreds. Except for disorders in outlying regions, however, we are inclined to be optimistic respecting an improvement of conditions in Mexico. The people of that country can hardy indulge in perpetual fighting. They must pause to do some work to feed and clothe themselves.

PERSONALS

Gelasio Caetani sailed for Italy, his native country, last week, and probably will remain there for some time to come.

Ralph W. Deacon and J. H. Polhemus have been elected to membership in the Mining & Metallurgical Society of America.

Guilford D. Scholl, who has completed his engagement with the Electrolytic Refining Co. of Australia, has returned to America.

Hon. W. H. Hearst, minister of Lands, Forests and Mines for Ontario, has been appointed Premier of the Province in place of the late Sir James Whitney.

C. Schnell, of Paterson, N. J., is in Kingston, Ont., in connection with a project for the establishment of a plant for the manufacture of potash from feldspar.

Dr. F. S. Pearson, of London, England, was in Toronto recently in connection with large Mexican enterprises, in which he is associated with Canadian financiers.

Dr. W. H. Ellis has been appointed acting dean of the Faculty of Applied Science, University of Toronto, pending the appointment of a successor to the late Dr. John Galbraith.

J. B. Tyrrell, of Toronto, has returned from an inspection of the Beaver Lake gold area in Saskatchewan, which has satisfied him that gold occurs in sufficient quantities to warrant thorough exploration.

Franklin Joslin, of Fairbanks, Alaska, was injured recently in a railroad wreck near Grand Junction, Colo. He was on his way home from Washington. His injuries are not dangerous, but may detain him in the hospital for a time.

Capt. J. H. Hodgson, superintendent of the Copper Queen mines at Bisbee, Ariz., for Phelps, Dodge & Co., and Chas. A. Mitke, ventilation engineer for the same company, have been looking over the Michigan iron and copper districts for several weeks.

Dr. David T. Day has resigned from the U. S. Geological Survey in order to engage in private practice. Dr. Day has been connected with the Survey for upward of 30 years, being for a long time in charge of its division of mineral statistics. In recent years he has been its expert upon the technology of petroleum, which will be his specialty in private practice.

Edward E. Free has withdrawn from the firm of Gould, Free & Ash, chemical engineers, San Francisco, and will reenter Johns Hopkins University as a student in scientific research. Mr. Free for some time prior to his connection with Gould & Ash was in the service of the Department of Agriculture investigating potash deposits in Nevada. Ralph A. Gould and Charles S. Ash will continue the business under the firm name of Gould & Ash, at 319 Monadnock Building, San Francisco.

OBITUARY

Albert W. Mix died at Boulder, Colo., Oct. 15, aged 58 years. He was born in Indiana, but had lived in Colorado for 35 years. He had owned and operated a number of mines in Boulder and Gilpin Counties. Recently he had been operating two mines near Sunshine. He leaves a widow and one daughter.

Otto E. Youtsey, of Denver, who had just accepted a position as electrical engineer with the Portland Gold Mining Co., died, Oct. 15, of typhoid fever, in Victor, Colo. He received his technical education in the Universities of California and Colorado and was a member of Phi Delta Theta and the Colorado Electric Club.

John Wesley Boileau, geologist and expert in coal lands, died at his home in Pittsburgh, Oct. 7, from a self-inflicted wound. He was injured in an accident some time ago and had since been melancholy. Mr. Boileau came into prominence several years ago when he instituted proceedings before the Interstate Commerce Commission which resulted in a reduction of 10c. per ton in the coal freight rates between the Pittsburgh district and Lake ports. He was joined in the suit by the Pittsburgh Coal Co. and other interests, but he prepared the [illegible] of data, with original maps and charts. To his efforts was largely due the fact that the testing station of the United States Bureau of Mines was located in Pittsburgh. He made an endeavor to unite all the operators in the Connellsville coke region, which was not successful. He was a member of the Duquesne Club, Oakmont Country Club, Pittsburgh Country Club, Engineers' Society of Western Pennsylvania and other organizations. He leaves a widow and two sons.

SOCIETIES

University of Wisconsin—In memory of the late Frederick E. Woodbury of Milwaukee, general manager of the Newport Mining Co., that Gogebic range corporation has established at the University of Wisconsin a scholarship in geology and mining engineering. The first beneficiary is Arthur Peterson, an Ironwood, Mich., young man who had been connected with the Newport engineering department. Mr. Woodbury was accidentally killed in the Newport mine last winter.

American Institute of Mining Engineers—The Utah branch met, Oct. 10, at the Commercial Club, Salt Lake City, for the election of officers. George W. Riter presided at the meeting, at which 36 members were present. Officers were elected as follows: Robert C. Gemmell, president; C. W. Whitley, vice-president; E. Gayford, secretary and treasurer. These will choose two other members to form with them an executive committee, which will outline the plan of the work for the coming year.

Mining & Metallurgical Society—The New York section met at the Engineers' Club, New York, Oct. 15, about 30 attending. B. F. Tillson, superintendent of the Franklin mine of the New Jersey Zinc Co., read a paper about the prevention of accidents in that mine, which will rank among the most important contributions upon this subject. His paper will appear in the Society's bulletin. Louis Ruhl, of the Roessler & Hasslacher Chemical Co., made some remarks about the cyanide situation. Sidney J. Jennings and W. W. Mein presented papers upon the sampling of mines of low-grade gold ore. Each of these papers led to lively discussion.

Teknik Club—At the regular monthly meeting in Denver, Oct. 13, the members heard an address by Dr. Lucien I. Blake, who founded the club five years ago. He gave a most interesting account of the activities of the Royal Institution, London, whose meetings he has attended regularly during his life in that city. He closed his address with the suggestion that the members of the Teknik Club undertake the individual instruction of young boys who evince scientific tendencies and thus stimulate them to efforts along lines that ordinary technical education does not. The plea was well taken and it will probably bear results. Not being content with this talk, the members of the club prevailed upon Dr. Blake to rise again and to explain the discovery and research that has evolved the system of submarine signaling with which his name is connected.

Colorado Scientific Society—This society has moved its headquarters from the Boston Building to the third floor of the beautiful new State Museum Building on the Capitol grounds, Denver. These quarters were permanently donated by the State to the society through the efforts of Franklin R. Guiterman and Otto Mears. This commodious suite will permit a better arrangement of the library and display of scientific collections than has heretofore been possible. The first monthly meeting in the new rooms was held Oct. 3, and was addressed by Prof Junius Henderson, of the University of Colorado and the State Geological Survey, on "Recent Progress in Colorado Paleontology and Stratigraphy." Prof. George Cannon, veteran geology instructor in the East Denver High School, spoke reminiscently on the discoveries of fossils at Morrison, Colo., years ago, and exhibited a number of specimens.

Colorado Metal Mining Association—The Denver County chapter of the state association recently held two meetings to consider measures that are to be brought before the coming session of the state legislature. The first meeting discussed systems of taxation that might prove more equitable. Since the enactment of the law by the last legislature fixing the valuation of mining properties for assessment purposes at one-half of the gross proceeds plus all the net proceeds, important suits have been won by mining companies at Cripple Creek who protested against taxes thus assessed by the local authority; and similar action is about to be instituted by leading operators of the Breckenridge district. Several plans for assessing mining property were discussed at the meeting, it being the general opinion that differing rates should apply to undeveloped claims, to idle mining properties and to active mines. The second meeting, held Oct. 15, took up the questions of proper width for lode claims, the pollution of streams by placering and mill tails, proposed federal leasing systems, and a more decided financial support to the state geological survey, state bureau of mines and the school of mines. These topics were discussed primarily to inform the legislative committee as to the desires of their fellow members. Strong opposition was expressed relative to proposed federal legislation aiming to discontinue the outright sale of mineral lands and to substitute sweeping leasing systems. While this proposition has not, as yet, been applied to the metal-bearing lands, it is felt that such application must ultimately occur if the government carries through its policy with regard to the coal and non-metallic lands.

California State Mining Bureau—Recent changes in the State Mining Bureau have been necessitated by the resignation of E. S. Boalich, statistician, and the death of E. B. Preston, determinative mineralogist. Mr. Boalich, who has been with the Bureau for about two years, resigned his position in the middle of September and left San Francisco for Washington, D. C., where he will be engaged in the Bureau of Mines as mine statistician; he was for some time prior to his connection with the Mining Bureau an assistant to Mr. Yale, statistician in the Geological Survey. He is a graduate of Stanford University and has had considerable field experience in California. The position of statistician is being temporarily filled by R. P. McLaughlin, chief of the petroleum department of the bureau. He has completed his field work for the forthcoming general report, and his present engagement in the department of statistics is timely for the reason that a great deal of statistical data essential to the report covers the petroleum industry. Mr. Preston's work has been taken up by F. L. Lowell, who was Mr. Preston's assistant for the past year or so. Mr. Hamilton, state mineralogist, has been very fortunate in securing graduate engineers who have come to the Bureau equipped with considerable field experience. The Mining Bureau is in a better condition as regards its future than it has been for several years. The work that has been put upon the general report should be a guarantee that it will be one of the most complete bulletins of this character that has been issued by the Bureau. If carried out on the plans provided in the initial work it should be of great benefit to prospectors and developers of mining property in California and a guide to investors.

INDUSTRIALS

Hardinge Conical Mill Co. reports that the war in Europe is not seriously interfering with its business in the belligerent countries. The first of September it had no difficulty in shipping machines into France and during the last week of September received orders for two 6-ft. Hardinge ball mills which were shipped on the 24th via Scotland and Archangel into Russia.

The Deister Machine Co. of Ft. Wayne, Ind., reports the following recent orders: Dominion Reduction Co., Cobalt, Ont., five single-deck slimers, two single-deck sand tables; Hollinger Gold Mines, Timmins, Ont., 12 single-deck slimers; Miami Copper Co., Miami, Ariz., 12 double-deck sand tables, 76 cone baffle classifiers; Doe Run Lead Co., Rivermines, Mo., 22 cone baffle classifiers; W. L. Reeder, Johannesburg, South Africa, four sand tables and four slime tables.

TRADE CATALOGS

Goyne Steam Pump Co., Ashland, Penn. Catalog. Goyne Mine Pumps. 60 pp., illus., 9x6¼ inches.

Keyston Driller Co., Beaver Falls, Penn. Keystone Drillers. Instruction Book. 15th Edition. 56 pp., illus., 11½x8¾ inches.

Slag Power Ltd., 638 Salisbury House, London. E. C Eng. Catalog. Utilization of Heat from Slag. 8 pp., illus., 6x9¾ inches.

The Wm. Powell Co., Cincinnati, Ohio. Booklet. Powell Steam Whistle and Whistle Valves. 14 pp., illus., 6½x3½ inches.

Burd High Compression Ring Co., Rockford, Ill Booklet. A Few Facts About Piston Rings and Their Relation and Importance. 8 pp., illus., 7½x5 inches.

Sullivan Machinery Co., Chicago, Ill. Catalog No. 111. 68 pp., illus., 9x6 inches. This is a general catalog in the Spanish language and will be found useful to many people in South America.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal,, at 25c. each. British patents are supplied at 40c. each.

ALKALI-SILICO-ALUMINATE—Method for Making Alkali-Silico-Aluminate Richer in Alkali Than Feldspar. Alfred H. Cowles, Sewaren, N. J., assignor to The Electric Smelting & Aluminum Co., Sewaren, N. J. (U. S. No. 1,111,881; Sept. 29, 1914.)

AMALGAMATOR. Charles R. Dennison, Youngstown, Ohio. (U. S. No. 1,111,251; Sept. 22, 1914.)

BARIUM AND STRONTIUM OXIDES—Process of Producing. Harry G. Akers, Toronto, Ont. (U. S. No. 1,113,178; Oct. 13, 1914.)

BRIQUETTES—Briquette Composition and Process of Making Briquettes. Edward Alfred Paterson, Port Arthur, Ont. (U. S. No. 1,111,919; Sept. 29, 1914.)

CAST IRON—Process of Converting Cast Iron Into Steel or Malleable Iron. John Alexander Hunter, Philadelphia, Penn. (U. S. No. 1,112,909; Oct. 6, 1914.)

CONCENTRATION—Movable Spray for Mineral Washing. Wilton E. Darrow, Sutter Creek, Calif. U. S. No. 1,111,300; Sept. 22, 1914.

COPPER—Process for the Treatment of Copper Ores and the Recovery of Their Values. Charles S. Vadner, Salt Lake City, Utah. (U. S. No. 1,111,874; Sept. 29, 1914.)

COPPER SMELTING—Improvements in and Relating to Metallurgical Furnaces for Use Chiefly in the Metallurgy of Copper. L. Addicks, Perth Amboy, N. J., and C. L. Brower, Chrome, N. J. (Brit. No. 16,307.)

CRUSHER—Gyratory Crusher. Thomas W. Capen, Milwaukee, Wis., assignor by mesne assignments, to Allis-Chalmers Manufacturing Co. (U. S. No. 1,110,887; Sept. 15, 1914.)

CYANIDES—Making of Alkali Cyanogen Compounds. John Collins Clancy, Colorado Springs, Colo., assignor of fifty-one one-hundredths to Portland Gold Mining Co., Colorado Springs, Colo. (U. S. No. 1,112,893; Oct. 6, 1914.)

DRILL—Rock Drill. Daniel S. Waugh, Denver, Colo., assignor to The Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,112,398; Sept. 29, 1914.)

DRILL MOUNTING. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,112,006; Sept. 29, 1914.)

ELECTRIC FURNACE—Apparatus for Reducing Ores. Raymond S. Wile, Pittsburgh, Penn. (U. S. No. 1,111,050; Sept. 22, 1914.)

ELECTRIC FURNACE—Method of Reducing Ores. Raymond S. Wile, Pittsburgh, Penn. (U. S. Nos. 1,111,049, and 1,111,341; Sept. 22, 1914.)

ELECTROSTATIC SEPARATOR. Harry Comstock, Mineville, N. Y. (U. S. No. 1,110,896; Sept. 15, 1914.)

FILTRATION—Apparatus for Making and Filtering Solutions, Applicable in the Extraction of Metals from Ores and for Like Purposes. P. C. C. Isherwood, Bushey Heath, England. (U. S. No. 1,110,790; Sept. 15, 1914.)

FUMES—Process for Arresting Sulphurous Gases and Fumes and Utilizing the Heat and Gases Contained Therein. Charles S. Vadner, Salt Lake City, Utah. (U. S. No. 1,110,660; Sept. 15, 1914.)

ORE-CONCENTRATING TABLE. Howard D. McLeod, Cleveland Heights, Ohio. (U. S. No. 1,110,070; Sept. 8, 1914.)

PIG-BREAKING MACHINE. James B. Ladd, Ardmore, and David Baker, Haverford, Penn. (U. S No. 1,112,146; Sept 29, 1914.)

REFRACTORY ORES—Process of Treating Complex Refractory Ores of Silver and Gold. Court C. Titus, Helena, Mont., assignor to Montana Metallurgical Co., Helena, Mont (U. S. No. 1,111,976; Sept. 29, 1914.)

RETORT PRESS. Charles Albert Wettengel, St. Louis, Mo. (U. S. No. 1,112,103; Sept. 29, 1914)

ROASTING Improvements in Rabble Shafts for Roasting Furnaces. E. J. Fowler, San Francisco, Calif. (Brit. No. 7471 of 1914.)

SCREEN OR SEPARATOR. Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. No. 1,111,041; Sept. 22, 1914)

SINTERING APPARATUS. John E. Greenawalt, Denver, Colo. (U. S. No. 1,110,623; Sept. 15, 1914)

STIRRER OR CONVEYOR. David J. Nevill, Denver, Colo., assignor to The Stearns-Roger Manufacturing Co., Denver, Colo. (U. S. No. 1,111,084; Sept. 22, 1914)

WASTE LIQUOR—Recovery of Values from the Leach-Water of Copper Extraction. Clarence A Hall, Mount Airy, Penn., assignor to Pennsylvania Salt Manufacturing Co., Philadelphia, Penn (U. S. No. 1,112,608, Oct 6, 1914.)

ZINC—Electric Zinc Furnace With Integral Condenser Charles Victor Thierry, Paris, France. (U. S. No. 1,110,359: Sept. 15, 1914.)

ZINC—Improvements in Muffle Furnaces for the Production of Zinc H Koppers, Essen-Ruhr, and N. Lengersdorf, Bunzlau, Silesia, Germany (Brit No. 6349 of 1914.)

ZINC—Process of Extracting Zinc from Its Ores or Compounds. Ernest Estram Watts, Kingston, Ont. (U. S. No 1,111,201; Sept 22, 1914.)

ZINC OXIDE—Manufacture of Zinc Oxide. James Arthur Singmaster, Palmerton, Penn., assignor to New Jersey Zinc Co., New York, N. Y., a Corporation of New Jersey. (U S Nos. 1,112,853, and 1,112,854; Oct. 6, 1914.)

ZINC RESIDUES—Treatment of Zinc Residues. Archibald Jones, Bartlesville, Okla., assignor to Bartlesville Zinc Co., New York, N. Y. (U. S. No. 1,112,010, Sept. 29, 1914.)

Editorial Correspondence

SAN FRANCISCO—Oct. 14

Relief of the Potash Situation may be under consideration by the Department of the Interior but the report that the government may advance money to the American Trona Corporation is untrue. The corporation is amply able to take care of its own affairs, and has asked no assistance from the Government. In addition to the Searles Lake deposit, which has been proved by exploration and development, there are other good prospects in California, the owners of which would probably be glad to receive financial aid. But this is likely to come from the incorporation of operating companies and the sale of stock. Besides the production of potash through mining operations, its manufacture from kelp is attracting the attention of San Francisco men, who are making a thorough, scientific and practical investigation to discover whether or not the kelp contains sufficient quantities of potash to make its handling a profitable commercial venture. The potassium content of sorted kelp has been demonstrated by Government experts to be high. But manufacturing on a commercial scale must depend upon whether or not the content of large quantities will average sufficiently high. There is no question but that the potash can be recovered from the kelp. That matter has been thoroughly investigated and the result was wholly satisfactory.

DENVER—Oct. 15

The Western Chemical Co., of Denver, has just erected a $30,000 fireproof steel building for the manufacture of nitric acid. Improvements to the extent of $10,000 have been made in the hydrochloric-acid plant. These works have been visited by disastrous fires in the past. Frank Ashley is president of the company.

Contracts for Pumping Equipment to be installed in the Penrose shaft at Leadville were finally let Oct. 10. This means that the Downtown Mines Pumping Co. will probably be in operation this winter, since delivery of the machinery has been guaranteed within 12 weeks. The Providence Engineering Works, Providence, R. I., secured the order for the centrifugal pumps while the General Electric Co. will provide the motors and other electrical apparatus. The success of this project means much to the Leadville district, since it will permit the operation of a centrally situated mineral area that has heretofore defied exploitation on account of its heavy flow of water. Former Governor Jesse McDonald has worked two years securing suitable contracts from the many owners of properties that will share in the proposed benefits. Pending arrival of the machinery, necessary surface alterations will be affected.

In Granting a Lease for Excavating and Retreating a Slag Dump at the defunct Boston & Colorado smelting plant, there was no intention to give publicity to certain shortcomings in Denver's earlier metallurgical practices. But the matter has reached litigation and some figures will inevitably be revealed. From the pending district-court suit, it appears that Crawford Hill, part owner and trustee of the Hill estate, including the old smelting site, entered into a lease contract with one Morris Prigel whereby the latter proceeded to ship slag to the Globe plant of the American Smelting & Refining Co., expecting to receive 70% of the settlement returns. After the resmelting of 5200 tons of this, Prigel has sued Hill for $12[illegible]0 which is alleged to be only a part of his share in the profits that have been unlawfully withheld. More particulars, whereby analysis of former smelting efficiencies may be possible, will probably crop out when this suit is tried.

BUTTE—Oct. 15

Labor Situation—Interest during the week centered in the suspension of the military courts as described in the "Journal," Oct. 17. While the decision left no room for misinterpretation, speculation immediately became rife as to the consequences of illegal procedure by the military authorities, covering a period of over six weeks, during which a great number of persons were tried, convicted and sentenced. All of them will have to be retried in the civil courts with the benefit of a jury. As to restoration of fines imposed and paid and stocks of liquors destroyed in the case where the saloon closing regulations were disregarded, that is a question which has not yet been answered. It looks as if the undoings may prove as interesting as the doings. Up to date a number of damage suits, aggregating $30,000, have been filed against Governor Stewart, Major Donohue, Major Roote and Provost Marshal Conley for illegal arrest and imprisonment. More are expected to make their appearance.

In announcing the suspension of the military courts, Major Donohue stated in no uncertain terms that there would be no relaxation of military authority so far as maintenance of peace and order in Butte was concerned. He pointed out that under the decision, the military forces might arrest disturbers and trouble makers as a matter of military necessity and might detain them, and he stated that this would be done.

Duncan and Driscoll will take their ouster cases into the supreme court as soon as transcripts can be made of the testimony. Since the decision causing suspension of the military courts, the press censorship has come in for adverse criticism on the part of the "Butte Socialist." Upon being advised that this paper intended to defy the censorship ordinance, Major Donohue notified the editor that if he published any matter calculated to incite the people and stir up trouble, he would have to suffer the consequences. The "Socialist" then decided not to resist the military censorship but intimated that a test case would be made of its legality by some outside paper.

Plans have been made to reduce further the force of men under arms in Butte, from 400 to about 200. This step is being taken in order that the civil authorities may begin the active resumption of their duties.

The first battalion of the 14th U. S. Infantry, which some time ago was brought to Fort Harrison, near Helena, from Fort Wright, Spokane, presumably to await developments in the Butte situation, was transferred to Fort Missoula on Oct. 12. No information is available as to the reasons for keeping the soldiers in Montana, but it seems evident that the Butte situation and other conditions in Montana, especially the I. W. W. movement, are the determining factors.

Latest reports are that the marauding band of men calling themselves I. W. W., decided to keep away from Butte.

The committees of the Western Federation of Miners and the United Mine Workers of America were in session in Butte, Oct. 12 and 13, to consider plans of uniting the two bodies under a proper working system. Many suggestions were made but the meeting adjourned without adopting definite measures, awaiting the results of discussions at the Denver meeting of the Western Federation to be held in the near future. The new Butte Mine Workers' Union had positively refused to merge with the United Mine Workers, if this had to be accomplished by first coming back into the Western Federation.

The Helena Mining Bureau, organized by Helena citizens, has succeeded in enlisting the interest and support of local as well as outside business men in the development of meritorious mining claims in and about the capital. From among a large number of properties, listed with the bureau, two have been selected by expert engineers as warranting the expenditure of energy and money for development. The Wayside group of claims, located six miles from Helena, is being developed under the supervision of the bureau and with local capital. Assays of the ore, extracted during the work have run well in gold and from present indications the prospects of opening a large body of pay ore are promising. The other property being thus developed is the Hawkeye, an old gold, silver and lead mine, situated close to the heart of the city. Modern machinery has been installed at both properties and the force of men will be increased as work progresses. The bureau is listing all properties near Helena and in tributary camps with a view to attracting outside capital. Inquiries have already been received from American and European firms, and mining men from various parts of the country are constantly inspecting the properties listed.

Outside of the activities of the bureau, many private enterprises are reported in the camps adjacent to Helena. Colonel Cruse is operating successfully his Franklin lead mine, six miles from Helena. The York Mining Co. is operating a gold property 26 miles northeast of Helena and has blocked out enough ore to keep its 50-ton mill and cyanide plant in operation for three years. At Rimini, 12 miles west of Helena, James Breen is putting in a 20-stamp mill to treat the product of the Porphyry Dike which carries gold values varying from $8 to $20 per ton. At Marysville, Colonel Cruse is exploiting, successfully as usual, his Bald Mountain mine, while the Piegan-Gloster recently acquired by the Barnes King is expected to enter the list of producers by the end of the year.

SALT LAKE CITY—Oct. 15

At the Snake Creek Tunnel, the September report, by Guy McKay, engineer in charge, shows that 350 ft. progress in hard rock was made, working two shifts. The face is in 9436 ft. The first igneous rock, a dark-colored basic rock of granular texture, probably gabbro or granodiorite, was cut early in the month. Several belts of similar igneous rock were passed through, the limestone in the contact zones being more or less silicified or altered. A good deal of the material is mineralized with pyrite, and occasionally with small seams of lead. This is not in known mineral-bearing ground. The tunnel is being driven northwesterly, and is approaching the known mineral-bearing zone of the camp on the southwest. It will crosscut the formation, both beds and fissures. Drifting will be done to the northeast to connect up with the Daly-Judge workings, at a depth of about 2000 ft. The tunnel will have a depth of 3500 ft. from the surface in places. Several large fissures and open water-courses were cut. The average flow in September was about 4767 gal. per min.

SEATTLE—Oct. 14

In the Portage Bay District, tributary to Cordova, this season saw a good deal of activity. Extensive prospecting and development work went on all summer and at least two new quartz gold discoveries apparently of some value were made. One of these was made near Picket Bay by Patrick Hogan, an old-time prospector of the Port Wells district, and the other in the same region by Hamilton, another well known prospector. Both discoveries gave exceedingly high assays, but enough development work has not been done yet to indicate the size and extent of the veins. The Golden Eagle mine where a five-stamp mill was put into operation for the first time this season, is said to have had a most successful run. The Granite mine also had a good season.

Prospectors Returning from the Knik District tell of large low-grade gold deposits near the head of the Indian River. This territory, opened last year under the name of the Broad Pass district, has never been extensively prospected before. The land was considered valueless for mining, but since the railroad will probably pass through the district the low-grade ore, which is known to be there, should become valuable, with cheap transportation. Men who entered the Broad Pass country this year report favorably on its prospects and hundreds of operators have announced their intention of going into the new territory next season.

No important new strikes have been made in the Knik district this season, the claims already in operation, however, have greatly increased their yield over that of last year. The Bullion mine, one of the largest in the district, yielded $140,000, while $115,000 was taken from the Alaska Gold Quartz holdings.

The Speel River Project is being pushed by its managers, who have established headquarters in Juneau. Messrs. Kennedy, Lass and Bascovich, recently of the Treadwell group, are in active command. The Speel River is a fair-sized stream dropping down off the mountains a few miles south of Juneau into a natural, deep-water, all-year-round harbor. A group of lakes connected with the river constitute a natural reservoir. The power can be developed at relatively low cost and it is estimated that 100,000 hp. can be had throughout the year. Since topographic and climatic conditions prevent the transmission of this power for any great distance and since at Juneau the demand is not at present very large, the project includes the formation of a manufacturing company to use the power. It is intended to make calcium carbide, ferroalloys, etc. The manufacture of wood pulp is also a possibility. The Treadwell engineers have had large experience in the installation and operation of hydro-electric plants in this vicinity and as consulting electro-chemical engineer they have engaged J. W. Beckman.

At Nome, a Departure in Freight Transportation, where practically no wagon roads exist, will be tried by the Kougarok Dredging Co. next season. The company has several hundred acres of dredging and hydraulic ground about 60 miles from Nome. The cost of transportation on the Seward Peninsula has been figured at about $125 per ton over country of similar character for the same distance as that on which the company has to figure. It is planned to use a large caterpillar engine and either wagons or especially designed cars and thus reduce the cost to about $25 per ton. The company has announced that it will carry freight to other properties also, which should help toward a speedy opening of the section. The engine will be of 70 hp., capable of hauling 40 tons over the rugged country, making its own trail as it goes. If this engine proves a success it will help to solve the difficulties of installation of dredges and heavy machinery in Alaska. The company will install a 2000-yd. dredge of the endless-chain type. It is claimed that the dredge is 40% lighter than other machines of similar design, strength and capacity. It is to be operated by two engines of 50 and 75 hp. Gasoline will be used as a fuel.

SILVER CITY—Oct. 15

A Profit Sharing Plan for all employees of Phelps-Dodge in service three months or over at Bisbee, Douglas and Morenci, Ariz., was inaugurated Oct. 1. The plan also includes the employees of the Burro Mountain Copper Co., at Tyrone, N. M. The following is an outline of the plan:

The company will share with its employees who have been in its continuous employ for three months or more, the net profit accruing from sales of merchandise to them. The employees will participate to the extent of 5% on their purchases of merchandise, not including wines and liquors. The year will be divided into quarterly periods. Bank drafts will be mailed on the first day of May, August, November and February to all employees entitled to participate.

ISHPEMING—Oct. 17

Notwithstanding a General Installation of Safety Devices and the adoption by the operating companies of other measures to protect human life, the mortality rate at the mines of the Marquette iron region for the year ended Sept. 30, according to the report of county inspector Quine, was exceptionally high. Including a force of about 50 men employed in quarries, there were engaged in the mining industry a total of 4969 workers; 22 men were killed, of whom 19 met death beneath the surface. The mortality rate underground was 5.23 per 1000 employees; on the surface it was 1.8; the combined rate was 4.43. Of the 22 men killed, seven lost their lives by falls of ground, four by objects falling down shafts, two by blows from skip or cage, one by breaking of cable, one by falling into shaft, one by an inrush of water and sand; two died in mine fires, one from a cause unknown and three as a result of railroad mishaps above ground. At least two accidents could, it is believed, have been avoided had the victims heeded orders. The largest number of fatalities at any one property took place at the American mine, Diorite, where four men were killed. Aside from the men killed, 200 suffered injuries involving the loss of 20 days of work or more and 345 were incapacitated for from one to 20 days.

That Independent Steel-Makers Are Not Apprehensive over the matter of future ore supplies is the deduction drawn from the action of Jones & Laughlin in relinquishing its option to the Feigh lands on the Cuyuna range. As previously described in the "Journal," the lands comprise 160 acres in Section 10, 46-29, and adjoin Tod, Stambaugh & Co.'s open-pit Pennington mine on the west and southwest. The tract is owned in fee by Thomas Feigh, of Duluth. It was leased to the C. M. Hill Lumber Co., on the basis of a royalty of 35c. per ton, was explored by that concern, and ore was found. Subsequently the Hill company transferred its rights to the Northern Pacific for a reported consideration of $250,000, and the latter, in turn, granted to the Jones & Laughlin company an option specifying an increased royalty, the amount of which was not divulged, and specifying also that the ore be shipped over the Northern Pacific R.R. It was stated at the time that drilling had revealed the existence of 3,500,000 tons of ore, a large part of which can be won by the steam-shovel method, and it is understood that the check drilling conducted by Jones & Laughlin has added materially to the known dimensions of the deposit. On account of the business demoralization due to the European war the company has retrenched in all directions, as have other Lake Superior operaters. It is believed, however, that had the company felt there would be any difficulty in procuring ore supplies in the future a deposit so large as that in the Cuyuna tract would not have been abandoned.

TORONTO—Oct. 17

The Revival in the Sudbury District has been the most interesting feature of Ontario mining during the last two weeks. International Nickel, which has been running at about one-third capacity, started up two more furnaces and is now operating at about 75% of its old rate. The New Jersey refinery was started about two weeks ago, and there is now a satisfactory demand for nickel. The Mond company is working steadily and, since most of its output is sold in England, it has been affected to only a slight extent. The only change of importance has been a reduction in the amount of development work, most of the drills being now kept on ore production.

The Mining News

ALASKA

COPPER RIVER & N. W. R.R.—Offer to sell or lease road to government made by J. P. Morgan to Secretary Lane in Washington. Secretary replied would have to await report by board of engineers.

ALASKA COAL LANDS LEASING BILL passed by Senate and House as returned by conference committee and signed by President Oct. 20, becoming law. President presented with pen and inkwell made of Alaskan gold and mastodon ivory bought with subscriptions of Fairbanks citizens.

ARIZONA

Mohave County

PITTSBURG (Oatman) — Air compressor and steam pump installed; sinking to begin at once.

GOLD REED (Oatman)—Good ore found in shaft at 212 ft. at which depth sinking was discontinued. Station being cut at 200-ft. level from which drifting will soon be in progress.

HARQUA HALA (Parker)—Rich strike made on 200-ft. level, in prospecting for lost orebody. Vein 12 ft. wide, is good milling ore. Mill being put in shape and bins filled preparatory to starting 20-stamp mill.

PIONEER (Oatman)—Work suspended temporarily. Shaft sunk on Pioneer claim from 200 ft. to 450 and about 200 ft. of drifting done. Property controlled by Carl S. Shaller, Santa Monica, Calif.; under development contract to Rochester, N. Y., syndicate; C. T. Van Winkle, in charge.

UNITED EASTERN MINING COMPANY (Oatman)—Organized to explore Tom Reed Extension group of claims for the Tom Reed vein or branch. It was supposed Olla Oatman vein was extension of Tom Reed vein and Tom Reed company held this vein and explored it on this idea. Promoters of new company assume Tom Reed vein proper branches at north end of Tom Reed claim or that it continues on in same course instead of swerving to west to take course of Olla Oatman vein. Proposed to sink shaft to 500 ft. to cut vein. Work on shaft commenced. George W. Long president of company; J. L. McIver, secretary.

CALIFORNIA

Butte County

NUGGET (Stirling City)—Electricity installed for operating machinery.

BUTTE STAR GOLD MINING CO. (Nimshew)—Reported company has resumed operations. E. C. Wilson, principal owner.

MAMMOTH CHANNEL GOLD MINING CO. (Magalia)—Judgment for $20,000 secured by widow for killing of William Crabbe while in company's employ, confirmed by state supreme court.

Kern County

AMALIE DISTRICT near Caliente attracting attention through recent discoveries of good ore. Ferris property installing new tube mill with capacity of 70 tons per day. Over 200 tons of new machinery installed at Parlow mine. Other mines being developed: Zenda, Cowboy and Antarosa. District easily accessible by stage from Caliente on Southern Pacific and Santa Fe railroads.

Mariposa County

MOUNTAIN KING (Mountain King)—New hydro-electric plant to be installed, will develop 400 hp. Twenty stamps will be added to present 10-stamp mill. Force to be largely increased. Alexander Hamilton, superintendent.

Modoc County

MODOC MINES CO. (Fairport)—Active development work in progress. N. E. Guyot reports mill will be erected.

Nevada County

UNION HILL (Grass Valley)—Shaft being sunk from 600-ft. point to 900 without drifting. Drifting on 300-ft. level in progress to tap Georgia vein, formerly producer.

Riverside County

IRON CHIEF MINING CO. (Riverside)—As soon as properly proved up, company will be allowed to retain properties containing iron deposits, in litigation with General Land Office.

Santa Clara County

AMERICAN MAGNESITE MINES (Livermore)—Road being constructed to connect property with Livermore for shipping purposes. Ore will be hauled by motor trucks. J. J. Cummins, manager.

Shasta County

UNCLE SAM (Kennett)—Milling operations to be resumed. One hundred tons high-grade ore shipped to Selby for treatment. Fred [illegible] Jr., manager

Sierra County

SOUTH FORK CO. (Downieville)—Los Angeles company operating gravel [illegible] has begun development of several quartz veins [illegible] run. Indications good. Fred Kuhfield in charge.

WISCONSIN NORTH FORK (Forest)—After hard fight against swelling rock in mine and adverse financial conditions, good strike made in this gravel property being developed by San Francisco company with D. E. Hayden at head.

MOTT (Downieville)—This gravel property leased to Gilbreath & Hughes, of Downieville, who will repair the 1200-ft. tunnel and lay track preparatory to working the ground. Channel known as "black lead," gravel being dark and badly cemented to bedrock; nevertheless, yielded well when worked several years ago. Mott & Morrison, of Forest, and Harlan, of San Jose, owners.

Siskiyou County

ASH CREEK MINING CO. (Hornbrook)—Five-stamp mill being erected.

Summit County

NIAGARA—Purchase of this gold mine controlled by W. M. Johnson Co., of Chicago under consideration by new company proposing extensive development.

Trinity County

TRINITY CONSOLIDATED MINING CO. (Douglas City)—Reported operations on large scale will be conducted as soon as rainy season starts. Company also operates Union Hill hydraulic mine.

GOLD-PLATINUM MINING CO. (Burntranch)—Litigation over possession of claims on New River, settled out of court and operations will begin with shipping in of supplies. W. H. Holcomb, superintendent.

Tuolumne County

QUARTZ VEIN running under municipal buildings in Sonora may be leased to E. H. McMahon, who will conduct extensive operations if conditions warrant.

PEORIA FLAT (Sonora)—Robert Lewis and Dennis Scott, who hold bond, will run open trench through gravel beds for draining water and exposing gravel. Installation of mill for washing gravel contemplated.

COLORADO

Boulder County

PRUSSIAN (Rowena)—Samuel L. Newhouse has decided to equip and operate this property, which he has owned many years. Under various leases, mine made reasonably large production, but through lack of sufficient capital and of business capacity, past operators failed. Mr. Newhouse will equip with modern plant.

Gilpin County

PENNSYLVANIA (Central City)—This Pine Creek property being provided with small stamp-mill and buildings so that work may continue through winter.

Lake County

NORTH SIDE (Leadville)—Sinking resumed; was necessarily suspended during installation of pump following tapping of strong water-course a few weeks ago.

BENGAL TIGER-GORDON (Twin Lakes)—After 17 years of idleness, mining about to be resumed by company organized by George W. Boyce, who has taken lease and bond and is now making systematic investigation of ore reserves; estimated in various reports that between 43,000 and 66,000 tons is blocked out.

BIG FIVE OPERATING CO. (Leadville)—Thomas M. Raney has contract for sinking Big Four shaft 350 ft. and will begin work soon. This will develop that portion of the district to about 1100 ft., much deeper than any neighboring workings. Steady small production of 10- to 15-oz. gold ore maintained. Richardson Gibson manager.

San Juan County

IOWA-TIGER (Silverton)—Lessees Kafka & Galsi rebuilt jigback tram and will ship lead-silver ore. Melville Leasing Co. sinking winze for 100-ft. lift. Delsant & Co., in new winze, have opened streak of rich gray copper in same vein that produced heavily years ago

KITTIMAC (Middleton)—Aërial tramline, of which several towers were last winter destroyed by snowslides, repaired. Good stopes of low-grade sulphide ore opened during summer in Kittimac vein proper while, in Little Joe vein, shoot of gold-silver ore disclosed and found adapted to cyanide treatment. New addition to mill, together with complete remodeling of equipment, almost completed.

San Miguel County

JUNTA (Telluride)—While starting up machinery, short time ago, motor of tube-mill burned out. Repairs proving rather uncertain, cyanide department of plant temporarily retired and the mill's work will be solely stamping and amalgamation. Ore from Orion mine keeping 30 stamps busy.

Teller County

JERRY JOHNSON (Cripple Creek)—On Oct. 7, ore house at main shaft totally destroyed by fire. New ore house will be built at once.

JOE DANDY LEASING CO. (Raven Hill)—Operations temporarily discontinued to permit necessary repairs near shaft collar. Upper 10 ft. of shaft being concreted to make it solid through dump.

BEACON GOLD LEASING CO. (Victor)—This company, now operating through Mable M. shaft of Gold Dollar, will sink winze from 13th level to water level, then crosscut 80 ft. to point under shaft, and raise to connect with shaft. Development will be performed on company account under supervision of Manager A. J. Campbell.

IDAHO

Coeur d'Alenes

PARAGON CONSOLIDATED (Wallace)—Company recently started mill, after shutdown on account of water shortage for month or more.

MONTANA-IDAHO COPPER CO. (Adair)—Work started on 7500-ft. tunnel from Adair, under shaft of Monitor Mining Co.; proposed to develop and operate number of promising properties in Adair district, according to Otis Hill, general manager of company. Buildings erected and preliminary operations started. First unit of water-power plant being installed and by Nov. 1 power drills will be in use for driving. Tunnel will be of double-track size, eventually to be equipped with electric haulage.

MICHIGAN

Copper

WHITE PINE (Ontonagon)—Thousand-ton stamp mill will be ready May 1, 1915, if operations continue at present rate of speed.

WYANDOT (Winona)—All operations suspended, treasury being so low it was considered wise to retain the funds for necessary expenses, such as taxes, during prolonged period of idleness.

Iron

JUDSON (Alpha)—Loading machine described in "Journal," Sept. 19, invented by J. H. Hodgson and Nels Floding, now being given trial at this property. Operating in one of main underground drifts and reported to be doing good work. Believed by some it has not enough power, but this will be easy to remedy. Machine manufactured by Lake Shore Engine Works, Marquette, Mich.

PORTER (Amasa)—Tract in Sect. 22, 44-33, to be developed by Longyear interests; explored with drills some months ago. Deposit reported to contain 1,000,000 tons; ore of excellent grade, much within bessemer limit. Formation is continuation of that of Hemlock mine several miles to northwest. Machinery formerly in service on Mesabi range being installed. Sinking will continue through winter and mine should produce next summer.

MINNESOTA

Cuyuna Range

CROFT (Crosby)—Installation of 150,000-gal. water tank completed.

CUYUNA-SULTANA (Ironton) — Second exploration shaft now going down on property. Deposit adjoins Cuyuna-Mille Lacs; is a manganiferous iron ore, estimated at several million tons.

WILCOX (Brainerd)—New Vulcan hoist, received. Surface plant now complete and operators expect to ship this season. Thus far only 200 gal. water per min. encountered, unusually small volume for Cuyuna property.

Mesabi Range

LEONARD (Chisholm)—Tracks of Great Northern and Duluth, Missabe & Northern being removed from property to facilitate stripping operations recently inaugurated.

MILLER (Aurora) — After sending 300,000 tons to Two Harbors dock this season, shipments suspended. As soon as possible new level will be started, when operations will be resumed for winter.

MISSOURI-KANSAS-OKLAHOMA

JOSEPH POWELL and others, of Galena, Kan., opened up good zinc prospect on their lease on Illinois Lead & Zinc Co. land west of Galena.

LESLIE PATRICK & CO. (Galena, Kan.)—Rich strike of silicate on lease at Happy Hollow; ore lies in loose formation of ground or water course. Company experienced great difficulty in holding ground, but now believes timbers recently placed will hold.

COMMERCE MINING CO. (Baxter Springs, Kan.)—Several drill rigs at work. Most of ore encountered at 200 ft. or more, some of it going as low as 300 ft. Almost exclusively milling undertaking, requiring large amount of capital.

GUM SPRINGS MINING CO. (Cave Springs, Kan.)—Ground drained and being let out to miners; several good prospects already struck and mill running steady on custom dirt taken from mines on ground. Land idle after mill was burned about a year ago, but with advancing price of spelter was reopened.

MONTANA

Lincoln County

LIBBY PLACERS (Libby)—P. J. Brophy, of Butte, secretary-treasurer of company, just returned from inspection, reports more than $100,000 in gold taken out since present company took possession. Holdings comprise 1100 acres, most of it suitable for dredging or steam-shovel. Company contemplates introducing shovel next season to permit operating without interruption throughout year.

Silver Bow County

BUTTE & SUPERIOR (Butte)—Mine closed down night of Oct. 17 to repair shaft.

ANACONDA (Butte)—Extensive tests under supervision of safety-first department with "Sabulite" so satisfactory that it is probable company may use it in its mines in future and that factory will be established in Butte for manufacture and distribution in United States.

BULLWHACKER (Butte)—Plans for reorganization as follows: Sell and dispose of all assets to Clark Bros. & Klein, total purchase price to be total indebtedness of the company. Clark Bros. & Klein will then transfer all of property to Butte-Bullwhacker Mining Co. and receive all capital stock of said company, consisting of 1,000,000 shares; will then sell to each stockholder of Bullwhacker Copper Co. same number of shares in new company as are owned by each stockholder in old company at 15c. per share, payable in six monthly installments of 2½c. per share. When entire issue of new stock is subscribed and paid for, Clark Bros & Klein will place in treasury cash equal to difference between total indebtedness of the old company and $150,000. This will leave $20,000 cash in the treasury.

NEVADA

Elko County

LEACHING EXPERIMENTS ON COPPER ORES AT CONTACT made with success. Samples high in lime and thought to offer insurmountable difficulties were successfully treated in Butte & Duluth plant, Butte, Montana.

Humboldt County

NEW CAMP OF SILVER MOON established between Queen Cañon and Sacramento. Several sales of claims reported. Number of small veins containing shoots of high-grade gold-silver ore discovered.

DAVEY GOLD MINING CO. (Davitown)—Five-stamp mill operating; average grade of ore said to be $40 in gold. Deep shaft will be sunk this winter, and if satisfactory tonnage of milling-grade ore is opened, a 50-ton mill and cyanide plant will be built.

Lander County

FOREST SHAFT (Austin)—Lightning set fire to timbers of this shaft on Lander Hill, Oct. 2. Lower tunnel bulkheaded and timbers saved, but all fire-fighting means useless for shafts, which finally caved in. Estimated loss, $10,000.

Lincoln County

NEVADA-DESMOINES (Pioche)—Stated company will resume work. Shaft, now 327 ft. deep, will be sunk another 100 ft. Larger pump will be installed.

Lyon County

NEVADA-DOUGLAS (Ludwig) — Second consignment of two cars of machinery for new leaching plant received.

MASON VALLEY MINES CO. (Thompson)—Operations closed down Oct. 17.

Nye County

TONOPAH MERGER (Tonopah) — Station being cut on 1235-ft. level preliminary to crosscutting.

LITIGATION HILL MERGER (Manhattan)—Milling of 50 tons completed by lessees in Associated mill, heads said to run $48 per ton.

GOLDEN ARROW MINING CO. (Golden Arrow)—Timber and machinery being packed in. Expected mill will be in operation by January, 1915.

CONSOLIDATED LEASING CO. (Manhattan)—Lessees of the Manhattan Consolidated have just started 1000-ton milling in Associated mill of ores developed when lease was in operation over year ago. Grade of ore said to average about $12.

TONOPAH JIM BUTLER vs. WEST END CONSOLIDATED (Tonopah)—Attachment for $1,500,000 served to cover value of 25,000 tons of ore alleged taken from West End-MacNamara vein in Eureka and Curtis claims, valued at $500,000; exemplary damages allowed under statutes.

WHITE CAPS (Manhattan)—Company will take over immediately cyanide part of Manhattan Milling & Ore Co. ten-stamp mill, now under lease to Mushett & Wittenberg, operators on Big Pine. White Caps will use stamps and tube mill for one shift each day. Base ore will thus not be run over plates, but go direct from stamps to tube mill and then into cyanide department. Fifty-ton ore bin now being built near White Caps shaft, and milling will soon be started. Oxidized ores proved amenable to cyanide.

White Pine County

DISCOVERY OF ANTIMONY ORE reported at old camp of Taylor, near Ely.

RUBY HILL (Ely) — Lease and bond on group of five claims taken. Work will begin soon. Considerable work done in past.

NEVADA CON. (Ely)—Adjustment to new conditions gradually being brought about. Mining and smelting forces greatly reduced; wherever possible, married employees retained, so district has more prosperous appearance than might be expected. At McGill, one reverberatory out of three in operation, and at Steptoe, four of eight sections operated for period of four to five days, then other half of plant for equal period; this to prevent deterioration of drive belts, vanner belts, launders, etc., which would rapidly dry up and become useless. As result of the half-time operation and consequent shifting of workmen from one part of mill to another, there is decided decrease in efficiency. Believed no further reduction in output will be made for present, at least, and that a complete shutdown will not occur unless imperative. Experiments in oil flotation at Steptoe being continued with satisfactory results. Large consignment of new equipment received recently. Experimental plant operated in connection with section of concentrating plant, so that ore is treated in commercial quantities. In addition to effecting greater saving of copper content, thought flotation will permit dispensing with part of concentrating process now followed.

NEW MEXICO

Grant County

CHINO COPPER (Santa Rita)—One steam shovel and two locomotives now working on night shift, more expected to be added soon. Mines worked on six-day shift; mill at Hurley running 5½ days.

AMERICAN MEERSCHAUM & PIPE CORPORATION (Hanover)—Mines and mill in hands of receiver. Equipment being sold. J. W. Bible appointed receiver. Close-down said to be no fault of mine or mill. Ore in sight and mine management excellent.

C & O MINING & MILLING CO. (Pinos Altos)—Several cars of ore high in gold shipped to Douglas. Mining continues on high-grade oreshoot. Incline shaft used; equipment [illegible] mine excellent. Four arrests made for alleged "high grading." Cases come before grand jury at Silver City in February.

San Miguel County

ROMERO MOLYBDENITE MINES (Las Vegas)—Shipment of one ton of molybdenite will be made in few weeks. [illegible] in demand at Philadelphia. Mill now producing $5[illegible]

Sierra County

BIMETALLIC MINING & MILLING CO. (Sierra Blanca)—Distillate engine, air compressor and drills purchased. Machinery will be moved to works soon.

Taos County

SILVER QUEEN (Red River)—Pending litigation over fraction crossed by quartz vein now settled. First shipment made to local mill Oct. 1. Tables being installed in concentrator.

UTAH

Juab County

CHIEF CONSOLIDATED (Eureka)—Side track or spur, three-quarters of mile long, from the D. & R. G. completed to mine. Experimental mill for treatment of ore from Chief Consolidated being built by separate company, known as Utah Minerals Concentrating Co. Work will start with ore from mine dump; if successful, may lead to building of larger custom mill in Tintic. Plant now in process of construction will have capacity of 100 tons. Foundations, ore bins, etc., built, and some of crushing machinery being installed.

WASHINGTON

Pend Oreille County

BEAD LAKE GOLD-COPPER MINING CO. (Newport)—Company developing group of 20 claims for 10 years, has opened vein about 12 ft. wide in lower tunnel. according to W. E. Allen, secretary. Strike made at 300 ft. depth. Shoot about 180 ft. long, of good milling grade. Company preparing to begin shipping immediately, but contemplates constructing mill soon to handle low-grade product. Other Spokane men interested are Dr. C. O. Linder, G. C. Reisler, Joseph Roslow and Edward Tragger.

Stevens County

GWIN (Kettle Falls)—Mine will resume operations after shutdown due to low water. Mine has been equipped with a 50-ton concentrator and electric-light plant. Power secured from Hall Creek. Peter Proff, manager.

CANADA

British Columbia

CONSOLIDATED MINING & SMELTING (Trail)—To date, over 290,000 tons of ore treated for year from Kootenai and Boundary districts and prospects are for a total of 350,000 tons. Biggest shippers are: Center Star, 130,000 tons; Le Roi, 61,000 tons; Sullivan, 23,000 tons; Le Roi No. 2, 2600 tons; and Ben Hur, 10,000 tons.

VOIGT (Princeton)—Active operations will start soon on this property, just taken over by lately organized Similkameen Consolidated Copper Co., located at Copper Mountain. W. S. Ayres, of Hazelton, Penn., president and chief consulting engineer. Expected large tonnage will be blocked out by next summer. With this company launched and British Columbia Copper Co. operating in Princess camp, future for Princeton district looking better than for some time.

Ontario

PEARL LAKE (Schumacher)—Plant will be sold at auction by sheriff, Oct. 22.

DOME LAKE (South Porcupine)—New 100-ton stamp mill in operation. Main shaft down 400 ft., where station has been completed. No. 3 vein opened up for 100 ft. on 300-ft. level. Believed by some that cyanide addition will be necessary for treating ore.

TEMISKAMING (Cobalt)—Main shaft down 750 ft., at which level high-grade vein several inches wide was encountered. Pockets of good ore on the 575- and 650-ft. levels.

VIPOND (Schumacher)—New Hardinge mill in successful operation. Third cleanup realized 550 oz., valued at about $11,000. Several new veins discovered on surface. Ore reserves above 300-ft. level sufficient to keep mill going 20 months.

DOME (South Porcupine)—Report for September shows steady increase in tonnage treated, which partially compensates for lower grade of ore. During month, 21,940 tons milled, producing $99,301. About 50,000 ft. of surface and underground diamond-drilling contracted for.

CANADIAN COPPER CO. (Copper Cliff)—Four of six furnaces at Copper Cliff closed on outbreak of war. Two of them started again and mining activity being resumed. Only Creighton mine being operated, but understood that No. 2 mine will shortly be reopened.

McINTYRE (Schumacher)—Contact vein which faulted on 500-ft level picked up and attempt being made to reach orebody on 600-ft. level through Pearl Lake shaft. Arrangements made with the Schumacher to prove up ground underlying Pearl Lake from one of Schumacher shafts. Mill treating 200 tons daily; ore reserves given at 15 months' supply.

CANADIAN EXPLORATION CO. (Long Lake)—At this mine, in Sudbury district, mill now treating 150 tons daily. Ore contains about 13% sulphide, refractory, rendering cyanide treatment necessary. Extraction of 86.6% being obtained. Bullion shipped to Ottawa mint, consignments last month amounting to $20,000. Four drills working on orebody which is being stoped from 180-ft. level.

TOUGH OAKES (Kirkland Lake)—Production from first of year to date, $100,000. Good progress being made with construction of 100-ton mill; company expects to resume underground work in December. New mill will crush in 20x12-in. Buchanan crusher, pass through trommel and crush oversize in 10x16-in. Buchanan; grind in 6-ft. by 16-in. Hardinge ball mill; send to simplex and duplex Dorr classifiers; grind in 5x20-ft tube mill; pass over amalgamating plates in tube-mill circuit; agitate; thicken; precipitate by Merrill apparatus. All tanks fitted with Dorr mechanism. Scheme of treatment involves counter-current decantation.

Saskatchewan

BEAVER LAKE—This company, organized at Prince Albert to operate in Beaver Lake gold area, has shaft down 67 ft. and is putting up camp buildings. Plant contracted for and will be brought in during winter.

MEXICO

MEXICAN ABSTRACT & CHARTER CO. reports that by decree of supreme chief of Constitutionalist army, in charge of executive power, such matters as have been handled and decided upon since Feb. 19, 1913, by Department of Fomento, and later by so called Department of Agriculture and Colonization since date of its creation, are declared void. Those affected by this decree are at liberty to call upon Department of Fomento to request reconsideration of their matters, and, should there be justice in so doing, new documents will be issued.

EL ORO MINING & RY. CO. informs stockholders that, owing to disturbed conditions prevailing, no accounts have been received from mine since end of April, and for same reason Mr. Main has been unable to furnish directors with usual annual report. In consequence, annual general meeting of company, usually held about end of September, will have to be deferred until manager's report and accounts to June 30 are received. Meeting will be held quickly as possible after these documents arrive. Management was compelled to suspend all milling and other surface operations on April 28. After that date, development of mine continued, and general surface equipment, as well as workings underground, maintained. So far as directors are advised, company's property has not suffered physical damage or disturbance.

Under date of Aug. 22, Mr. Main wrote that forces of Constitutionalist party entered El Oro on Aug. 7, after evacuation of town by Federal troops, but except for levy on various companies operating, under which this company was assessed 20,000 pesos, peace of camp was not disturbed. Under date Sept. 9, Mr. Main cabled that, owing to difficulty in exporting and disposing of bullion, and general unsettled financial condition in Mexico City, did not see way to recommend resumption of milling.

On Sept. 22, Mr. Main cabled that in view of recent changes in situation, and peculiar local conditions, he believed it advisable partially to resume milling operations about first week in October. Directors now hear through New York that milling operations on small scale were resumed on Oct. 1, and that this course was believed necessary for protection of company's plant and interests In view of terms of Mr. Main's cable of Sept. 9, directors cannot divest themselves of conviction that pressure was brought to bear on Mr. Main which left him no alternative but to adopt this course. On Sept. 30, directors were informed by foreign office in London that information received from chargé d'Affaires in Mexico City stated bullion, estimated at 1,500,000 pesos, had been seized by military authorities there on Sept. 29, of which 72,000 pesos was property of El Oro Mining & Ry. Foreign office informed directors that urgent representations with regard to matter had been made to Mexican authorities.

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ASSESSMENTS

Company	Delinq.	Sale	Amt
Annie Laurie, Utah	Nov. 9	Nov. 28	$0.004
Black Bear, Ida (post)	Oct. 30	Nov. 28	0.01
Blaine & Emmett, Ida.	Oct. 26	Nov. 14	0.005
Bullion, Ida.	Oct. 21	Nov. 23	0.005
Bullwhacker, Mont.	.....	.....	0.15
Cardiff, Utah..	Oct. 19	Nov. 9	0.01
Challenge Con., Nev.	Oct. 27	Nov. 17	0.05
Coeur d'Alene Investment, Ida..	Oct. 10	Nov. 14	0.002
Comet, Ida..	Oct. 20	Nov. 20	0.0005
Comstock Copper, Ida	Oct. 5	Nov. 5	0.001
Confidence, Nev.	Nov. 11	Dec. 2	0.10
Continental, Ida	Oct. 6	Nov. 5	0.016
Copper Chief, Ida	Oct. 21	Nov. 23	0.005
Copper Crown, Ida.	Oct. 10	Nov. 14	0.002
Copper King, Ida	Oct. 1	Nov. 1	0.01
Copper Plate, Ida..	Aug. 29	Nov. 29	0.002
Custer Peak, S.D.	...	....	0.02
Dalmatia, Ida	Oct. 1	Nov. 2	0.001
Davis-Daly, Mont	Oct 15	......	0.25
Diamondfield Black Butte, Nev (post)...	Oct. 15	Nov. 21	0.01
East Hercules, Ida (post) ...	Nov. 1	Dec. 1	0.001
Eastern Star, Ida.	Oct. 20	Nov. 20	0.002
Fly Con, Nev.	Oct. 15	Dec. 2	0.03
Emerald, Utah, (three installments)	.....	June 9, '15	0.01
Excelsior Iron, Utah.	Oct. 25	Nov. 15	0.115
Greenhorn, Utah.	Oct. 26	Nov. 30	0.005
Hilarity, Ida.. ...	Oct. 12	Nov. 23	0.003
Hypotheek, Ida.	Oct. 26	Nov. 16	0.01
Idaho-Montana, Ida	Nov. 2	Nov. 21	0.001
Idaho-Nevada, Ida	Nov. 7	Dec. 1	0.001
Lead King, Ida	Nov. 1	Nov. 16	0.0005
Lewis & Clark, Ida	Sept. 15	Nov. 13	0.001
Little North Fork, Ida.	Oct. 12	Nov. 12	0.001
Lucky Deposit, Utah.	Oct. 12	Nov. 15	0.005
Lucky Swede, Ida. (post)	Oct. 19	Nov. 19	0.001
Nabob, Ida..	Oct 1	Nov. 2	0.005
National Copper, Ida	Oct 5	Nov. 5	0.03
North Bunker Hill, Ida. (post.)	.	Oct. 31	0.002
North Scranton, Utah.. ..	Nov. 3	Dec. 3	0.002
Overman, Nev	Oct. 8	Oct. 29	0.05
Peerless, Utah	Oct. 30	Nov. 16	0.001
Phoenix, Ida.	Oct. 26	Nov. 26	0.005
Robbers Roost, Calif..	Oct. 15	Nov. 9	0.01
Santaquin, Utah	Oct. 7	Nov. 21	0.005
Silver Pick, Nev. (post)	Sept. 30	Nov. 2	0.01
Sunset, Ida	Nov. 7	Nov. 30	0.003
Tarbox, Ida. (post)	Oct 26	Nov. 27	0.0025
Triumph, Utah..	Nov. 2	Nov. 23	0.01
Tuscumbia, Ida...	Oct. 20	Nov. 20	0.002
Union Con, Nev. ..	Oct 15	Nov. 5	0.05
United Copper, Wash			0.005
United Tintic, Utah	Nov. 7	Nov. 23	0.01
Valentine, Ida. (post)	Oct. 12	Nov. 12	0.001
Yellow Jacket, Nev	Nov. 5	Nov 25	0.05

The Market Report

METAL MARKETS

NEW YORK—Oct. 21

The chief features of the week have been a further softening in the prices for copper and silver, a sharp advance in the spelter market, a slump and recovery in tin and a distinctly firmer tone for lead.

The steamship "Dwinsk" sailed from New York for Archangel, Russia, on Oct. 15, with a cargo comprising 1600 tons of lead, 400 of spelter, 200 of nickel, and 172 of antimony.

A London dispatch of Oct. 20 says that the committee of the London Metal Exchange has decided that its members must pay all sums due at the end of October by Nov. 5, on the following basis per ton: Copper, £49; tin, £120; iron, 49s. Members who are unable to pay the full amount due must notify the committee by Oct. 22, and the committee will thereupon appoint an accountant to investigate such members' financial standing or position. Members who are unable to pay will be suspended from dealing and must pay interest at 1% above the bank rate, with a minimum of 6%. Members must also take up and deliver metals due and close their defaulting clients' accounts. The committee is yet undecided about reopening the Exchange on Nov. 5, but the scheme paves the way for the resumption of daily settlements.

Copper, Tin, Lead and Zinc

Copper—Only a small business is reported. Sales have been made at 11⅜@11¼c., regular terms, to domestic consumers, corresponding with about 11¼@11⅛c., cash, New York, but sales for export are said to have been made at prices netting only 11c., cash, New York. Producers are apparently feeling more free in their efforts to make sales and the market is becoming less one-sided than it was, which no doubt has had something to do with the declining tendency. However, an accumulation of unsold stocks is still going on.

Base price of copper sheets is now 17c. per lb. for hot rolled and 18c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 13@13¼c. per lb. for carload lots at mill.

The American Smelting & Refining Co. has authorized its works managers to settle at 12.02c. per lb. for copper purchased in September.

The Australian copper mines are reported to be producing at about 80% of their ordinary capacity. The government has been making advances (of 80% on a valuation in August) to them in order to keep the mines going in the interest of the laboring men. Wallaroo & Moonta has notified the government that it will have to recede from this arrangement unless 20% reduction in wages be permitted

The Rio Tinto is understood to be operating only three days per week and to have suspended its shipments of pyrites.

L. Vogelstein & Co. has issued a circular letter to its clients, saying that the firm proposes to account for all material received during trade interruption at the actual price realized when the respective quantities of copper are ready and marketable as refined copper. In the event of this proposition not meeting with approval, copper will be sold on order of the consignor, subject to a commission of 1%, or will be returned to the consignor, the commission having been deducted, for sale by the consignor.

The price reported in the newspapers as having been paid by England for the copper seized in the Holland-America ships was incorrect.

DAILY PRICES OF METALS

NEW YORK

Oct.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
15	4.9700	51⅜	*	28¼	3.50	3.32½ @3.35	4.70 @4.75	4.55 @4.60
16	4.9725	50⅞	*	28¾	3.50	3.35	4.70 @4.80	4.55 @4.65
17	4.9700	50⅝	*	28½	3.50	3.35	4.75 @4.80	4.60 @4.65
19	4.9675	50½	*	28¼	3.50	3.35	4.80 @4.90	4.65 @4.75
20	4.9625	50⅜	*	29	3.50	3.35	4.90 @4.95	4.75 @4.80
21	4.9500	50	*	29½	3.50	3.35	5.00 @5.10	4.85 @4.95

*No quotations.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c : Chicago-New York, 13½c.

Tin—The market was heavy under liquidation during the first half of the week. Its tone changed completely as soon as the liquidation was over. Domestic consumers became more interested and were buyers of futures, which, however, they found hard to obtain at the ruling prices. The market closes firm.

Lead—The curtailment of production by the principal producers of Idaho and Missouri has given a distinctly better tone to this market. As yet, consumers have not become interested in taking very large quantities, although it is commonly recognized that the price is probably at bottom. Some sales of lead for export have been made.

The St. Joseph and Doe Run have curtailed production 25%; Desloge, 20%; no advices respecting the Federal have been received. Among the Cœur d'Alene producers, Hercules has curtailed 50%; Hecla has curtailed: Morning is closed. Total curtailment in the Cœur d'Alene is estimated to be equivalent to about 3500 tons of lead per month compared with the production at the midyear.

Spelter—This market advanced right from the beginning of the week, first under the influence of support by important producing interests who became buyers last week, next because of an increased inquiry from Europe, and finally because of the suspension of production at the Butte & Superior mine. Some sales for export have been made and some domestic sales, but the volume of business has not been large, the market having advanced by producers progressively raising their prices after doing small business. There has been a distinct improvement among them and some have not yet been induced to offer quantities any larger than necessary to feel the market. At the close some sellers were asking 5c., but there were sellers at lower prices.

Other Metals

Aluminum—The market for this metal remains quiet, but there has been some increase in inquiries. Quotations are 18@19c. per lb. for No. 1 ingots, New York.

Antimony—The market has been stronger, chiefly on account of a demand for export. Ordinary brands, Chinese, Hungarian, etc., are selling at 11@12c. per lb. Cookson's sold early in the week at 14c., but is now held at 15c. per lb., New York.

Quicksilver—Demand here is fair, but the market has settled a little. The current quotation is $50 per flask of 75 lb.; it is possible that this might be shaded on a good order. In London, the price has been advanced to £9 5s. per flask.

Silver—Owing to the sharp decline in foreign exchange and the apathy in the silver market, the price has reached the lowest point—50c.—yet touched in the decline.

The London official prices for the week were: Oct. 15, 23⅜d. per oz. standard Oct. 16, 23⅛d.; Oct. 17, 23⅛ d.; Oct. 19, 23d.; Oct. 20, 22[illegible]d.; Oct 21, 22[illegible] pence.

Platinum—The market is rather uncertain and business is slow. The demand from jewelers, usually good at this season, has been slow. Prices are quoted at $48@50 per oz. for refined platinum and $55@58 for hard metal; but these are subject to negotiation. Abroad the market is entirely nominal

Zinc and Lead Ore Markets

JOPLIN, MO.—Oct. 17

Blende showed a high price of $42; assay base, $36@40; metal base, $34@36 per ton of 60% zinc. Calamine base, $18@20 per ton of 40% zinc. Average all grades of zinc, $38.16 per ton. Lead was steady at $40 per ton of 80% metal content. Average all grades of lead, $39.84 per ton.

Purchases Friday were at prices $2 to $3 per ton higher than Thursday, and the week-end brought a ray of hope to the producers of zinc ore. The lead shipment this week is 300 tons short of last week, and buyers are expecting a further decline in output on account of the low price level.

SHIPMENTS WEEK ENDED OCT. 17

	Blende	Calamine	Lead	Value
Totals this week	9,565,320	343,600	1,462,530	$219,170
Totals this year.	418,366,280	31,033,660	72,395,670	10,366,730

Blende value, the week, $185,680; 42 weeks, $8,299,320.

Calamine value, the week, $4360; 42 weeks, $362,660.

Lead value, the week, $29,130; 42 weeks, $1,704,750.

PLATTEVILLE, WIS.—Oct. 17

The base price paid this week for 60% zinc ore was $38@39 per ton. The base price paid for 80% lead ore was $40 per ton. Shipments were light owing to the rains and bad condition of roads.

SHIPMENTS WEEK ENDED OCT. 17

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	2,313,460	110,000	290,940
Year	127,175,460	4,230,700	27,776,510

Shipped during week to separating plans, 2,052,800 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Oct. 21

The iron and steel trades continue dull, and new business is scarce still. Even on contracts, specifications are rather slow in coming to mill.

Prices are weak, as might be expected under the circumstances. Sellers are holding for higher quotations for next year's business, but not much has been reported as yet.

A little inquiry for pig iron is reported, but few sales, and business has been slow. Some small sales of Southern iron are reported for shipment to Italy and Japan.

Arguments in the suit to dissolve the United States Steel Corporation were begun in the U. S. Circuit Court at Philadelphia on Oct. 20. The hearing will occupy several days.

PITTSBURGH—Oct. 20

The iron and steel market as a whole has lost a little more ground in the past week, specifications on old contracts being filed in lesser volume, while new orders are still lighter. An exception is the pipe industry, which has had heavier bookings. The lightness of steel buying is attributed to the financial situation, whereby banking accommodations are largely withheld.

Steel mill operations this week are at an average rate of about 45% of capacity, against a 50% rate a week or two ago. The tin-plate mills are showing the best operation, the wire mills being a close second. At the bottom of the list stand the plate, structural and rail mills. Export business is running at a slightly lesser rate than just before the war, when it was abnormally quiet. South America is a particularly poor market, but Canada is doing better. England has shown good demand for barb wire, nails and wire rods.

Pig Iron—No transactions in bessemer iron have been reported for some time. There have been a few small sales of basic iron, generally at slight concessions from $13, Valley, which has been the regular asking price. Foundry iron is moving only in a very small way, and some sellers are making concessions, it being possible to buy a fair sized lot at $12.75, furnace. We quote prices unchanged, except for foundry iron: Bessemer, $14; basic, $13; No. 2 foundry, $12.75@13.25; malleable, $13; gray forge, $12.50@12.75, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market is very soft, generally speaking. There has been no contract buying at the reduced price of $68, Baltimore, lately quoted by the English producers. There is considerable resale material available from the United States, and there are even offerings from foreign consumers who find themselves overbought. Prompt lots can be picked up at about $65 per ton.

IRON ORE

Imports and Exports of Iron Ore in the United States eight months ended Aug. 31, in long tons:

	1913	1914	Changes
Imports.	1,621,309	986,576	D. 634,73
Exports...........................	505,841	518,597	I. 12,75

The larger imports this year were 565,543 tons from Cuba and 240,967 tons from Sweden. The exports were chiefly to Canada.

Imports of manganese ore were 238,475 tons in 1913 and 183,929 tons in 1914; decrease, 54,546 tons.

Iron-ore shipments from the Lake Superior region in September were 5,431,307 long tons, a decrease of 1,828,55 tons from September, 1913. For the season to Oct. 1 the total shipments were as follows, by ports, in long tons:

Port	1913	1914	Changes
Escanaba....................	4,297,223	3,019,651	D. 1,277,57
Marquette....................	2,573,604	1,385,718	D. 1,187,88
Ashland......................	3,558,802	2,741,917	D. 816,88
Superior......................	10,818,324	9,478,253	D. 1,340,071
Duluth........................	9,830,726	5,278,899	D. 4,551,827
Two Harbors.................	8,194,738	4,804,975	D. 3,389,763
Total....................	39,273,417	26,709,413	D. 12,564,004

Of the 5,341,307 tons of iron ore shipped from Lake Superior ports in September, 4,260,529 tons, or 79.8%, were delivered to Lake Erie ports.

Imports at Baltimore for the week included 13,530 tons manganese ore from Brazil; also 1182 tons ferromanganese from Liverpool.

COKE

There is tentative inquiry for a little furnace coke for November delivery, also for a moderate sized tonnage over the balance of the year. A recent forced sale of about 4000 tons of spot furnace coke was at $1.50, generally regarded as under the regular market. There is a fair demand for prompt lots of foundry coke, but scarcely any for contract. Prices are quotably slightly lower: Prompt furnace, $1.60; contract furnace, $1.65@1.75; prompt foundry to consumers, $2.10@2.25; contract foundry, best grades, $2.35 to jobbers, $2.50 to consumers, per net ton at ovens, Connellsville region.

CHEMICALS

NEW YORK—Oct. 21

The general markets are quiet, even inclined to be rather dull.

Arsenic—There is a little more activity and sales have been larger than for some weeks. Prices have weakened, however, and current quotations are $3.75 per 100 lb. for both spot and futures.

Copper Sulphate—The market is not specially active, but is steady. Quotations are unchanged at $4.50 per 100 lb. for carload lots, and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business has been quiet, with only moderate sales. Quotations continue 1.87½c. per lb. for spot and November-December; 1.90@1.92½c. for 1915 deliveries.

Imports and Exports of Raw Material for chemical manufacture, eight months ended Aug. 31, long tons:

	Imports		Exports	
	1913	1914	1913	1914
Sulphur...	4,841	14,583	52,684	95,174
Pyrites..	614,288	667,066	....	....
Chrome ore	45,779	48,081	....	... . ..
Magnesite	112,010	89,690	723	1 196

Exports include reëxports of foreign material. Exports of calcium carbide were 21,448,762 lb. in 1913, and 23,174,699 lb. this year.

PETROLEUM

Total oil production in California for the eight months ended Aug. 31 is reported at 70,608,830 bbl.; deliveries, 67,278,167 bbl.; surplus added to stocks 3,330,663 bbl. The production showed an increase of 6,005,905 bbl. over last year.

Production of petroleum in Ontario in the half-year ended June 30 was 109,884 bbl. in 1913, and 104,641 bbl. in 1914; a decrease of 5243 bbl. The total amount of bounty paid was $54,936 this year.

Exports of mineral oils from the United States in September were 520,333,573 gal. For the nine months ended Sept. 30, the total exports were 1,504,868,564 gal. in 1913, and 1,695,583,269 gal. in 1914; an increase of 190,714,705 gal., or 12.7%, this year.

The Engineering and Mining Journal

VOLUME 98 OCTOBER 31, 1914 NUMBER 18

Electric Shovels in Lapland

By L. E. Ives*

SYNOPSIS—The Luossavaara-Kirunavaara company operates the world's greatest iron mine, north of the Arctic Circle. The ore is mined largely from an openpit with mechanical shovels. The equipment includes three electric shovels, one of which was made in this country by the Bucyrus Co. Electricity is obtained from a large hydro-electric plant. Electrical connection system and automatic controllers for shovel motors furnished by Cutler-Hammer Co. Brief description of generating station, ore handling, transportation and deposits.

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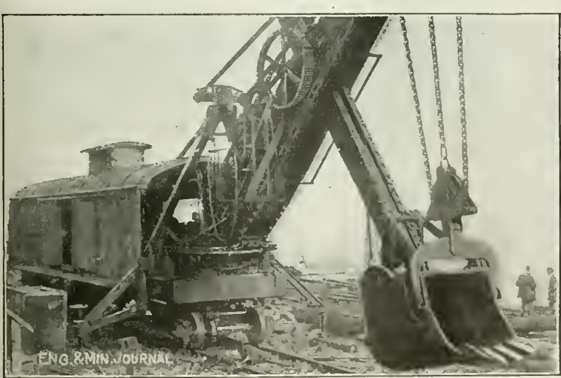
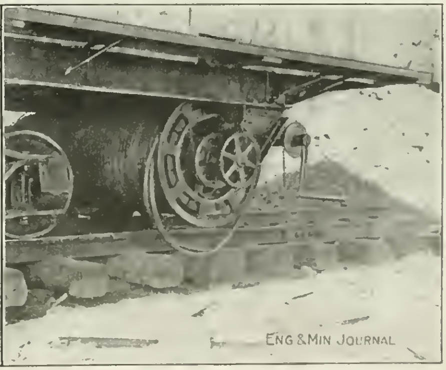
A remarkable undertaking is that of the Luossavaara-Kirunavaara company, which operates iron mines 80 miles north of the Arctic Circle in Sweden and uses electric energy on a large scale. American machinery and American methods are largely employed in these operations.



Near View of Bucyrus Electric Shovel



Electric-Cable Reel under Rear of Shovel

The Kiruna iron-ore deposits are in a remote and desolate country, 170 miles from Lulea, a port on the Baltic Sea, and 90 miles from Narvik, the present shipping port for the ore, on the northern coast of Norway. The distance from Stockholm to Kiruna is about 1000 miles.

The climate is severe, the winter lasting from the beginning of October to the last of May, with an average yearly temperature of 29° F. There are huge falls of snow and the temperature frequently goes to −30 degrees.

Kiruna is a clean, well laid-out city, with macadamized streets and good sidewalks, splendid schools and churches, and a population of about 10,000 people. When the mines were opened, there were no permanent settlements in the vicinity, and it was necessary for the company to build up a town and attract labor from the south.

The Deposit

The mines lie on a plateau about 1000 ft. above the sea. The iron mountains reach a height of about 800 ft. above this plain. The only timber in the district is birch; the tree-line is below the mountain tops. The Kirunavaara ore deposit commences in Luossajarvi and continues toward the south, as far as is known, with a length of somewhat more than 3½ miles.

At the top of the mountain ridge, which constitutes a large part of the deposit, where the boundaries of the ore are well known, the horizontal width averages about 300 ft., and the thickness, at right angles to the hanging and foot walls, is approximately 240 ft. The greatest depth yet found is about 1700 ft. under the ridge of Kirunavaara, and the horizontal area, calculated from careful surveys, is about 140,000 sq.yd. Luossavaara mountain has not been mined as yet, but on Kirunavaara there are at present seven levels from which the ore is being extracted, either by hand labor, or with shovels, steam or electrically driven.

The ore is hard and requires considerable blasting, but it is pure and low in sulphur, phosphorus, etc. Two [illegible]

Note—From information furnished by the Cutler-Hammer Co., Milwaukee, Wis., and the Bucyrus Co., South Milwaukee, Wis.

*Chicago editor, "Engineering and Mining Journal."

are employed and mining is carried on the year round. Permanent level tracks and some portions of the inclines are covered with snowsheds, to keep the tracks clear in the winter. The ore is loaded by shovels into dump cars which bring it to inclined chutes discharging into hoppers at the foot of the hill; there the ore is loaded into railroad cars and conveyed to the port for shipment.

SHIPMENT

The annual output is approximately 4,000,000 tons, soon to be increased to 6,000,000 tons. The ore goes principally to Germany to be used by Krupp, some being shipped to England and the United States. Part of the ore for German Baltic Sea points is shipped to Lulea, a port several hundred miles east of Narvik and connected with the latter by railroad, but most of it goes to Narvik.[1]

Between Kiruna and Narvik, the railroad crosses the mountain divide, at a high altitude. The operation of freight trains across this divide is extremely difficult because of the low average temperature which makes it hard to procure water for the locomotives, and to keep up steam. For this reason, it was decided to electrify the road from Kiruna to Narvik. This is now nearly done and electrically operated trains will run in a short time. The power is obtained from Porjus Falls, south of Narvik.

POWER GENERATION

Porjus Falls is one of the great water-power resources of Sweden. The head obtained is approximately 150 ft. and the total available power is estimated at 320,000 hp., of which 160,000 hp. is developed. The power station is interesting in many ways. It is built below the water line of the tailrace and blasted out of solid rock, the roof being about 50 ft. below the surface of the ground. This was done for protection against the low temperatures and to permit the use of horizontal instead of vertical waterwheels. It was feared that the deep shafts necessary with vertical wheels would lead to freezing of the water in the winter.

The power generated at this station is brought to Kiruna on two lines at a tension of about 70,000 volts. One of these lines, with two-phase current, supplies the substation of the railroad company, and the other, with three-phase, supplies power for the mines. It is estimated that the mine demand will average about 60,000 hp.; the remainder is to be used by the railroad. At present, the mining company operates a steam-power station which supplies three-phase current to the mines. In the future, this station will be a standby.

THE SHOVELS

The equipment of the mines includes three electric shovels and one steam shovel, all of about 100-ton size with 3½-cu.yd. dippers. Two of the electric are of German manufacture, while the latest is a 100-C Bucyrus. The steam shovel is also a Bucyrus. The Bucyrus electric is equipped with a 225-hp. hoisting motor, a 115-hp. swing motor and a 110-hp. thrusting motor. It is designed to operate on a 440-volt, three-phase, 25-cycle circuit. Power is supplied from the central station through 2200-volt three-phase, underground cables to a number of substations in the mine. These consist of small buildings, protected against the flying stones from blasting. Inside of the buildings are one or more overload oil switches, and in some cases a step-down transformer to supply low voltage for the lighting circuits. From such an oil switch assembled with ammeter, voltmeter and disconnecting switches in an ironclad cabinet, another underground cable goes to plugging stations along the track on which the shovel is to run. The shovel may be connected to these plugging stations through a flexible cable, which is carried on a cable reel shown in one of the illustrations.

The plugging stations, specially designed for the company by the Cutler-Hammer Mfg. Co., Milwaukee, Wis., are arranged so that the oil switch in the substation cannot be closed unless the cover is on the plugging station, or the movable half of the plug on the shovel cable. As all the plugging stations on the main circuit are connected in parallel, they must all be closed before the oil switch in the power house can be closed. This prevents a man from touching the high-tension terminals in the plugging station and also indicates whether or not the plugging stations are being left open and exposed to the weather and to blasting. It is similarly impossible to remove the plug or the cover from the plugging station unless the oil switch in the substation is opened first.

SHOVEL AT WORK

Snowsheds over tracks in background.

THE MOTOR CONTROLLERS

In the rear of the shovel are installed transformers, which step the power down to 440 volts for the motors. All motors are operated by Cutler-Hammer controllers of the series-relay type. A number of double-pole clapper switches operate the primary circuit and similar switches controlled by series relays, control the resistance in the secondary circuit of the motor. The hoist and thrust motors are also equipped with "jamming" relays, which reinsert resistance in the rotor circuit when the torque on the motor becomes too high, as when the shovel strikes solid rock or is subjected to too great a load. This prevents the motor from being stalled with the rotor short-circuited, which would cause the torque of the motor to decrease rapidly and which might also burn it out. This shovel was installed in 1913; its operation is so satisfactory that two more of identical design have been ordered from the Bucyrus company.

The controller described is the only type so far proved successful for shovel operation. During the trials on the first shovel, comparisons were made with a shovel of another make, employing the ordinary drum-type controllers, and it was shown that the shovel with the improved controller could easily handle twice as much material as the other. They were comparable both in size and weight. The automatic controller also enables the use of comparatively unskilled labor for the operation of the shovel, which is not possible with the drum type. The automatic feature prevents the frequent opening of circuit-breakers, whereas continual trouble of this kind was experienced with the other type.

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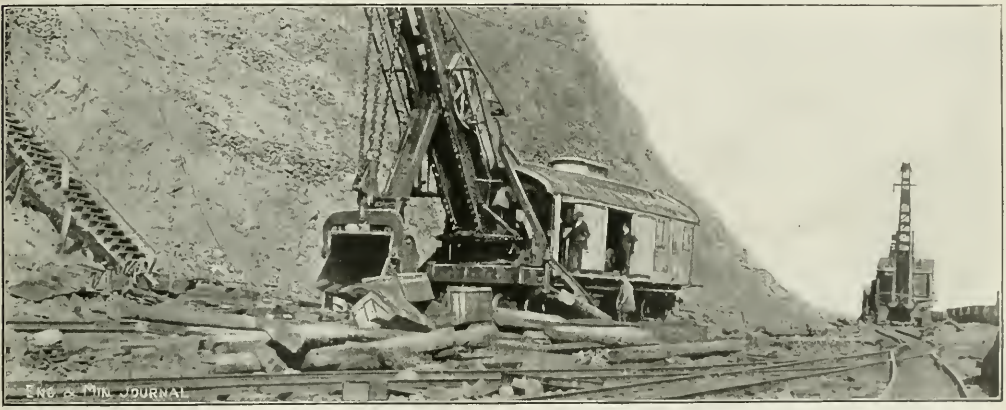
[1] We do not know what effect the war may have had on these shipments.—Editor

The shovel motors are a heavy and substantial mill type. Air-operated thrust cylinders have proved satisfactory. Air is supplied by a separate, automatically controlled, motor-driven air pump, with necessary tank and piping. The shovel weighs 112 tons in working condition and has proved itself more efficient and more economical to operate than the German machines.

HANDLING THE ORE

The shovels load the ore into 12-ton side-dump cars, which are hauled in trains of five cars each by Orenstein-Koppel 12-ton, 90-hp. switching locomotives to the scales and breaker, which are situated side by side. The jaw breaker was supplied by the Power & Mining Machinery Co. It has a capacity of 500 tons per hr., and probably weighs about 150 tons.



ELECTRIC SHOVELS IN THE PIT

Bucyrus in foreground; German machine in background.

There are now in use in the mine 700 dump cars of 2-, 3-, 5- and 12-ton capacity; 15 electric locomotives of 125- and 250-hp. capacity, and eight 12-ton steam switching locomotives, all of the latter having been supplied by Orenstein-Koppel. Nine of the electric machines were built by the Allgemeine Elektricitäts Gesellschaft, of Berlin, Germany; five by Nya Forenada Elektriska Aktiebolag, of Ludvika, Sweden; and one by the Deutsche Machinen Fabrik, of Magdeburg, Germany.

A passenger incline, about 2000 ft. long and rising at an angle of about 30°, is used to handle the workmen. The upper station is at the fifth level. Another electrical incline lowers ore from the fifth level to the hoppers, situated over the steam railroad tracks. This is handled by two 195-kw. machines, which operate either as motors or generators, according to the position of the load on the incline. The time that the machines are working as motors is perhaps not more than 10 to 15 sec., while the generating period lasts for several minutes.

The company operates a complete sawmill for furnishing all of the mine lumber, the machinery in the mill being all electrically driven.

The ore shipped to the port of Lulea is stored in stockpiles, since the port is open for only five months of the year. When required, it is loaded out by two Bucyrus 70-ton shovels, three 95-C Bucyrus shovels and one Vulcan shovel, all steam driven. At Narvik, two Bucyrus 95-C steam shovels are used in stockpile work.

The immediate direction of the company is in charge of Dr. Hj. Lundbohm, assisted by Thure Lindbohm and E. and Axel Dahleen.

Volcanic Spat

BY CUTLER B. WHITWELL*

The incident related here recently came to my notice. It needs no embellishment and indeed has been given none. It may serve as a warning to those investors who engage questionable engineers to examine and report on mining property.

The story is of the examination of a gravel mine in the early stage of development. The total of drifts and crosscuts would not require over four days for sampling.

The examining engineer belonged to that variety which looks upon the hard and seasoned practical miner with an air of superiority, and shows signs of impatience and annoyance if the latter ventures to intimate that he has acquired a little knowledge of mining. I was quickly made to realize that my presence, but nothing more, would be tolerated. Like his pipe he carried his swagger with him at all times. With an expression of ennui, probably intended to indicate that it was a beastly bore for a man of his superior intelligence to bother with such a small property, he suffered himself to be lowered underground to commence work.

In order to make certain that everything would be right, in case the ground had been prepared for his coming, he removed volumes of gravel from the places he expected to take his samples the following day. With this great show of caution, he ruthlessly left these nice, clean faces to the tender mercies of the night shift, while he reposed in peaceful slumber at the town hotel. However, at the end of several days everything was in readiness to collect the samples and start panning. After watching the foreman pan a moment, he removed the pan from his horny hands. The foreman, having only worked in the gravel mines of California about 20 years, had not been educated to the technicalities of panning. He was accustomed to run a pan of dirt down in 5 or 10 min. The new method required 45. He was informed that this insured the saving of every minute particle of gold. After patiently watching the new method for 15 or 20 min., he plucked up courage to bet his instructor that he had allowed a color to slip over the pan. This was answered by an almost imperceptible nod of the technical head and a scarcely audible "Oh, no, impossible!" However, the pupil grabbed several handfuls of gravel from the professor's tailings and proceeded to pan in his own natural way, while the professor flashed him sidelong glance of marked disapproval. What balm to the foreman when two small colors appeared in the pan. He turned, only to discover that the expert had found important business elsewhere.

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*Mining engineer, Nevada City, Calif.

By the time he had panned down his first lot of samples, it was very evident that the development work was proceeding a great deal faster than the engineer could collect and pan his samples. At the end of 10 days it was, therefore, deemed advisable to stop all work of development in the mine, otherwise the engineer would have a life job on his hands. Accordingly a telegram was sent to the head office for advice. While waiting for a reply to this telegram, the engineer lost his pipe. All hands were immediately called on deck and informed of the terrible loss. There was no other pipe like it in the world. He could not work unless he had a firm grip on his pipe, so he stood around in a helpless sort of way, making one round trip after another through the pockets of his coat, vest and trousers. When the patience of the men seemed exhausted, the lost member of the trio was found lying on the ground. The next day orders were received to stop the advance of the drifts and allow the engineer to complete his work. By this time it became necessary to relieve the monotony. A piece of brass was, therefore, melted in the forge and carelessly dropped among some sulphides and bits of quartz. In trying to remove a piece of dirt from the cooling mass a hole was made in it, which asumed the shape of a natural blow-hole. The final result was a perfect imitation of a wash nugget, about the size and shape of a Blue Point oyster, with particles of quartz and sulphides adhering in a most unsuspecting manner. The specimen was placed in one of the sacks of gravel which the E. M. had laid out for panning.

The following day the engineer was watched by a committee of two. In due time he reached the sack containing the nugget. After panning laboriously for a half hour, he perceived it, for he suddenly ceased gyrating the pan, which was the secret of his great success as a panner, and removed the obstruction. He examined it minutely with his glass, turning it over and over and finally, with a cautious look in all directions, he slipped the treasure into his vest pocket. The committee of two shook hands and carelessly approached the innocent one who, in the meantime, had resumed his panning. No mention was made of the wonderful nugget.

That evening a few of the foreman's friends, having been enlightened, were invited to meet the E.M. informally downtown. In due course of time, the subject of nuggets was introduced. The foreman and his friends had seen some fine specimens and the E.M. seemed to be getting the worst of it, when suddenly, with a mysterious air, he produced from his vest pocket his newly acquired wealth carefully wrapped in tissue paper.

"You people talk about nuggets, but I want to tell you that here is a class of specimen which none of you have ever seen before." He passed it over for inspection. With little persuasion he condescended to tell the history of the specimen.

"This is a very rare specimen of what we call 'volcanic spat.' True specimens of volcanic spat are very rare, and this is one of the finest. The localities from which they come are few. This one was formed by being shot from a volcano and made to assume its flattened shape on striking the ground. I found it about two years ago near an old crater about 10 ft. below the surface. If you will hand me a piece of string I will show you something interesting."

Upon being handed the string, he passed it through the hole which, by chance, was in the center of a long edge, causing it to balance perfectly. Allowing the "specimen" to hang suspended, the engineer remarked: "Note how beautifully nature has placed the blow-hole, making a perfect balance and a wonderfully valuable specimen for a watch charm. I would not take $50 for that specimen."

The following day the engineer departed, with the firm belief that he had slipped one over in getting away with the "nugget." He seemed so elated that he made no bones about stating that his report would be very favorable. I expect to see that report. If it is as full of romance as his tale of the "volcanic spat," it should be accorded a place among the masterpieces of the world's greatest fiction.

* * *

Radium Extraction

R. Sternlicht, in *Chem. Ztg.*, 1914, Vol. 38, p. 49 (through *Journ. Soc. Chem. Ind.*), states that the working of pitchblende (average uranium content, 15%) at the Austrian State radium factory, Joachimstahl, by the Curie-Debierne method gives at most 80% of the radium present, and, at the French factory of Armet de Lisle, uranium mica, uranium ocher, carnotite and autunite, in part decomposed directly with hydrochloric acid, yield about 70% of their radium content. Ebler's method of reduction with calcium hydride is criticized on the ground of expense and because loss of radium is liable to occur through reoxidation of sulphide to sulphate. The Ulzer-Sommer method gives yields of 97 to 98% and has been carried out on the large scale. The separation of radium and barium is usually effected by fractional crystallization; Ebler's absorption method is said to be little used at present. The total world's output of radium (mostly used in pharmaceutical preparations and radiation apparatus) is estimated at seven to eight grams per annum.

* * *

Gold Production in the Transvaal in September is reported by cable at $14,510,340. For the nine months ended Sept. 30 the total was $139,088,430 in 1913, and $128,753,430 in 1914; a decrease of $10,335,000, or 7.4%, this year.

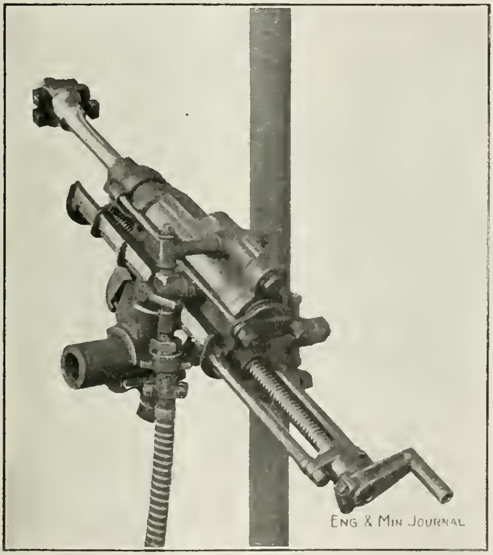
Modern American Rock Drills--III

By L. O. Kellogg

SYNOPSIS—Chicago Pneumatic Tool Co. has brought out ball-valve drill. Cochise Machine Co. and Wood Drill Works make spool-valve machines. Holman makes auxiliary-valve drill with ball tappets; unusual chuck and leather piston ring. McKiernan-Terry puts out unusual type with "corliss" valve.

⁂

The Chicago Pneumatic Tool Co. has recently put on the market a line of drills using a ball valve. The piston-drill model called the "Gatling" is illustrated herewith. The valve chamber is cast integral with the cylinder, the valve cage and the ball valve are inserted in this chamber from one end. The valve controls the inlet only: for exhaust, large passages are provided in the walls of the cylinder, which are alternately opened and closed by the piston head. The valve mechanism requires description in detail.

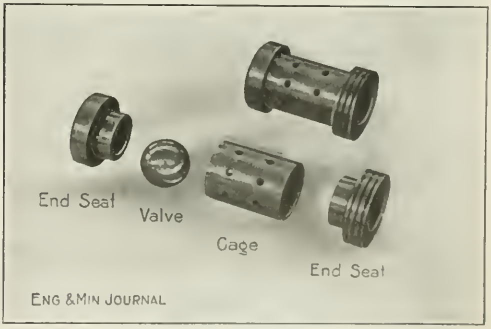


Chicago Pneumatic "Gatling" Model

The component parts are shown in the illustrations. The valve itself is a hollow steel ball, 1¼ in. in diameter, weighing 2 oz. It has ⅛ in. of travel in the perforated cylindrical cage which is shown; the ends of the cage are reduced in section by plugs which act as seats for the valve. The radial perforations in the cage are open to live air at all times. With the ball seated against the left end of the cage, the air is permitted to pass out at the right end and through a port to the back of the cylinder, thus exerting a force to push the piston forward. The right half of the ball is under pressure and part of the left half also, all except that opposite the opening. As the piston moves forward, it finally passes the rear exhaust port. This exhaust area is greatly in excess of the inlet, consequently the pressure back of the piston drops with the outrush of air and the pressure on the right face of the ball drops also. The pressure on the left face of the ball is then sufficient to throw it over, and the live air supply is directed to the front of the cylinder, causing the piston to reverse and start its back stroke. The back-stroke movement is similar.

On the forward stroke, while a slight compression takes place, this amounts to only a few pounds and does not appreciably diminish the force of the blow. The forward motion of the piston closes the front exhaust port before the end of the stroke and there is thus a certain amount of air trapped in front of the cylinder, which aids in throwing over the ball. The piston is shown retracted so as to touch the back head. In practice, this position is not attained, since in the inclosed space behind the inlet ports air will be trapped and compressed, cushioning the return of the piston and giving it a start forward on its useful stroke. The valve permits a certain amount of short stroking. If the cylinder is fed forward, the piston will reciprocate as long as the rear exhaust port is uncovered by the piston head on its forward stroke, but if the exhaust port is not uncovered sufficient to reduce the pressure in the cylinder to atmosphere, the greater initial density of the entrapped air will result in the earlier reversal of the piston with corresponding increase in length of stroke.

The valve cage is held in the chamber by a screw plug, the forward end of which is hollow and perforated so as to allow the passage of the air to the rear-cylinder inlet ports. The plug has a projecting head notched at intervals so that a dowel from the back head can always be fitted to a notch when the plug is screwed to a seating, and thus lock it against rotation. There are inlets to the valve chamber on both sides of the valve itself.



Chicago Pneumatic Ball Valve and Cage

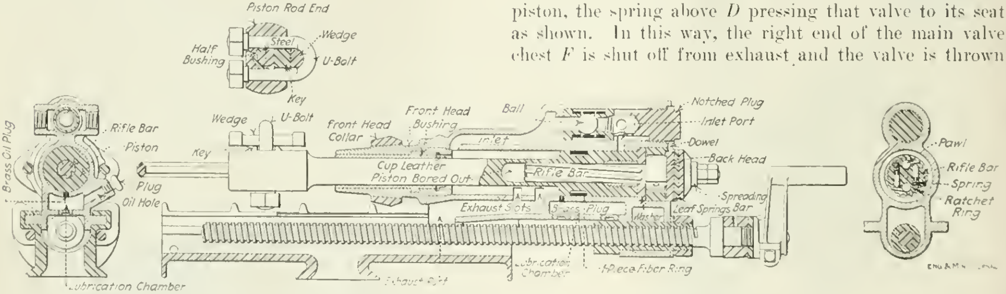
The large ports for both exhaust and inlet air are a noteworthy feature. The exhaust ports are transverse slots covering a good-sized arc of the cylinder circumference, and bridged longitudinally of the cylinder, so that no single opening will admit a piston ring.

The parts of the front head shown in the assembled section, consist of a tapered collar clamping together the long tapered halves of the head proper and a long bushing. The bushing is held to the head by a circumferential lug fitting a groove in the latter. A second groove provides a recess for the cup-leather packing which is used. As the tension comes on the through bolts, the taper of the head acts to bring all parts to a snug fit in the usual manner. The through bolts, holding together the front head, cylinder and back head, work against leaf springs at the back.

The rotation is of the outside-tooth type, the two pawls which are used being carried in the rifle bar itself. Slip under high stress is permitted. A five-flute rifle bar is used. The chuck is of the wedge type, and a half bushing to accommodate varying diameters and sections of steel is supplied.

For lubrication, a chamber is cast under the cylinder back of the exhaust port and is connected with the cylinder by a $^{1}/_{64}$-in. hole in a brass plug pressed into a hole in the casting. The oil escapes slowly to the cylinder through this hole, as a result of capillary action. This lubrication, it should be noted, does not reach the valve, but a ball valve does not require much lubrication.

The steel shell is of the one-piece type, i.e., without removable gibs, for the sake of lightness. The shell rods run the full length of the shell and pass through sleeves at the back for spacers.

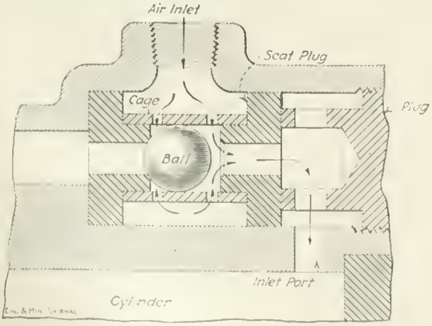


THE CHICAGO PNEUMATIC "GATLING," ASSEMBLED SECTIONS

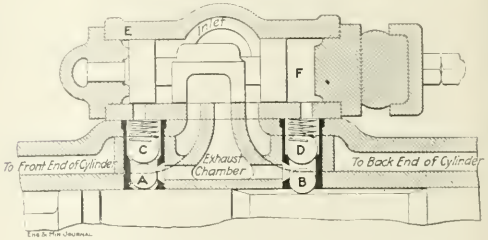
The machine weighs 143 lb., has a $2\frac{3}{4}$-in. cylinder and a $6\frac{1}{2}$-in. stroke.

HOLMAN DRILL

The Holman drill, introduced in America a few years ago, embodies some features of great interest. First among these is the valve action, which is of the auxiliary type, but different from others in use. It involves a main valve, which is a modified spool valve, and two sets of auxiliaries which are ball valves with ball tappets. A reference to the illustration will explain most of the features of the valve action. It represents the piston just started on its forward movement. The lower and smaller of the left-hand balls *A*, which is really a tappet, is lifted by the piston so as to lift the ball valve *C* above it against the pressure of the small spring and permit air to pass from the left end *E* of the main valve chest, past the ball *C*, and into the exhaust chamber. The right-hand tappet ball *B* is allowed to enter the spooled-out portion of the piston, the spring above *D* pressing that valve to its seat as shown. In this way, the right end of the main valve chest *F* is shut off from exhaust and the valve is thrown and held to the left. It will be noted that the spool valve is somewhat different from the typical spool valve, inasmuch as the two middle of the four spools are not continuous over the top of the valve, this part being cut off and horizontal partitions, as it were, being applied.



OPERATION OF THE CHICAGO PNEUMATIC CO.'S HOLLOW BALL VALVE



THE HOLMAN BALL-VALVE ACTION

When the valve is at the left, as shown, live air is admitted to the port which carries it to the back of the cylinder, where it acts on the piston and throws it forward. Toward the end of the stroke, the tappet *A* is allowed to descend in the spooled-out portion of the piston, so that valve *C* is forced to its seat by its spring, shutting off that end of the spool valve from exhaust. At about the same time the tappet *B* is raised by the shoulder on the piston, and the valve *D* is also raised from its seat, so as to open the right end of the spool valve to exhaust. The valve will then throw to the right, and when the momentum of the piston has been overcome the return stroke will begin.

The valve balls are $\frac{7}{8}$ in. in diameter, and the tappet balls are $\frac{3}{16}$ in., both of solid steel. A certain amount of rotation takes place whenever the balls are moved, so that the wear is not concentrated on any one point. Both sets of balls work in special seatings forced into the top of the cylinder. Since the spool valve is unsymmetrical, it is necessary that it be not allowed to rotate. For this reason, a squared end works in a square hole in one of the end plugs. The valve chest is closed with plugs which are kept to their seats by through bolts.

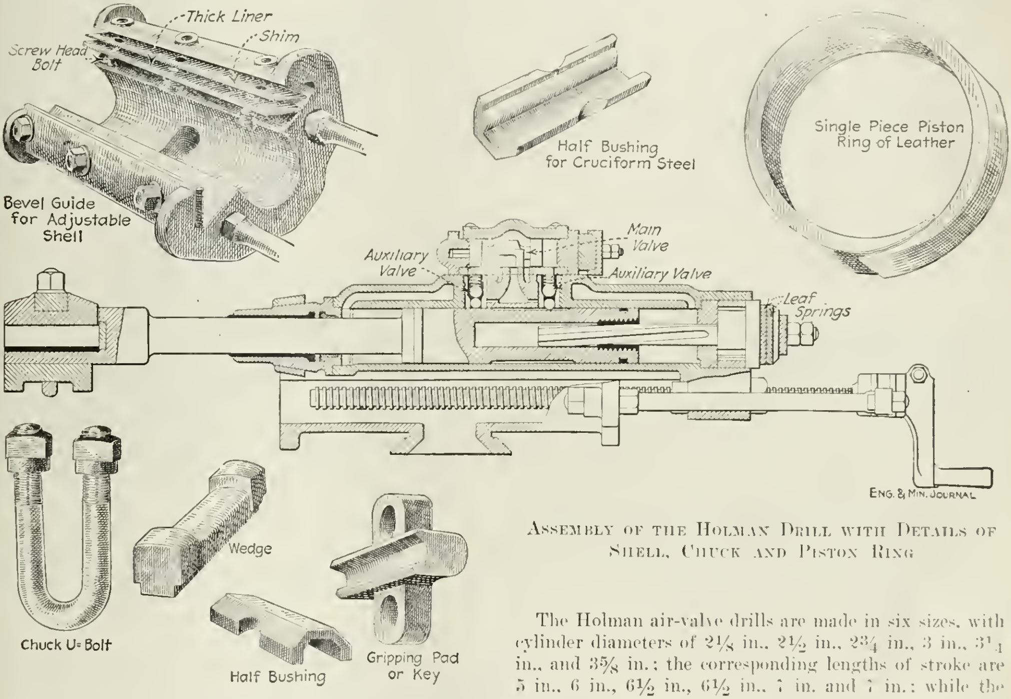
The piston head of the Holman drill is not unlike standard piston-heads, except that the piston rings are of leather instead of metal or fiber. They are of one piece and held out by leaf springs in the usual fashion. The leather is designed to decrease the wear on the cylinder walls and thus lengthen the life of the cylinder, before reboring is necessary.

The Holman chuck is of great interest, as it differs from the standard chucks in this country. While it is of the wedge type, the wedge itself does not work against the key which bears on the steel. This key is on the other side of the chuck, and the half bushing is open on the side toward the key. The half bushing is notched on the sides and is held in the chuck by the U-bolt. There can also be furnished a special chuck made to take cruciform steel, as illustrated, a rather novel feature in piston-drill chuck design.

The rotation is of the type carrying the pawls in the rifle bar with the ratchet ring outside. It does not present features particularly different from standard design.

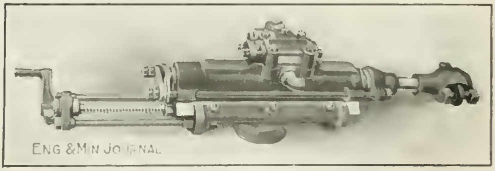
The front head consists of the outside collar with conical inner face, a split conical sleeve, a split bushing, and a cup leather. The through bolts holding the back and front heads to the cylinder work against two leaf-springs on the back head.

The shell, while it is of the fixed-gib type, is nevertheless designed to permit adjustment for wear. The lugs on the cylinder, and consequently the ways in the shell, are beveled instead of being rectangular, and the top of the inside of the shell way is lined with a rather thick piece of metal, held on by bolts having nuts outside and screw heads, well countersunk in the liner. When it is desired to take up wear, a shim is inserted between the liner and the gib proper, and the ways are thus brought to any desired degree of tightness. The studs or standards of the shell are of the short type, that is, they do not extend its full length. No special provision for lubrication is made.



Assembly of the Holman Drill with Details of Shell, Chuck and Piston Ring

The Holman air-valve drills are made in six sizes, with cylinder diameters of 2⅛ in., 2½ in., 2¾ in., 3 in., 3¼ in., and 3⅝ in.; the corresponding lengths of stroke are 5 in., 6 in., 6½ in., 6½ in., 7 in. and 7 in.; while the weights are 100 lb., 140 lb., 180 lb., 250 lb., 295 lb., 380 lb., respectively. The valve action described, however, is applied only to the largest sizes.



The Holman Piston Drill

McKiernan-Terry Corliss Valve

On one of its piston-drill models the McKiernan-Terry Drill Co. has used a valve action so different from any other in common use that it deserves special description. It is a tappet-actuated rotary valve, called a "corliss" valve. This lies along the top of the cylinder, extending practically its full length. It is made in three sections for convenience in fitting and machining, but acts as a unit, inasmuch as the ends of the adjoining sections are tongue-and-grooved together. The valve chest may or may not be cast as a part of the cylinder, depending on its size. Into each end of this chest is forced a slotted bushing, the slots corresponding to slots in the chest, which communicate with live air, exhaust and the cylinder. The bushing is of hardened steel ground to a close fit on the valve. The two end sections of the valve, which work in the bushing, are slotted so that by turning, the slots establish communication between the exhaust and the cylinder or the live air and the cylinder, acting on the principle of the three-way valve. The cut parts of the bushing give a clear, sharp opening for inlet and exhaust. The valve is balanced by having the ports slotted through to the back of the valve, giving equal area on each side and reducing the friction of turning. The easier turning decreases wear and results in a longer life.

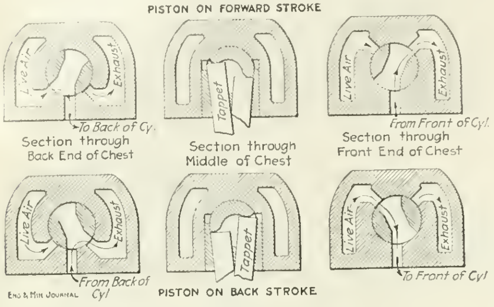
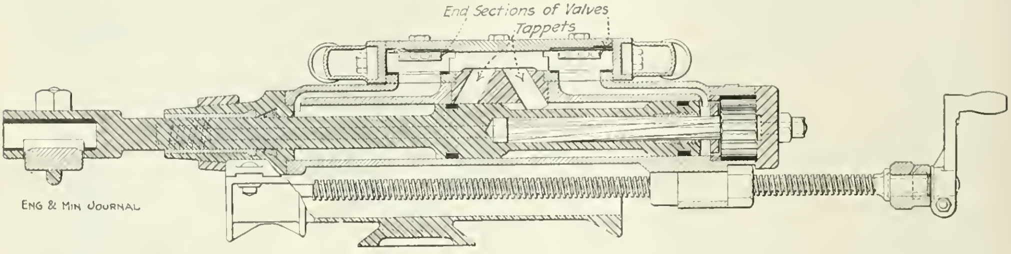


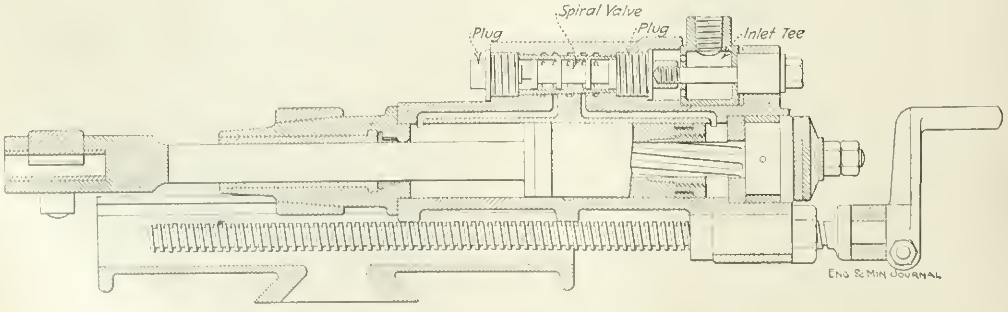
Diagram of Corliss Valve Action

The central portion of the valve does not have anything to do with the passage of the air, but merely receives the thrust of the tappets which effect the turning. These tappets work in a steel block machined to fit both the valve chest and the cylinder top; the tappets slide in two inclined slots, their lower ends being in a line along the top of the cylinder. The beveled ends of the spooled-out portion of the piston head strike the bottom ends of the tappets, which are thus forced up and strike alternately the sides of the center section of the valve. The lower part of the valve is made concave, so that a rounded edge is formed on each side. It is this edge which the tappet strikes. A blow on one tappet rotates the valve in one direction, and one on the other tappet rotates it in the other direction, the air pressure being thus alternately directed to the front or back of the piston and reciprocation established. The outline of the cross-section of this central portion is such that the angular velocity of the valve in turning is at a minimum at the beginning of movement and increases constantly until the movement is completed, thus reducing the shock of the impact of the tappets and prolonging the life of the valve.

This tappet valve, like others, will not short stroke to the extent that fluid-actuated valves will, but the stroke can be reduced nearly 35% by feeding the cylinder forward until the piston just passes the operating point on the forward stroke. It is not so liable to breakage as many other types of tappet valves are, and is also balanced so as to be thrown with the greatest ease.



Longitudinal Section of the McKiernan-Terry Corliss-Valve Piston Machine



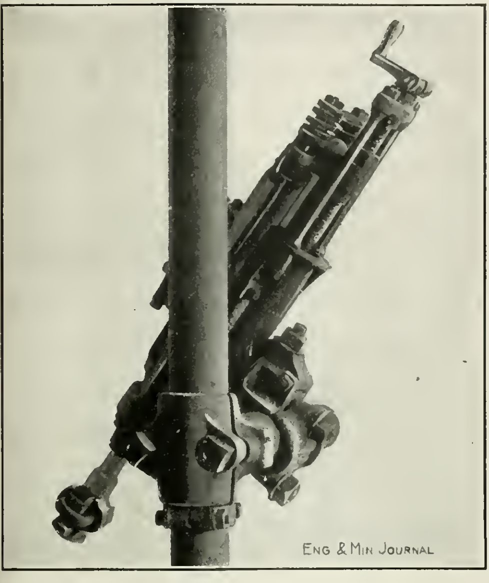
Longitudinal Section through the Cochise Piston Machine

Cochise Drill

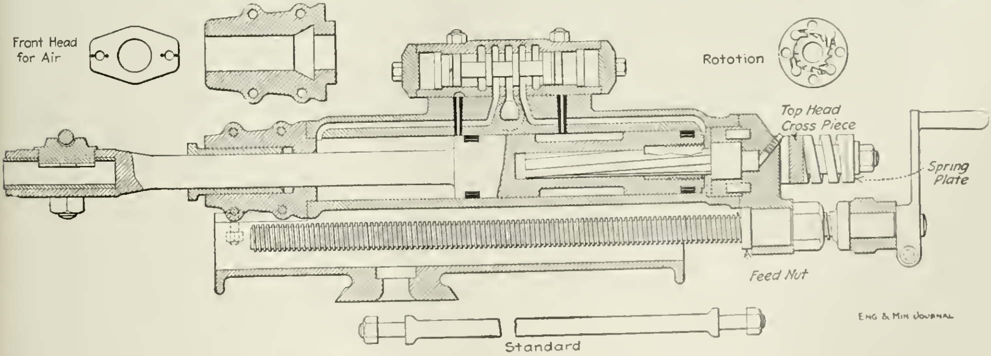
The Cochise Machine Co., of Los Angeles, puts out a piston machine using a four-spool valve without an auxiliary valve. The valve chest is cast with the cylinder.

At the back end is secured an inlet tee which can be revolved so as to bring the inlet on either side or on the top. This is shown in the drawing on top. The front end of the tee is perforated with small holes so as to act as a strainer and exclude foreign material from the valve or the cylinder.

The valve slides in a bushing and seats against screw plugs in either end. Side passages connect the inlet tee with the center of the valve chest and carry the air to this point. The drawing shows the inlet ports from the valve chest to the two ends of the cylinder. Other small ports connect the cylinder with the ends of the valve chest and serve to throw the valve when uncovered by the piston.



The Wood Piston Drill



The Wood Rock Drill, Section and Details

The construction of the front head is apparent from the drawing. The through bolts have helical springs at the front-head collar. The piston is not spooled out in the center, but is maintained at uniform diameter. It has two two-piece piston rings, however. The rotation has the ratchet teeth on the surrounding ring. The chest is of the usual type, with or without a wedge. The shell has adjustable gibs.

Lubrication is taken care of by a chamber connected with the inlet tee, whence the oil is fed automatically into the entering air.

The machine is built in three sizes: One with a 2½-in. cylinder and a 5-in. stroke, weighing 126 lb.; one with a 2¾-in. cylinder and a 6¼-in. stroke, weighing 159 lb., and one with a 3¼-in. cylinder and a 6½-in. stroke, weighing 220 pounds.

The Wood Rock Drill

The Wood Drill Works makes a spool-valve piston machine. The general features of the machine are shown in the illustrations. The valve has four spools and is made as light as possible, so as to throw easily and with little shock. The rotation mechanism has the ratchet teeth on the bar, while the pawls are in a surrounding pawl holder. The rotation is positive, but a release is furnished when desired. The chuck bushing has an unhardened strip left in it, which can be sheared with a chisel when it is to be removed.

The side-rod springs are placed at the back and crosspieces between the rods are used to keep them in alignment. The feed nut is applied to the back head instead of to the cylinder. The shell rods or standards are made with nuts on both ends, and the lower nut is held in a recess in the shell which prevents it from falling out and down the hole.

(To be continued)

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Houghton Copper Co.

The 1913 report of the Houghton Copper Co., Winona, Mich., shows receipts of $50,483, all of which came from assessments, except $227. Expenditures and debts paid for the year amounted to $35,218, leaving a balance of $15,265 on hand at the end of the year. The total drifting for the year was 1331 ft. and a winze was sunk 98 ft. The shaft was also sunk 14 ft. Work was resumed again after the strike was ended.

The Commercial Classification of Refined Copper*

SYNOPSIS—The characteristics of copper determine the field in which it may be used; for electrical purposes there is little choice between high-conductivity Lake and electrolytic copper. Low-conductivity Lake copper, really an alloy of copper with arsenic, has certain desirable properties for special uses. Casting coppers vary greatly. There are three general classes of impurities, the effects of which are discussed, as are also the physical defects of refined copper.

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Any adequate classification of a material, such as copper, must take into account both the limitations of the metallurgical processes by which the material has been obtained and the needs of the manufacturing processes in which it is to be employed. The metallurgical methods depend upon the nature of the ores or other sources of supply and the manufacturing ones upon the ultimate uses of the finished product.

The world's copper supply comes from four main sources, sulphide ores, oxidized ores, native ores and scrap. Perhaps the chief chemical characteristic of copper is its affinity for sulphur and the largest deposits of copper ores consist of more or less complex sulphides. Near the surface these ores are frequently altered to oxides and carbonates by atmospheric influence and there are also large deposits entirely free from sulphur. Native copper ores where the copper exists as free metal, occur in various parts of the world in small quantities, but notably in the enormous deposits in the northern peninsula of Michigan, the source of the so called Lake copper.

THREE GENERAL PROCESSES OF ORE SMELTING

Metallurgically there are three typical processes for producing crude or unrefined copper from the ore, based on the general principles of oxidizing sulphides and reducing oxides: (*A*) Roasting, smelting and converting, (*B*) alternate oxidation and reduction, and (*C*) direct reduction of oxidized ores. (*A*) which is a strongly oxidizing process by which the great majority of the American production is made from sulphide ores, results in the almost complete elimination of impurities which have volatile oxides, including some of the worst enemies of refined copper, such as arsenic. Converter bar nearly always runs 99% copper plus silver, and is not likely to carry more than a few hundredths of a per cent. of any impurity but nickel. (*B*) is the old Welsh process, still used to some extent abroad, based upon the reaction between copper oxides and sulphides to eliminate sulphur as sulphur-dioxide gas and carried out in a long series of roasts and fusions in reverberatory furnaces. The removal of impurities is here imperfect, although they may be to a certain extent segregrated in a portion of the product, whence the origin of the "best selected" copper of Great Britain. (*C*) When the ores are wholly oxidized the copper may be recovered by direct reduction in a blast furnace and as this is a strictly reducing process, the resulting black copper seldom runs over 96%, due to iron and other impurities reduced.

Except in the case of "best selected" and similar English coppers, all the products from the foregoing processes are given a further treatment or refining, which may be broadly divided into furnace or fire refining and electrolytic refining.

FIRE REFINING

Fire refining is based upon the scorifying effect of cuprous oxide upon base metals contained in a bath of molten copper. The crude copper is melted in a reverberatory furnace and air blown into the bath. Cuprous oxide rapidly forms and dissolves in the bath, the blowing being stopped at or before the saturation point. In this way oxygen is carried to all parts of the molten bath, and when there are any metals present which are more easily oxidized than copper, cuprous oxide is reduced back to copper and the oxide of the impurity is formed. If this oxide is not soluble in the molten copper, it will float to the surface where it may be removed by skimming. As copper stands high among metals in the order of nobility, the metallic impurities with the exception of the precious metals may be readily removed in theory. In practice, while elimination proceeds rapidly while considerable quantities of impurities are present, the rate diminishes until traces are reached which cannot be slagged off with any reasonable amount of scorifying. Therefore furnace refining is limited in its application to relatively pure crude copper unless a low-grade refined copper is contemplated. Less than $10 worth of silver and gold per ton will justify electrolytic refining.

Returning to the bath of molten copper, which has been skimmed clean, it is necessary to reduce the excess cuprous oxide dissolved, and no better way has yet been devised than the old Welsh process of covering the bath with a protecting layer of charcoal or low-sulphur coke and then forcing the butts of green trees or poles of hardwood beneath the surface by means of suitable tackle. The cuprous oxide is reduced in this way until a normal amount corresponding to an oxygen content of from 0.01 to 0.07% is left when the copper develops its best physical characteristics, the condition of the copper being followed by the appearance of the fracture of small buttons cast in a spoon, which is a sort of ductility test, and by the swell or depression of the surface of an ingot as it cools, which indicates the gas content. The copper is then cast, usually by machine.

ELECTROLYTIC REFINING FOLLOWING FIRE REFINING

When the copper is to be electrolytically refined it is first given a rough furnace refining and cast into anode plates, which are then electrolyzed in a strongly acid solution of copper sulphate. The same order of nobility applies, but the great preponderance of copper over the impurities is now an aid as it assists the selective action of the current in depositing only copper at the cathode. Silver and gold are also saved as they are insoluble in the electrolyte chosen and fall to the bottom of the tank as anode mud or slimes, to be separately refined and parted.

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*A paper by Lawrence Addicks, read at the American Institute of Metals, Chicago meeting, Sept. 11-15, 1914.

It is quite evident that copper entering an electrolytic refinery must entirely lose its identity and that the purity of the resulting cathode copper will depend upon the conditions under which electrolysis is carried out rather than upon the momentary quality of the day's anodes. Therefore it is not necessary to consider whether the input be converter bar, black copper or Lake "mineral" when buying electrolytic, but simply whether the product meets the accepted standards of quality for electrolytic copper.

Electrolytic cathodes generally run about 99.95% copper, much of the missing 0.05% probably being hydrogen. The metallic impurities generally total about 0.02%. Except for the fact that individual cathodes may vary more or less in impurity content, they are ideal material for brass making. Copper producers, however, have never encouraged the sale of cathodes, as there is apt to be some shrinkage in weight during shipment, owing to the comparative ease with which nodules or small pieces can be detached either accidentally or intentionally.

Melting is done in a reverberatory furnace and originally was an exact duplication of the fire refining already described. As the cathode copper is already pure, a simple melting is all that should be required, but molten copper is so susceptible to contamination that until recently the gases from combustion, iron in the rabbles, etc., were absorbed to a sufficient extent to require actual refining. At the present time large quantities of cathodes are being added to the molten charge during ladling and earlier, basic furnaces are being substituted for acid ones, thereby suppressing slag formation, and attention is being paid to keeping coal ashes from blowing over from the firebox, so that a true melting without refining is being approached. It is well known that cathode copper when drawn into wire will show an electrical conductivity some 2% higher than the same copper after a subsequent fire refining. This is probably due partly to the fact that chemical impurities in the cathode are chiefly present as a mechanical mixture due to adherence of anode slimes which are dissolved in the copper when melted, making a high resistance matrix around the copper crystals when the metal is cast and cooled; and partly to contamination during melting. It seems probable that the conductivity of perfectly pure, soft copper is in the neighborhood of 103% of the Matthiessen standard in common use.

Lake and Electrolytic Copper

Lake ores are low-grade native-copper deposits, which are mechanically concentrated to an 85% "mineral." This is melted and, after skimming off the slag formed by the remaining gangue, is given a fire refining as previously described. The Michigan mines are among the oldest, largest and deepest in the world. Thirty years ago, Lake copper was the standard of the industry. The surface ores were remarkably free from objectionable impurities and copper of the highest conductivity was readily produced. The first electrolytic copper to come on the market was of irregular character, due to lack of familiarity with the principles of this new process, and for a considerable time Lake copper was deservedly considered superior. With increasing depth, however, many of the mines showed increasing quantities of arsenic, and, indeed, all Lake copper may be considered as arsenical copper, although in some brands the arsenic is very low. The result was that electrolytic copper began to take precedence for electrical work, as its conductivity could be absolutely depended upon, and Lake began to fall back upon superior "working" qualities, a term which defied exact definition.

It is now generally admitted that high-conductivity Lake copper cannot be distinguished from electrolytic copper, while low-conductivity Lake is really an alloy of copper with arsenic, which has certain desirable properties for special uses. Nearly all the elements which markedly depress the conductivity when alloyed with copper are helpful in developing desirable mechanical properties, for example, phosphorus, aluminum and silica. High arsenical copper, running about 0.4% arsenic, has now a special market for making firebox plates in Germany, and uses are beginning to be found for the intermediate grades.

One of the large Lake companies maintains its own electrolytic refinery, and in this way recovers a small amount of silver and eliminates the arsenic, the product still being classed on the market as Lake, although it is equally electrolytic. The old prejudice in favor of Lake on general principles has now largely died out, but only with the contemporaneous retirement of the older generation of wire-mill managers. Lake copper should be clearly graded by arsenic contents into a series of alloy coppers, the class at one end competing with electrolytic on its own ground, and the other classes sold in competition with arsenical copper from other sources, a field which has only lately been properly appreciated.

Casting Copper

The last class of copper produced which we have to consider is that generally known as casting copper, a very loose term covering a multitude of sins. There are three main sources of casting copper: From converter bar or black copper from smelters, whose ore supply carries quantities of silver and gold insufficient to pay for refining; byproduct copper not up to standard electrolytic grade occasionally produced by refineries; and the result of smelting scrap reclaimed from all sorts of new and old work. The first is often of excellent quality, one well known brand being maintained at 99.80% Cu or better, and is generally comparable with English best selected. The second class is generally an arsenical copper and is not now often seen as the refineries are nowadays able to eliminate arsenic from the process in other ways. The third class is generally foul, but often suitable for common castings as the impurities help the founding, pure copper being a difficult metal to handle in a foundry. The copper contents may run below 99% Cu, however. About the one thing that can be said of casting copper is that neither a conductivity nor a ductility test is applicable in the nature of things.

Copper Used in Five Fields

Turning now to the uses for copper, they may be broadly classified as follows: (a) Wire and other shapes for electrical purposes; (b) sheets and plates for nonelectrical uses; (c) copper castings, generally for electrical use; (d) in alloys, such as brass and bronze; (e) special purposes for which small quantities of alloyed impurities may be advantageous.

Electrical use immediately imposes a conductivity requirement which rules out everything but electrolytic and high-conductivity Lake, which, as before stated, are practically identical. Most of the electrolytic refineries figure on averaging about 100% soft in the electrical conductivity of their outputs. Occasional lots may reach nearly to 101% and some may approach 99%, while 98.5% is the usual rejection limit, but it is unusual for a refinery to ship anything for electrical use which is below 99%. No distinction is made between cakes, wirebars and ingots, more than one shape often being cast from a single furnace charge, so that there is nothing to be gained by ordering wirebars and then cutting them up, when ingots are desired. Unless electrical use is specified, it is customary to allow an additional leeway of 1% in conductivity to the refiner, but he rarely needs this and prefers to maintain the higher standard, as copper is often resold several times before it comes into the hands of the actual user. As copper from a single furnace charge will carry practically uniform chemical impurities, shipments on an individual order should be filled from as few furnace charges as possible and all wire bars and cakes should be stamped with marks identifying these charges. The refiner will always consider complaints on a furnace-charge basis if they are of a chemical nature. If they are indefinite he will generally investigate what other customers received copper from the charge complained of, and in the absence of other complaints will demand a bill of particulars before giving the matter serious consideration. The conductivity of a furnace charge is generally determined at the refinery several times while the charge is being cast and this precaution, together with the ample margin above rejection limits which is maintained, have practically abolished conductivity complaints.

Three General Classes of Impurities

When the copper is not to be put to an electrical use conductivity is of no special value except as a certificate of the absence of more than a trace of a certain class of impurities. The refiner divides impurities into three classes; those that depress conductivity, such as arsenic and antimony; those that impair ductility, such as lead, tellurium and bismuth; and those which are of value if reclaimed, such as silver, gold, platinum and palladium. The elements which depress conductivity are kept within bounds by the conductivity test regularly made. Those which are of value if reclaimed will never reach quantities sufficient to affect the physical properties of the copper, as it would pay to re-refine any such copper. The remaining class, comprising elements which impair ductility, is more difficult to deal with. We know that bismuth, lead, tellurium and probably selenium make copper brittle even when present in very small quantities. We do not know, however, how to write a specification limiting these impurities as the presence of small amounts of other impurities will neutralize their bad effects. We do know that amounts of lead up to 0.005% have no perceptible effect in mill practice or in alloys. Double this amount shows mild effects. Lead is about the only one of the group ever met with in sufficient quantity to be of interest. As these elements are practically insoluble in copper, their effect on the conductivity is directly proportional to the amount present and consequently negligible.

It must be understood that an element like lead is always present in small amounts in refined copper and the mere fact of its presence as shown by a delicate qualitative test is no basis for complaint. It should be further borne in mind that the determination of the small quantities of impurities in refined copper quantitatively can only be done with even reasonable accuracy by a chemist who has had large experience in this particular work. A representative analysis of refined electrolytic copper would be somewhat as follows:

Conductivity (annealed)	100.0 %
Copper	99.93000%
Silver	0.00100%
Gold	0.00001%
Sulphur	0.00300%
Oxygen	0.04000%
Iron	0.00350%
Nickel	0.00400%
Arsenic	0.00200%
Antimony	0.00300%
Aluminum	0.00100%
Phosphorus	Trace
Lead	0.00200%
Bismuth	Trace
Selenium	0.00050%
Tellurium	0.00050%
Total	99.99051%

It will be seen that oxygen is the chief impurity. It has been pretty conclusively shown that too much oxygen makes the copper harder and affects the annealing temperature, the tensile strength of wire and the number of breaks in a wire machine. This may be due to some surface effect as the "set" surface of a wire bar has a greater oxygen content than the body of the bar and as the oxygen content increases it is possible that this oxidized layer becomes thicker. Another point about high oxygen is that it corresponds to low copper and to that extent is sold as copper. In brass making, the "set" or "pitch" of the ingot is of no consequence except when the most careful work is done when melting in the foundry to avoid further absorption of oxyven. It is obviously useless to impose rigid conditions upon the refiner if the same conditions are not observed in the remelting and it is only at the largest and best equipped brass foundries that such conditions are even approached. When zinc is introduced into molten copper it acts as a deoxidizing agent forming zinc oxide. If the copper is kept at high pitch, this source of zinc loss and dirty brass can be greatly diminished and this fact has resulted in a demand for high-copper ingots.

It has therefore become a general custom to specify that the copper contents of refined copper shall not be less than 99.88%, which really means 99.90%, allowing 0.02% for assay variations. As this is a rejection point, the actual average content is expected to be between 99.02 and 99.94%.

When we come to casting copper, a greater leeway must be allowed, as already pointed out. In fact, except in considering the price charged for the material, copper contents have but little to do with casting copper. It is best to buy this material on the basis of known brands after finding what brands yield good results in the particular class of work and then insist upon uniform deliveries, judging the material by chemical analysis of the chief impurities.

Physical Defects of Refined Copper

The physical defects of refined copper are many. Practically all cast copper is porous, doubtless due to the discharge of dissolved gases as the copper cools.

This is analogous to the "piping" of steel ingots but is not so pronounced because copper is cast in a shallow mold instead of on end. These microscopic bubbles are doubtless the cause of roughness in wire. Then there is a class of defects inseparable from ladling, consisting of cold sets and splashes where the copper has run up on the mold and chilled before the main body of metal reaches that point. Then there is porosity or sponginess of the surface due to the mold being either too hot or too cold. Another defect is raised edges on the set surface, generally due to slightly lowered pitch corresponding to excessive oxygen content of the copper. Should the pitch drop still lower, "nigger heads," or little black spots, will appear. These are the outlets of gas cavities extending some distance into the copper. On the other hand, should the oxygen content be too low, the surface of the bar rises and finally breaks open or "spews," an even worse condition.

Many of these defects are always present in more or less degree. Mechanically ladled copper can never be perfect. Specifications require that copper shall be free from mechanical defects, but a reasonable attitude regarding minor troubles on individual pieces is generally necessary to the peace of mind of a buyer. On the other hand, a refinery occasionally becomes careless in such matters and will send out some surprisingly bad work, so that careful, systematic inspection, combined with an attitude of friendly criticism, is the best way for a copper producer and a copper user to live together.

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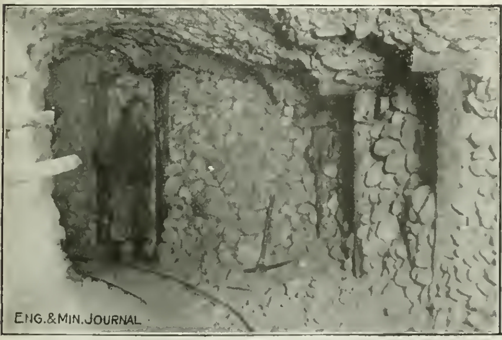
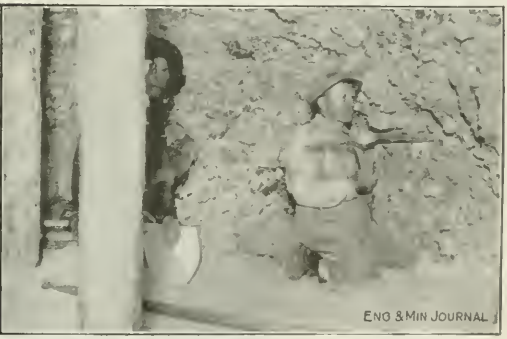
Working a Placer Deposit Underground

SPECIAL CORRESPONDENCE

About four miles from Dawson, Y. T., the Barnes tunnel is driven into the mountain on the east side of Bonanza Creek. At this point the gold-bearing gravel is cemented until it resembles a conglomerate, and being frozen, permits of regular room-and-pillar mining. The whole development is analogous to that of a coal mine, having air courses driven parallel to the main and cross entries, and a break-through every 50 feet.



LARGE BOULDERS USED FOR GOBBING IN BARNES TUNNEL



MINING FROZEN GROUND WITHOUT BLASTING OR THAWING

Since the entire mountain is frozen, no timbering is necessary, except where a number of miners are working in one place, when the heat from their bodies and lights causes more or less spalling, and temporary timbers are set for safety. Also when pillars are being drawn the main haulway is safeguarded by posts set in the gob.

The excavation is carried about 6 in. below the top of the bedrock, and 5 ft. 6 in. of overlying gravel is removed, leaving 6 ft. clearance. The gravel and bedrock above and below this horizon carry no gold. A peculiar feature which may be noticed in entries where work has been stopped for some weeks is that the top and sides never squeeze, but the bedrock bottom will "puck" if the surrounding pressures remain constant.

The miners loosen the frozen material with heavy picks, fork out the large boulders, and load the fine gravel, containing the gold, into the cars. It is then wheeled out and dumped into a large pile under which the sluice boxes and riffles have been built. Water for washing is impounded in a small reservoir at the head of the gulch and the dump may be washed at such intervals during the summer as water may be available.

CRIBBING TO PROTECT ADJOINING CLAIMS FROM TAILINGS AND TO PRESERVE WATER RIGHTS

The mine was developed by Alfred Barnes, of Dawson. The average cleanups during the past 18 months have been about $2 per cu.yd. The mine is operated throughout the year but as water can only be obtained or used during the five months of open season, the year's cleanups are made during that period.

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Explosives in the United States

"The Production of Explosives in the United States during the Calendar Year 1913," has just been published by the U. S. Bureau of Mines. The total production of explosives, according to the figures received from manufacturers, was as follows, in pounds:

	1912	1913	Changes
Black powder.	230,293,369	194,146,747	D 3[illegible]
High explosives	234,469,492	241,682,364	I [illegible]
Permissible explosives.	24,630,270	27,685,770	I [illegible]
Total	489,393,131	463,514,881	D [illegible]78,2[illegible]0

In 1902, only 11,300 lb. of permissible explosives were used in coal mining, whereas in 1913 the quantity so used was 21,804,285 lb. The quantity of permissible explosives used in the United States in 1912 represented about 5% of the total quantity of explosives produced, and in 1913, 6%. The total amount of explosives used for the production of coal in 1913 was 209,352,938 lb., of which about 10% was of the permissible class, as compared with 8% in 1912. The use of permissible explosives in coal mining has had gratifying results, and few serious accidents can be attributed directly to their use.

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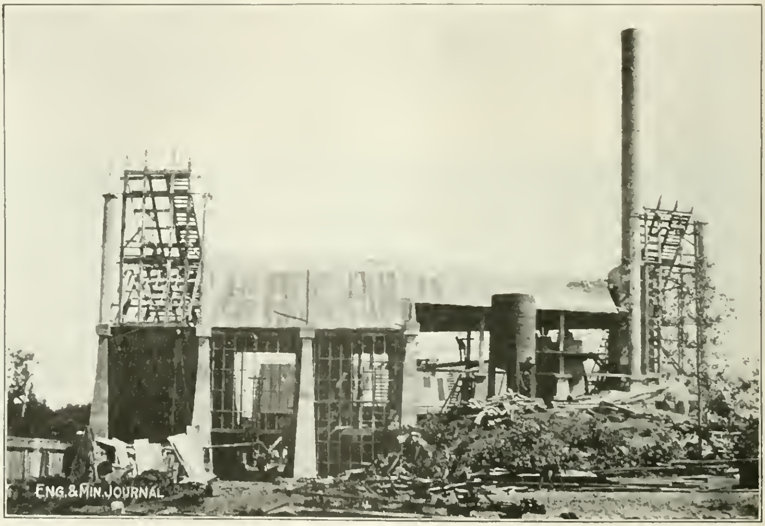
New Metals Process Company

Special Correspondence

Experiments were conducted by J. T. Jones, Iron Mountain, Mich., some time ago, with the Jones furnace and Jones step process. The original furnace consisted solely of a long tube which pitched slightly and revolved slowly. This was lined with heat-resisting material of some sort. The ore and fuel were fed into the upper end at constant speed and the metallized product was taken out of the lower end. Subsequent treatment separated the metallic iron from whatever gangue there was. The principal difficulty with this furnace, or rather with its operation, lay in the inability to secure a lining material that would withstand the cutting action of the ore and fuel as it revolved at the high temperature that was necessary to produce the desired results. All sorts of linings were tried without success. Some of these would stand up satisfactorily to about 2000° F. However, it was necessary to reach 3000°, and the range between 2000° and 3000° destroyed the lining. These conditions led to further experiments, which were conducted in Salt Lake City. As a result of these, some important changes have been made in the process, and are being embodied in an experimental plant, which is being erected on a rather large scale, at Marquette, Mich., by the New Metals Process Co. The company itself has the financial backing of J. M. Longyear, of Marquette, Mich., the well known operator in the Lake Superior district. The construction work is in charge of Arthur J. Jones, assistant engineer.



Plant of the New Metals Process Co., Marquette, Mich.

The feature of the plant now under construction, which differs entirely from the original furnace, is the vertical stack to be used, which forms a second step in the process of reduction. The long revolving tube is retained, and is 60 ft. long, 6 ft. in diameter, and pitches $^3/_4$ in. in 1 ft. It will be lined with a special firebrick and will make a complete revolution in two minutes. It rests on concrete piers at a considerable height from the ground, and will be rotated by electrically driven machinery. The ore and the fuel, which in this case will be cord wood, will be fed into the upper end of this tube, having been raised by mechanically operated skips. The lower end of this skiproad terminates in a pit in the stockhouse, into which the ore is brought by railroad cars which dump from a trestle on to the concrete floor, and the ore is then shoveled from the floor into the skip. The revolving tube retains this mixture of ore and fuel, and in traversing the tube it is heated up to approximately 2000° F. At this juncture it reaches the lower end of the tube and is dumped into the top of the vertical stack.

This stack is not unlike a small blast furnace or cupola in general appearance. It is 30 ft. high from the base to top, 12 ft. diameter, and the lower 24-ft. section is lined with firebrick, with a special block at the bottom. The stack is provided with tuyeres, and at this point the furnace is water-jacketed. A most interesting feature, also, is the fact that only natural draft is to be used through these tuyeres, no blower being employed; further, that although the draft will enter at the tuyeres, the interior design of the stack is such that the latter is really a downdraft stack. In this stack, the product of the revolving tube is heated from 2000° to 3000° F. By having a stationary furnace at this step in the process, it is claimed the difficulty of excessive wear on the lining has been overcome. The product of this stack, which is metallized ore and gangue, is pulled out at the bottom into water carriages, and the contact with the water breaks up the material. It will then be hoisted by bucket elevator to two of a set of four steel storage tanks, from which it will feed by gravity to a crusher. The crusher product will also be raised by bucket elevator to the remaining two tanks. From these it will feed by gravity to electro-magnetic separators which will separate the metallized iron from its gangue, which consists of silica, sulphur, phosphorus, etc. It should be remembered that these constituents are mechanically and not chemically combined.

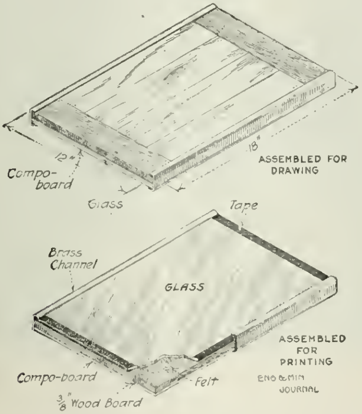
Details of Practical Mining

Portable Combined Blueprint Frame and Drafting Board

By Frederick W. Foote*

Many engineers engaged in examination work have felt the need of tracings and blueprints to accompany their reports and often have had to wait to make them until a place was reached where there were facilities—with inconvenience to themselves and loss of valuable time.

To eliminate this trouble I devised an outfit which I have found serviceable. It is light and compact, fitting in a suitcase, and performs well the work required of it. It consists of a drawing board, 12x18 in., built with end cleats rather than back cleats; a piece of "Compo" board; a piece of clear glass of the same dimensions; and two channels of brass, 18 in. long and of the desired thickness.



Manner of Assembling for Drawing and for Printing

The drawing board is ⅜ in. thick. If made up of several narrow strips and held together by the end cleats, the danger of warping is greatly reduced. One side is dressed for drawing and the other side is covered with felt. The glass is bound on the edges with adhesive tape to prevent chipping and lessen the danger of cracking where the channels come in contact with it. The channels are of sufficient depth to accomodate the board, glass, "Compo" board, a reasonable amount of tracing cloth, drawing paper and blueprint paper, the latter being kept in a black-lined to protect it from the ligth.

The drawings show the outfit assembled with the glass inside, for use as a drawing board; and also with the glass outside for blueprinting. Thus assembled, it can be set up in any window-sill in the sun and the blueprints washed in the bathtub if the engineer is in a hotel or in a hand basin if he is in the field. The whole outfit may be made for a dollar or so; if it does not have to be carried in a suitcase, the size may be altered as desired.

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*Mining engineer, University Albemarle County, Va.

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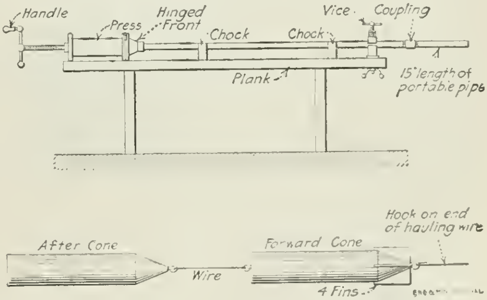
Lining Pipe with Cement

Cement-lined wrought-iron pipes, because of their freedom from interior corrosion and stoppage, have been used for water service to some extent for many years. Recently, a company has been organized in Boston to line pipe on order, either taking pipe supplied to it or furnishing the pipe itself. This fact is of interest on account of the possible application of the cement-lined pipe to mine uses. The procedure in lining the pipe is described in *Engineering News*, Oct. 8, as follows:

A screw-piston press 5 in. in diameter and about 18 in. long, mounted on one end of an 18-ft. plank, is used to force the mortar into the pipe. The forward head of the press cylinder is hinged to swing open; it has a central hole threaded for 2-in. pipe (other sizes are accommodated by use of bushings). The cylinder head is swung open, the cylinder filled with mortar, and the head closed and locked. The pipe to be lined is then screwed into the hole in the cylinder head. By forcing the piston ahead, the cement is then shoved out into the pipe. After this the pipe is unscrewed and moved along into a vise at the front end of the plank. A coupling is set up on the forward end, with a portable length of pipe about 15 in. long screwed into it as far as another pipe would be fitted, usually about six threads; this keeps the threads clear of mortor for connecting the length of pipe to another length.



Apparatus Used in Lining

A stiff wire is now pushed through the cement in the pipe, from the front end, and a pair of tapered mandrels pulled through the pipe by means of this wire, to core out the bore of the pipe. The mandrels are short lengths of brass pipe with tapered front end, fastened together by a loose wire. The outside diameter of the mandrels is ¼ in. less than the inside diameter of the pipe. The forward mandrel has four longitudinal fins, at 90° intervals, to center it in the pipe, while the rear mandrel is smooth and, following through the bore made by the first mandrel, finishes it to shape and surface. The result is a smooth $\frac{1}{8}$-in. lining of cement mortar.

After inspection, the pipe is laid away for the mortar to harden. The short length of pipe at the point is unscrewed, but the coupling is left on. All tees, elbows and other fittings are also lined with cement mortar, so applied as to give an interior surface continuous with that of the pipe, giving minimum friction at the joints.

*

Sabulite--A New Explosive

Mention was made in the JOURNAL, Oct. 3, p. 631, of trials by the Anaconda company in Butte of a new Belgian explosive, sabulite.

Sabulite was developed from the ammonium-nitrate powders. Aluminum powder with ammonium nitrate and a nitrated hydrocarbon seemed promising, but the high cost, low density and danger of aluminum powder prevented its successful use on a commercial scale. Eventually calcium silicide was adopted instead of aluminum powder. Calcium silicide is completely unaltered when exposed to the atmosphere, has a crystalline structure and is obtained in gray compact masses with metallic luster. In the manufacture of sabulite it is used in the form of a fine powder. The amount of heat developed during its combustion approximates that of aluminum and the heat is utilized to a surprising extent during the explosion. Calcium silicide and nitrate of ammonia, if used alone, would develop great quantities of heat, but the volume of gases given off would be small, which would detract from the power. To overcome this, a nitrous combustible in the form of trinitrotoluene is introduced. This might be replaced by one of the nitrated naphthalenes or anything to produce the same effect. The valuable properties of sabulite, however, lie in the calcium silicide.

In its present form, sabulite gives off large volumes of gas on explosion, generates great heat and has a high velocity of detonation. Therefore it should not only have a great effect when the rock is hard and compact, but should also work well when lifting power rather than shattering effect is required.

The powder is a simple mechanical mixture of the three ingredients. The sensitiveness of the ammonium nitrate to moisture is, to a considerable extent, overcome during the process of manufacture, the explanation appearing to be that its molecules become enveloped by a film of trinitrotoluene, which protects them from moisture.

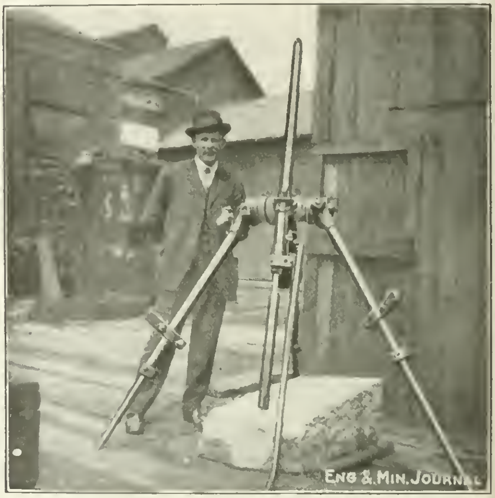
The tests carried out in Butte, both as regards breaking ground and as regards safety, are stated to have been successful. These tests demonstrated that the powder cannot be exploded by heat. A cartridge was placed on a fire and, after melting, it burned slowly. Another cartridge was demolished by means of a red-hot poker without explosion. Powder was placed on an anvil and repeatedly struck with a chisel and a hammer without explosion. Some of the powder was placed on a rough piece of granite and drilled into without explosion. A high-power rifle bullet was fired through a cartridge, cutting it in two, but not exploding it. Most important of all, there are no noxious fumes given off by its explosion.

*

In Using Slings whether rope or chain, avoid kinks (N. F. A. Safety Buletin, June 1, 1914). Provided racks for storage so as to keep the slings convenient and save wear and tear. Have extra sets in order that there may be others available while defective slings are being repaired.

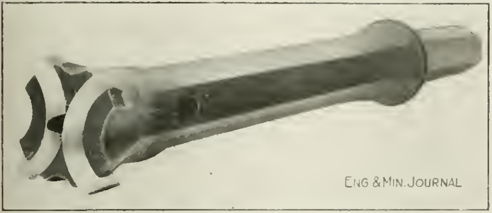
Follow-Up Drill and Detachable Bit

There is shown in one of the accompanying illustrations a rock drill invented by the late J. D. MacDonald of Butte. It is of the hammer type and has its drilling cylinder so constructed and of such a diameter as to follow the bit into the hole. This, of course, practically eliminates the use of drill steel; an exceedingly resistant detachable bit consisting of cutters and socket or holder is attached at the end of the cylinder, the holder receiving the blows of the hammer and having a motion not unlike that of an anvil block. This bit suffers little or no diminution in gage, so that the hole maintains a practically uniform diameter from collar to bottom and there is always room for the cylinder therein. The drilling cylinder itself is attached to a piece of hollow drill steel at the rear end and receives its air through this. This piece of drill steel in turn is attached to a plunger working in a feed cylinder and thus the drill is fed forward against the rock in about the same manner as a stoper is. The bit is mechanically rotated while drilling. The drill has only 11 parts, weighs 40 lb., has a 3-lb. hammer and a 3-in. stroke. The hole drilled is $2\frac{1}{2}$ in. in diameter. The drilling speed varied from $1\frac{1}{8}$ to 2 in. per min. in hard Butte granite, when the machine was properly mounted. The air consumption was only 28 cu.ft. of free air per min. The air consumption and weight of hammer are too small for so large a hole and experiments are now under way toward increasing the size of the air inlet and the weight of the hammer, and drilling a smaller hole.



THE FOLLOW-UP DRILL MOUNTED ON A TRIPOD

There would be many advantages in a machine of this kind when perfected, but most of these inhere in the use of the detachable bit. For this reason, the possibility of using such a bit with standard machines at once suggests itself. A trial was made in Butte last summer with a Leyner machine, using the same bit as that used on the machine described, and the results obtained are of interest. The bit itself is shown in the accompanying illustrations, which, however, show it attached to plugger steel, not to Leyner steel; it consists of a holder in which two cutters are held. The holder is fastened to a piece of hollow Leyner steel. Its shape is shown in the picture; a central longitudinal hole carries a plug and spring with a projecting pin. The arc-shaped cutters are slipped into the holder from the side with the pin depressed; when the pin is allowed to spring out, it enters the cylindrical hole formed by the two grooves down the center of the cutters and thus locks the cutters against slipping laterally. The ribs along the back of cutters hold them against slipping longitudinally. Two sets of cutters are shown here, differing, however, only in detail of design. They are of chrome steel and are reversible, that is, each cutter has two cutting edges. The plug and spring can be taken out and replaced easily with a pair of pliers. The spring is made a little larger than the hole in the holder so that when compressed it is held in place while the cutters are being removed or changed.



A BIT COMPLETE WITH HOLDER AND CUTTERS

For the test, holes were drilled in hard blocks of Butte granite forming an old engine foundation west of the Mountain View mine at Butte. The tests were conducted by starting with a receiver full of air at 80 lb. gage pressure and running until the pressure fell to 70 lb.; it was calculated that the machine used the equivalent of 1880 cu.ft. of free air during this 10-lb. drop in pressure. The machine used was a practically new No. 18 Leyner with an 8-lb. hammer, a 3-in. stroke, and a 2½-in. diameter of cylinder. The holder was tapped on regular Leyner hollow steel with a light hammer; the joint had a slight taper. When it became necessary to substitute longer steel or to change or turn the cutting edges, the holder had to be forced off the old steel and driven on the new. The spring device was not designed to work with this type of steel. This accounts for the long delays. A soft steel pin, having a hole drilled in the center to pass water through the holder, was used for holding the cutters instead of the regular hard-steel pin. This finally battered out of shape and while a second hole was being drilled, the regular solid pin had to be substituted. As a result, practically no water reached the bottom of the second hole for the last 9½ in. of drilling. After drilling, the holder showed practically no signs of wear. The holes were 2½ in. in diameter from collar to bottom. Table I gives the detailed results of the cutter tests. Table II compares these results with the results of drilling, using ordinary Leyner steel.

TABLE I—RESULTS OF DRILLING TEST WITH DETACHABLE BIT

	Actual Drilling Time Min.	Inches Drilled in Actual Drilling Time	Inches per Minute of Actual Drilling Time	Delays to Succeeding Period Min.	Total Distance Drilled Inches	Total Inches Drilled per Minute of Elapsed Time (Delays Included)
Hole No. 1						
First period	1.5	3.0	2.0	0.5	3.00	2.0
Second period	3.0	7.0	2.33	3.0	10.00	2.0
Third period	6.5	15.0	2.31	6.5	25.00	1.53—
Fourth period	6.0	13.25	2.21	....	38.25	1.42—
Hole No. 2						
First period	5.0	9.25	1.85	2.75	9.25	1.85
Second period	5.0	10.875	2.175	9.00	20.125	1.58
Third period	5.0	9.625	1.925	.	29.75	1.11+

The first hole was a wet hole, 7° from the horizontal, and was drilled in four periods. The first stop was made to examine the cutting edges, which were found in good condition. The second stop was made to reverse cutters and change the length of steel from a starter to a second. The soft-steel pin was found slightly battered. The third stop was made to put in a new set of cutters and change to the third length of steel. The holder was found in satisfactory condition. When the hole was bottomed, the first cutting edges of the second set of cutters were dulled, but were in good shape. It will be noted that three sets of cutting edges were used, or one and a half cutters. The cutters were afterward used for drilling several feet in the Colorado mine at a speed of 1⅛ in. per min. It is thus evident that for each pair of cutting edges, 12½ in. would be drilled, or for each pair of cutters, 25 inches.

THE HOLDER WITHOUT PIN OR CUTTERS

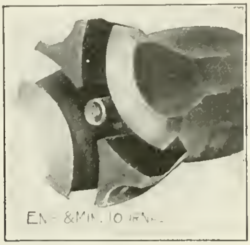
TABLE II—COMPARISON OF DRILLING WITH DETACHABLE BITS AND WITH ORDINARY STEEL

Machine and Steel	Total Depth of Hole In.	Actual Drilling Time Min.	Diameters Collar	Diameters Bottom	Diameters Average	Average Cu. In. of Rock Cut per In. of Hole Drilled	Total Cu. In. of Rock Cut from Hole	Per Minute of Actual Drilling Inches of Hole Drilled	Per Minute of Actual Drilling Cu. In. of Rock Cut	Total Number of Pieces of Steel or of Single Cutters Used	Inches of Hole Drilled per Piece of Steel or per Single Cutter	Cubic Inches of Rock Cut per Piece of Steel or per Single Cutter
Leyner No. 18 with MacDonald cutters	38.25	17.00	2.5	2.5	2.5	4.9088	187.76	2.25	11.04	3	12.75	62.59
Leyner No. 18 with MacDonald cutters	29.75	15.00	2.5	2.5	2.5	4.9088	146.04	1.98	9.74	3	9.92	48.68
Leyner No. 18 with regular Leyner steel	61.00	18.70	2.125	Under 2.00	2.0(?)	3.1416	191.64	3.26	10.25	10	6.10	19.16
Small Leyner with regular Leyner steel	197.00	48.15			1.5(?)	1.7672	348.13	4.09	7.23	20	9.85	17.41

The second hole was a dry hole, also 7° from the horizontal. The first stop was made to put in a new set of cutters and change steel from starter to second. The second stop was for the purpose of turning the cutters. The holder was found in good shape, but it was necessary to remove the soft pin and complete the drilling with a solid pin, so that, as before stated, no water reached the face.

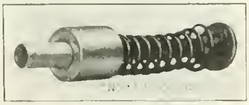
In regard to Table II, it will be noted that while progress was slower using the cutters than when using the regular Leyner steel; on the other hand the number of cubic inches of rock broken per minute was much greater. The service got from the small light cutters, as compared with that got from the ordinary steel, is most impressive. The distance drilled per *single* cutter is about 30% more than that per piece of steel. The difference in performance, taking into consideration the cubic inches of rock removed, was many times greater.

It would be unsafe to predicate too much, of course, on a single test like this; but on the other hand, the device is probably not nearly so well developed as it is capable of being, and when its full efficiency is obtained, a still more favorable showing would be made.



The Holder with Pin in Position

There are several points in connection with the use of such of these detachable bits that merit consideration. The first that will occur to anyone is, of course, the saving in the transportation of the steel. The cutter is small and light. The miner going on shift, can fill his pockets with as many as he is likely to need, and then bring back his dull cutters along with any that are left over, in order to check out, thus guarding against their being thrown into the ore. The lengths of steel become part of the machine equipment, to be kept with it along with wrenches, etc. The cutters are not dressed again; they are most available at Butte for precipitating copper. When got in quantities they cost 3c. per pair. Assuming that a pair is good for 25 in. of hole, the steel cost per foot becomes approximately 1½c. This cost would probably be slightly reduced for cutters giving a smaller hole. It is calculated that a round trip for a piece of steel from mine to shop and back in Butte costs from 12 to 15c.; this includes the labor of collecting the dulled steel, transporting it to the blacksmith shop, the cost of sharpening and the loss in that process, together with the high loss of steel which disappears in the filling underground. There are other indeterminable costs which would largely increase this figure. The cost of the holder must, of course, be considered. One of these drilled 60 ft. and was still in good condition thereafter. They cost about $1 to $1.50 each. Assuming that this cost is about equivalent to the indeterminate costs on the length of steel, a piece of ordinary steel to equal the cost of the cutters would have to drill about 9 ft. for every sharpening, which it will not do even if slow and inefficient work with dull steel be permitted.



Plug, Pin and Spring

One Form of Cutter

The direct cost, furthermore, is not the only point to be considered. It is a baffling problem for the underground superintendent in Butte, as elsewhere, to get enough sharp steel to his miners. A machine man seldom has enough steel for a shift, and spends valuable time getting what he has. He uses dull steel far beyond the point of economy, and the net result all around is a serious decrease in the footage drilled per man per shift. It will be noted in Table II that under test conditions the No. 18 Leyner used 10 pieces of steel to drill 61 in. and the small Leyner used 20 pieces in 197 in. There are few mines in Butte where a machineman does not count himself as being in great luck if he can get eight pieces of steel to drill his stope round. Again, the handling of the long lengths of steel is difficult and dangerous work for both the miner and the tool nipper. Miners are hit by falling steel, and riding on the cage with steel is always hazardous.

Latest Form of Cutter

A second consideration is the fact that the cutters maintain their gage, so that the hole is of substantially uniform diameter from collar to bottom. The resultant advantage in making it possible to concentrate the powder at the bottom of the hole is manifest.

For the information on which this article is based, the Journal is indebted to Marcus L. Hurley.

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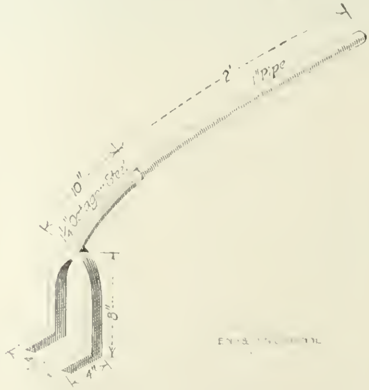
Rail and Tie Holder

In laying or repairing mine tracks, it is not always possible to have the rails resting upon all the ties before spiking, due to the unevenness of drift and crosscut floors. To overcome the difficulty of spiking under such conditions, the tool shown in the accompanying illustration was devised. One end of a 2-ft. length of 1¼-in. octagon drill steel was split for 1 ft. and shaped into a fork, the end of each prong for a length of 4 in. being bent forward at a right angle; the other end of the drill steel was drawn out so that it would just slip into a piece of 1-in. pipe; this pipe serves as a handle and lever. By placing the fork over a rail and slipping the prongs under a tie, the latter may be held up firmly against the rail while being spiked.



Lever Fork for Holding Tie to Rail

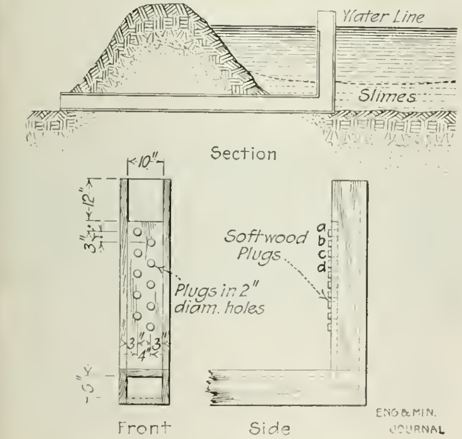
Details of Milling and Smelting

Increasing Capacity of Slimes Ponds

By Thomas H. Tulloch*

The arrangement described here was found to increase the capacity of small slimes ponds where it was desired to settle the slimes and cake them for shipment by drying in the sun. This arrangement makes the slimes available for treatment or shipment much sooner than would be the case in large ponds, and is an advantage where lack of room, topography or convenience in rehandling make it desirable to use as small an area as possible, and where it is not practicable to build settling tanks.

A box, the front and side elevations of which are shown in the diagram, is built of 2x10-in. lumber. This box is used as an overflow and is put in the retaining-wall of the dam as shown in the diagram. The box should be placed as far as possible from the intake and about 10 ft. from the edge of the bank. The feed is turned into the pond and after filling it, is not diverted until the submerged stream of settling slimes has raised to such a point that there is a loss of slimes in the overflow. The feed is then diverted to another pond. As the slimes in the first pond settle, the clear water is drawn off by successively removing the plugs *a*, *b*, *c*, etc., until no further settling of the slimes takes place. The plugs are then put back, the feed turned into the pond again and the operation repeated. This alternate filling of the pond, settling of the slimes and decanting of the clear water is continued until it is no longer possible to get a clear overflow. The feed is then diverted to other ponds, all clear water drawn off the surface and the slimes dried by evaporation until they can be handled. The slimes are then removed for treatment or shipment and the pond is ready for the feed again.



Method of Draining Slimes Ponds

This method entails little loss of slimes and, due to the successive settling and decantation of the water, the solids settle compactly and dry quickly. Rectangular ponds with the intake and overflow at opposite ends give the best results. The maximum depth should not be over 3 feet.

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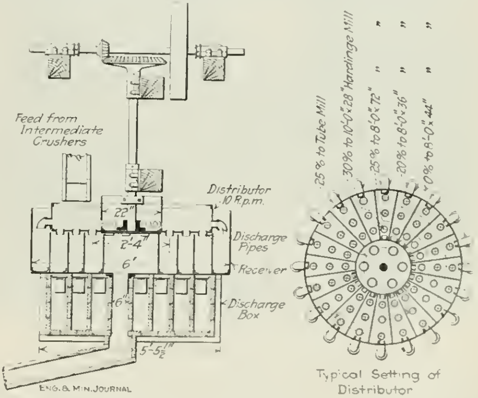
Distributor for Regulation of Feed to Pebble Mills

By P. S. Huntington*

In all mill work it is necessary to know the weight of ore which is being handled by any given unit. In modern mills this is usually obtained for each unit by means of a weighing machine which automatically weighs the ore to be treated as it passes on a conveyor belt from the mill bins. In case the feed is afterward divided for treatment in several various types of machines, as frequently occurs in experimental work on a large scale, it is necessary to employ a distributor to apportion such amounts as may be required, to the various machines.



Distributor for Pebble-Mill Feed

To meet such a requirement the distributor shown in the accompanying sketches was designed and installed at the test mill of the Inspiration Consolidated Copper Co. It takes the product from intermediate wet crushers and distributes it to five pebble mills, or any less number, depending on the nature of the test being run. Being made up of 20 radial compartments it is possible, by plugging the discharge pipes, to vary the feed to any machine 5% of the total. Then, knowing the weight of the main ore stream for any given period, it is a simple matter to ascertain the amount of ore handled by each machine in that period. A 5% variation, based on the normal pacity of the test plant, has been found to permit of a feed regulation amply close for all experimental purposes. A typical setting is shown in the drawing.

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*San Diego, Calif.

*Construction department, Inspiration Consolidated Copper Co., Miami, Ariz.

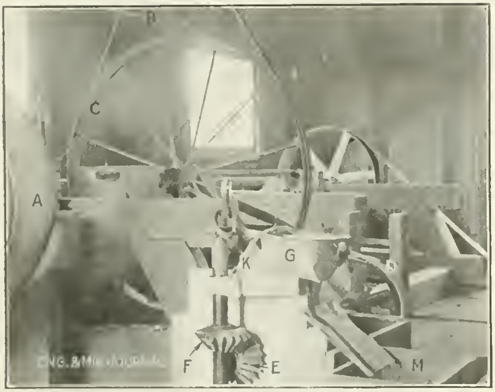
A chart, showing the numbers and sizes of the mills, together with their respective settings, given in terms of discharge pipes left open, is kept posted near the distributor, so that the men in charge can always know just what proportion of the total feed each machine is handling. This distributor was devised by H. Kenyon Burch, chief engineer, and Dr. Rudolph Gahl, metallurgist, of the Inspiration Consolidated Copper Co.

* * *

A Home-Made Automatic Sampler

By Percy E. Barbour*

A home-made automatic sampling device which was made from scrap material and cost almost nothing, was devised by R. C. Coffey, superintendent of the Uwarra mill, at Candor, N. C., and gave satisfactory results. The sampler was to cut the stream of ore from the inclined-belt conveyor, the discharge end of which is shown in the illustration at *A*. The sampler was driven from the head-pulley drive shaft, and the necessary speed reduction was obtained by the pulleys *B*, *C* and *D*. Pulley *D* operates a short shaft carrying at the other end a bevel gear *E*, which meshes with the bevel gear *F*, from which several teeth were chipped away, as can be seen at the point of the arrow. This vertical shaft had two arms at right angles, one carrying the sampler *G* and the other having its end turned up about 4 in., like a crank, at *H*. Any desired speed can be obtained by proper pulleys; in this case the device took a sample every 12 minutes.



Automatic Sampler Installed

The sample collector *G* was an old 8-in. elevator bucket with holes punched in both ends to take the arm. The bucket was free to swing on this arm, and was counterweighted so that it would hang upright except when being tripped. A piece of small rod iron was bent as shown at *K*, fastened to the back of the bucket with two jamb nuts, and projected over the bucket, acting as a dumping cam. This engaged a pin, not visible in the photograph, and slowly rotated the bucket on its arm as the arm passed over the sample box, shown at *M*. As soon as the tripping stud was passed, the counterweight righted the bucket ready for its next cut. All of this is, of course, simple enough. The clever trick about the device was that which gave the quick cut necessary for a fair sample.

The vertical end of the arm *H* had a cord and spring attached to the framework behind it. This cord and spring were constantly in tension. When the slowly revolving bevel gear *E* went out of mesh with the equally slowly revolving gear *F*, owing to the teeth being chipped away, the spring cord in tension gave the arm, and hence the vertical shaft and the bucket, a sudden and quick rotation through an arc from which the teeth had been chipped away and brought the bevel gears into mesh again. This sudden swing of the bucket through the ore stream gave the quick cut necessary for a fair sample.

This sampler cuts the ore stream from side to side, which is not the theoretically proper way to take such a sample, but at this point the ore stream is narrow and the cutting is done quickly, and the results proved satisfactory in the case, the taking of a mill-head sample for a 50-ton plant.

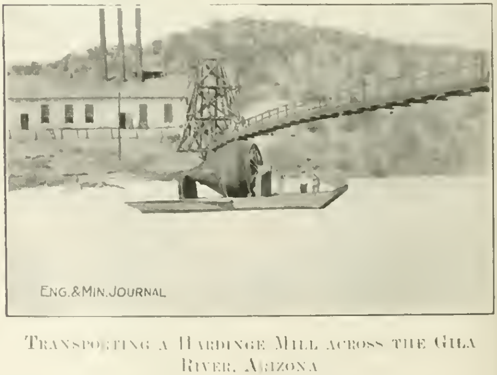
The sampler was quickly and crudely made out of junk, but worked well and suggests a home-made sampler which could be well made in any machine shop at small cost.

* * *

Transporting a Hardinge Mill across the Gila

By A. L. Flagg*

The accompanying illustration shows the method of transporting an 8-ft. x 22-in. Hardinge mill across the Gila River, in Arizona. The bare mill weighed 10,000 lb. The boat was made of rough lumber, 2x12-in. It was 16x24 ft. over all, 2 ft. deep at the back and 3 ft. deep at the front. When loaded it drew 11 in. of water. At the time the mill was taken across, the surface velocity of the river was approximately 7 ft. per sec. The river was very muddy, carrying about 33% solid matter. A small contractor's hoist was used to draw the boat and cargo across the river. The time for the trip was 1 hr. 10 min. The river is 250 ft. wide, but to avoid rocks the boat was taken upstream about 200 ft. and then drawn straight across.



Transporting a Hardinge Mill across the Gila River, Arizona

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*Mining engineer, 887 Middle St., Bath, Maine.

*Mining engineer, Kelvin-Sultana Copper Co., Kelvin, Ariz

The Assayer and Chemist

Volumetric Estimation of Mercury

By J. E. Clennell*

The methods in general use for estimating mercury volumetrically depend on titration with either potassium iodide or a thiocyanate.

Iodide and Thiocyanate Methods

The iodide method, on which I have made numerous experiments, has the disadvantage that the finishing point is somewhat uncertain. The solution may be standardized in various ways. Thus we may use a mercuric-chloride solution of known strength and note the point (a) where addition of the standard iodide first produced a permanent turbidity, (b) where the precipitation of mercuric iodide is complete, ascertained by an external indicator, or (c) where the precipitate, on continued addition of iodide, finally dissolves.

The last point is preferable, though no sharper than the others, because a larger volume of the standard solution is used and hence the percentage error in the determination resulting from a given error of observation in the titration is less. Some writers recommend adding the mercuric solution to the iodide instead of *vice versa*, but there appears to be no marked advantage so far as sharpness in the finishing point is concerned, and the method has obvious disadvantages where the amount of mercury is not approximately known beforehand.

In Seamon's modification (cf. A. H. Low, "Technical Methods of Ore Analysis," 5th Edition, p. 183, quoted from "Manual for Assayers and Chemists," p. 112), an external indicator is used consisting of starch liquor, and nitric acid containing nitrous acid is added to the liquid to be titrated. Apart from the objections to the use of all external indicators, the results which I obtained by this method were unsatisfactory and appeared to vary with the amount of nitrous acid present, with the degree of dilution, rate of titration, and other conditions. Only a rough approximation was obtainable by any form of the iodide method.

The thiocyanate method of L. L. Krieckhaus (A. H. Low, *loc. cit.*, p. 181) is probably more accurate, but was discarded for the present purpose as it necessitates conversion into mercuric nitrate by a tedious process of reduction with stannous chloride, washing, settling, etc., finally dissolving the precipitated mercury in nitric acid and titrating with thiocyanate as in Volhard's method for silver. Several hours are required for the entire operation.

Cyanimetric Method

The following cyanimetric method appears to be not only rapid, but at least as accurate as any method, gravimetric or volumetric, hitherto described.

A method, due in its original form to Hannay, is described in Sutton's "Volumetric Analysis" (8th Edition, p. 269) with modification by various workers, in which potassium cyanide is used for the direct titration of mercury in pure mercuric compounds. In that process, dilute ammonia is used as an indicator and it is necessary to neutralize the solution exactly with potassium carbonate and hydrochloric acid, add ammonia to produce a slight turbidity, and titrate with cyanide till the solution just clears. The method appears to require rather careful manipulation and regulation of the amount of reagents used.

In the process detailed below, which I worked out in the laboratory of the Nipissing Mining Co., Cobalt, Ont., the mercury is determined by indirect titration with cyanide; an excess of cyanide is added and the excess determined by silver nitrate. There is no necessity for exact neutralization of the solution; an excess of alkali is added in all cases, and this may be varied within reasonable limits without affecting the result.

Ammonia appears to affect the result, and its presence should be avoided.

Preparation of the Solution—Mercury compounds soluble in hydrochloric acid (50% by volume) are dissolved by agitation and gentle warming with that acid (0.5 gram of mercuric oxide, HgO, is readily dissolved in the cold by 5 cc. of 50% HCl).

Compounds insoluble in HCl are dissolved by *aqua regia*, using a mixture of equal parts of 50% HCl and 50% HNO_3. The mixture may be boiled for 30 seconds or more without appreciable loss of mercury, and this is necessary to eliminate free chlorine.

The acid solution, filtered if necessary, is then made distinctly alkaline by addition of caustic soda. Enough must be added to change the color of the precipitated oxide from reddish-brown to orange-yellow.

The Titration—Standard potassium cyanide, say about 1% strength, is then run in from a burette until the precipitate entirely dissolves to a colorless liquid. It appears best to add about 5 c.c. of the cyanide solution beyond this point. The excess of cyanide is then titrated with standard silver nitrate, after addition of about 10 c.c. of a 1% potassium-iodide solution as indicator. The relative strength of the cyanide and silver nitrate must, of course, be carefully determined.

The amount of silver nitrate used in this excess titration is then deducted from the silver-nitrate equivalent of the total amount of standard cyanide used. The difference is the equivalent of the mercury present.

Reactions Involved

The mercuric oxide formed by addition of alkali to the mercuric solution is dissolved thus:

$$HgO + 4\,KCN + H_2O = K_2Hg(CN)_4 + 2\,KOH$$

The results obtained by the titration correspond closely to the reaction:

$$K_2Hg(CN)_4 + AgNO_3 = Hg(CN)_2 + KAg(CN)_2 + KNO_3$$

i.e., half the cyanogen of the double salt is estimated in the silver-nitrate titration.

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*Metallurgical chemist, Oakland, Calif.

Thus if we use a silver-nitrate solution containing 6.52 grams $AgNO_3$ per liter

1 c.c. $AgNO_3$ = 0.00769 gram Hg

Standardizing—Instead of using this theoretical number, the silver-nitrate solution may be standardized empirically on a mercury salt of known composition. Thus 0.5 gram of mercuric chloride or mercuric oxide may be taken. In the latter case the oxide is best dissolved in 5 c.c. of 50% HCl and made alkaline with about 30 c.c. of 5% NaOH. Run in 1% KCN until the precipitate dissolves and a perfectly colorless liquid is obtained; add 5 c.c. more KCN: about 35 c.c. will be required altogether. Then add 10 c.c. of 1% KI and titrate with standard $AgNO_3$. Using the solution referred to above, 1 or 2 c.c. will be required.

It seems preferable to use the silver nitrate rather than the cyanide as the standard solution, as the former is less liable to undergo change of strength on keeping.

The end point is marked by the appearance of a yellowish turbidity of silver iodide. Sometimes a white turbidity may appear earlier, but this is faint and indefinite and should be disregarded.

Application of the Method to Samples of Impure Oxide

When a mixture of mercuric and mercurous oxides is treated with 50% HCl, the mercuric oxide dissolves, and insoluble mercurous chloride is formed by the reaction:

$$Hg_2O + 2\ HCl = Hg_2Cl_2 + H_2O$$

In cases where metallic mercury, mercurous and mercuric compounds are present, the mercuric compounds are alone dissolved by dilute HCl and may be determined separately after filtering and washing. A grayish residue remains consisting apparently of Hg and Hg_2Cl_2, which blackens on addition of ammonia.

To obtain the total mercury, the following method is often applicable: 0.5 to 1 gram of the sample is treated with 5 to 10 c.c. of saturated bromine water, then with 5 c.c. of 50% HCl, boiled for about 30 seconds, and a few drops of KI added. If any iodine is liberated, boiling is continued until fresh addition of KI gives no liberation of iodine. All the mercury will now be in solution and in the mercuric condition. Excess of NaOH is then added, and the solution cooled and titrated as usual. It is essential to remove the excess of bromine, otherwise on addition of NaOH a hypobromite is formed, which reacts with cyanide thus:

$$NaBrO + KCN = KCNO + NaBr$$

and more cyanide is consumed than is equivalent to the mercury, so that the value obtained for the latter would be too high. A solution of iodine in potassium iodide may be used instead of bromine, the excess of iodine being boiled off before adding NaOH.

Separation of Interfering Metals

In cases where other metals, such as copper, nickel or zinc, are present, which would react with cyanide, they may be readily eliminated by utilizing the insolubility of mercury sulphide in moderately concentrated nitric acid. The metals are precipitated in acid solution by H_2S, the precipitate filtered and washed free from chlorides, and digested with warm 50% HNO_3. The residue, after washing to remove copper, etc., is treated with HCl and HNO_3, heated to boiling for about 30 seconds, diluted, filtered to remove sulphur, and the filtrate made alkaline with NaOH and titrated with KCN as usual. When lead is present it is preferable to boil the original H_2S precipitate with 50% HCl, which readily dissolves PbS, leaving HgS unaffected.

Iron in the ferric state does not interfere with the method except by obscuring the end point with $AgNO_3$. When present with mercury in a solution with HCl, add 5 c.c. 50% HNO_3 and boil before neutralizing with NaOH. On adding the cyanide, a precipitate of ferric hydroxide appears, which is insoluble in excess of KCN. This must be filtered off and washed before titrating the excess KCN with $AgNO_3$.

Effect of Varying Conditions

The following tables illustrate the method of working and the degree of accuracy which is obtainable by this method of titration. The same silver-nitrate solution was used throughout, but the cyanide solution was made up approximately and the exact standard determined for each series of tests.

Constants assumed. 1 c.c. $AgNO_3$ = 0.005 gram KCN = 0.00769 gram Hg = 0.008305 gram HgO.

Solutions used:
(A) Mercuric chloride, 5% $HgCl_2$
(B) Caustic soda, 5% NaOH.
(C) Potassium cyanide, 0.97 to 0.98% KCN.
(D) Potassium iodide, 1% KI.
(E) Silver nitrate, 0.652% $AgNO_3$.

EFFECT OF VARYING QUANTITIES OF MERCURY

1 c.c. KCN = 1.91 c.c. $AgNO_3$

(A) $HgCl_2$ Taken c.c.	(B) NaOH Added c.c.	(C) KCN Added c.c.	(D) KI Added c.c.	(E_1) $AgNO_3$ Required for Excess c.c.	(E_2) $AgNO_3$ Corresponding to Hg c.c.	Mercury Hg Present gram	Mercury Hg Found gram
1	10	4	5	2.95	4.81	0.0369	0.0370
2	10	6	5	2.05	9.59	0.0738	0.0737
3	10	8	5	1.40	14.12	0.1107	0.1086
4	10	10	5	0.65	18.75	0.1476	0.1442
5	10	14	5	2.85	24.31	0.1845	0.1869
7	10	18	5	1.55	33.37	0.2583	0.2566
9	10	22	5	0.70	41.98	0.3321	0.3228
10	10	25	5	1.40	48.10	0.3690	0.3699
15	15	36	5	0.65	69.19	0.5535	0.5321

The numbers in the sixth column are calculated from the formula $E_2 = 1.91\ C - E_1$. The numbers in the last column = $E_2 \times 0.00769$.

The results show that with a pure mercuric-chloride solution the method is sufficiently accurate for practical purposes, for quantities of mercury ranging from 40 to 500 milligrams.

In order to test its applicability to mercuric oxide, a sample of pure oxide was prepared by precipitating pure mercuric chloride with caustic soda, filtering, washing with hot water till free from alkali and chlorides, and drying in the steam oven. A second sample was taken after further drying in the oven for several hours.

TITRATION OF PURE MERCURIC OXIDE

Amount taken 0.5 gram.
Dissolved in 5 c.c. 50% HCl, excess NaOH added and titrated with KCN
1 c.c. KCN = 1.952 c.c. $AgNO_3$

Sample No.	KCN Added c.c.	$AgNO_3$ Required (E_1) c.c.	$AgNO_3$ Required (E_2) c.c.	Mercury Found gram	Mercury Found %	HgO %
1	32	2.80	59.66	0.4588	91.76	99.10
2	33	4.00	60.42	0.4646	92.93	100.36

EFFECT OF ADDING BROMINE OR IODINE AND BOILING

Test No.	$HgCl_2$ 5% c.c.	HCl 50% c.c.	Bromine Water Added c.c.	$\frac{N}{10}$ Iodine Added c.c.	KCN Added c.c.	Ag NO_3 Required E_1 c.c.	Ag NO_3 Required E_2 c.c.	Mercury Indicated gram
1	15	5			36	0.8	69.76	0.5365
2	15	5	5		36	0.6	69.96	0.5380
3	15	5	5		36	1.45	69.11	0.5314
4	15	5		5	36	0.6	69.96	0.5380

1 c.c. KCN = 1.96 c.c. $AgNO_3$

REMARKS ON TABLE NO. 3

Test No. 1. After addition of HCl, added excess NaOH and titrated without boiling.

Test No. 2. Added 5 c.c. saturated bromine water, then 5 c.c. 50% HCl, and added KI in small portions, boiling and adding more KI until further addition no longer caused liberation of iodine; then excess NaOH, cooled and titrated.

Test No. 3. Added 5 c.c. saturated bromine water, then 5 cc. 50% HCl, boiled for some time, then added a drop of KI, which gave no evolution of iodine, then excess NaOH, cooled and titrated.

Test No. 4. Added 5 cc. $\frac{N}{10}$ iodine, then KI till a precipitate of $HgCl_2$ began to appear. Boiled off excess of iodine, added excess NaOH, cooled and titrated.

EFFECT OF VARYING AMOUNT OF ALKALI

1 c.c KCN = 1.972 c.c $AgNO_3$

Test No	$HgCl_2$ 5% c.c.	NaOH 5% c.c	KCN .986% c.c	$AgNO_3$ E_1 c.c	 E_2 c.c.	Mercury Indicated gram
1	15	5	36	0.7	70.3	0.541
2	15	10	36	0.7	70.3	0.541
3	15	15	36	1.1	69.9	0.538
4	15	25	36	1.7	69.3	0.533

The amount of mercury indicated diminishes with increased additions of alkali, but the effect is only noticeable with excessive amounts.

EFFECT OF VARYING AMOUNT OF ACIDS

1 c.c. KCN = 1.962 c.c. $AgNO_3$

Test No.	$HgCl_2$ 5% c.c.	HCl 50% c.c.	HNO_3 50% c.c.	NaOH 5% c.c	KCN 981% c.c	$AgNO_3$ E_1 c.c.	 E_2 c.c.	Mercury Indicated gram
1	15	2		15	36	0.3	70.33	0.5408
2	15	5		30	36	0.45	70.18	0.5397
3	15	10		60	36	1.1	69.53	0.5347
4	15		2	20	36	0.8	69.83	0.5370
5	15		5	50	36	1.15	69.48	0.5343
6	15		10,	80	36	0.75	69.88	0.5374
7	15	5	5	80	36	2.25	68.38	0.5258
8	15	5	5	70	36	1.1	69.53	0.5347

REMARKS ON TABLE NO. 5

In Test No. 7 the alkali was added direct to the cold mixture; in No. 8 the solution was boiled for 30 sec. before adding alkali, then cooled before titrating.

EFFECT OF VARYING AMOUNT OF CYANIDE

1 c.c. KCN = 1.956 c.c. $AgNO_3$

Test No.	$HgCl_2$ 5% c.c.	HCl 50% c.c.	NaOH 5% c.c	KCN 978% c.c.	$AgNO_3$ E_1 c.c.	 E_2 c.c.	Mercury Found gram
1	10	5	40	25	0.85	48.05	0.3695
2	10	5	40	26	2.4	48.46	0.3727
3	10	5	40	27	4.2	48.61	0.3738
4	10	5	40	28	5.7	49.07	0.3773
5	10	5	40	29	7.6	49.12	0.3777
6	10	5	40	30	9.5	49.18	0.3782
7	10	5	40	40	28.95	49.29	0.3790
						Theor	0.3690

These results show a slightly increasing value of mercury indicated for increasing excess of cyanide added. For the most exact results it is therefore best to determine approximately the amount of cyanide required by a preliminary experiment, then repeat the test, using only a slight excess of cyanide.

In the estimation of copper by a method devised by me and based on a similar principle, a similar effect was obtained with increasing quantities of cyanide ("Cyanide Handbook," p. 412).

EFFECT OF BOILING

1 c.c KCN = 1.938 c.c $AgNO_3$

Test No.	$HgCl_2$ 5% c.c.	HCl 50% c.c	Time Boiling seconds	NaOH 5% c.c	$AgNO_3$ E_1 c.c	 E_2 c.c	Mercury Indicated gram
1	20	10	0	40	1.5	95.10	0.7336
2	20	10	30	40	1.5	95.10	0.7336
3	20	10	60	40	1.75	95.15	0.7317
4	20	10	120	40	1.65	95.25	0.7325

The results show that the volatilization of mercury salts by boiling under the conditions of the test is practically negligible. It is seldom necessary to boil more than 30 seconds.

In a future paper, I hope to be able to describe certain important practical applications of this method. Thanks are due to the Nipissing company for facilities accorded in carrying out the work.

Magnesia in Magnesites

Mayerhofer's method has been found inaccurate, but gives good results when carried out in the following manner, according to H. Udowis-Zewski (*Chem.-Ztg.*, p. 949, 1914). Five grams of magnesite are decomposed by heating with *aqua regia* on the water bath, the solution is evaporated to dryness, the residue heated for half an hour at 180° to 200° C., treated with hydrochloric acid on the water bath, filtered from silica, and made up to one liter. Forty cubic centimeters of the solution (or 20 c.c. with burnt magnesite) are treated with 5 c.c. of strong sulphuric acid and 100 c.c. of ammonium-citrate solution (100 grams of citric acid and 333 c.c. of ammonia, of sp.gr. 0.91 to 1 liter), cooled to 1° to 2° C., further treated with 20 c.c. of 10% sodium-phosphate solution and 15 c.c. of strong ammonia, the mixture shaken vigorously for 5 minutes, and allowed to stand for 2 hours in ice water; the precipitate is filtered off, washed with dilute ammonia (1 : 3), and dissolved in hydrochloric acid, the solution again precipitated with ammonia, allowed to stand for half an hour in ice water, the mixture shaken for 5 minutes, filtered and the precipitate washed with ammonia, dried, ignited and weighed as $Mg_2P_2O_7$.

⁂

Resistance of Platinum to Hot Nitric Acid

In a recent investigation of the atomic weight of selenium, Jannek and Meyer made the statement that 10 c.c. of halogen-free nitric acid, distilled through a platinum condenser, yields 0.00228 grams of non-volatile residue. This led Baxter and Grover to a new investigation of this problem (*Journ. Am. Chem. Soc.*, June, 1914), their conclusions being as follows:

That pure nitric acid is without effect on pure platinum. Any large residues may be attributed either to the use of vessels of impure platinum, to inefficient cleaning of the platinum vessels, or traces of hydrochloric acid in the nitric acid. New platinum vessels should always be cleaned before use, either by fusion with pyrosulphate or sublimation of ammonium chloride from the vessel or both.

⁂

Ink for Labeling Reagents

For writing on labels of reagents and other bottles exposed to laboratory fumes, the following ink is recommended by the *Chemical Trade Journal*: 20 grams shellac are dissolved in a hot borax solution (30 grams in 100 c.c. water) and filtered while hot. To the filtered liquid the following solution is added: Aniline black, 8 grams; tannin, 0.3 gram; picric acid, 0.1 gram; ammonia, 15 grams, water, 10 grams.

⁂

Selenious Acid in Sulphuric Acid

To detect minute traces of selenious acid in sulphuric acid, E. Schmidt recommends dissolving a few milligrams of codeine phosphate in 10 c.c. of the suspected sulphuric acid (*Arch Pharm.*, p. 161, 1914). With even so little as 1 : 1,000,000 of Se : H_2SO_4, a distinct green coloration appears, which changes to a deep blue green in about 15 minutes.

Photographs from the Field

Outcrops of Rock Asphalt in the Hills near Sunnyside, Utah

Butte under Military Rule

1. Troops upon arrival at the mines
2. Marching through Butte streets.
3. Guard lines with Gatling guns.
4. Silver Bow Court House, military headquarters.
5. Breaking up miners' union parade on Labor Day
6. Destroying liquors of an unruly saloonkeeper.

PORJUS LAKE ABOVE THE FALLS, MIDNIGHT SUN SHINING
Tracks in foreground lead to power-plant site.

PORJUS FALLS, ONE OF THE GREAT WATER POWERS OF SWEDEN
Power generating plant to the right. The total power is estimated at 320,000 hp., of which about 160,000 hp. is now developed. The power is utilized in the iron mines and railroad of the Luossavaara-Kirunavaara Co., in Lapland.

Development of Continuous Counter Current Decantation--II

By Herbert A. Megraw

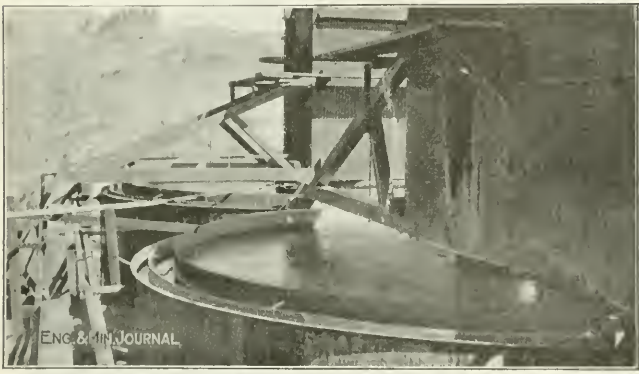
SYNOPSIS—The decantation system has been installed at the Tom Reed mill, supplanting a filter installation. It effects a saving over that method. Power and water costs are less. The Gold Road mill has had a similar experience, its new installation effecting a saving of $0.60 per ton over the operation of the filter plant. The system is applicable to copper hydrometallurgy, and is being studied by some copper companies.

*

Taking up now another example of utilization of the counter-current decantation principle, we have the Tom Reed mill, at Oatman, Ariz. This plant formerly used a 18-leaf vacuum-filter plant, but in view of the possible economies by the use of counter-current decantation, it changed the plant and put the filter out of commission.

Installation at Tom Reed Mill

The present installation consists of five 30x10-ft. Dorr thickeners and one 22x18-ft. tank. The operators say that the difficulties in the use of this plant are of minor importance, the principal one being that the regulation of the amount of solution drawn off for precipitation and the amount of water added at the final stage were rather difficult to gage. This trouble was finally overcome by installing a meter for the solution to be precipitated and a float-valve arrangement for the water and barren solution taken into the plant. This apparatus has already been described in the Journal. The principle is the maintaining of a constant, or practically constant, head whereby the flow of solution is easily approximated. The overflow from No. 1 thickener is collected in an old agitation tank before clarification. It is clarified by pumping through ten 5x10 ft. filter leaves. The leaves are washed by a hose once a week. For the sake of convenience in running to the tailings pond, one of the agitating tanks formerly used with the filter plant is allowed to fill, and the whole tank discharged at once.



Foam Rings on Thickener

12 in. above and 12 in. below surface of contents.

Thick Pulp and Solution

Mixed in air-lift box.

Air Lifts for Pulp Transfer

In this mill the pulp and overflows are transferred by means of air lifts, which have occasioned no trouble whatever. Nor is there any trouble in keeping the underflow of proper density between stages. The average gravity of discharged pulp for a period of three months has been 1.55, which, for the Tom Reed ore, represents 56.3% solids and 43.7% solution. The cyanide loss in the system is slightly higher than when using the filtration plant, but the net extraction is the same. For the last three months it has averaged 96.2%. The cyanide loss is, in figures, 5c. per ton of ore treated more than the corresponding loss when using the filtration plant. This difference is much more than offset by the difference in power cost of the two systems. The loss of water per ton of ore treated is slightly less than when using the filter plant, amounting to about five tons on a basis of 110 tons treated daily.

The accompanying table shows the assays from the plant giving the values of the overflow solution and of the underflow thickened pulp when working along normal lines. The underflow assays represent the total value discharged from the different thickeners, and the results are obtained by the pulp and its contained solution being evaporated to dryness without decantation or filtering.

ASSAYS OF PULP AND OVERFLOW

Thickener No.	Thickened Pulp Ounces Gold per Ton	Overflow Solution Ounces Gold per Ton
1	0.82	0.38
2	0.22	0.22
3	0.04	0.02
4	0.03	0.01
1	0.96	0.16
2	0.28	0.14
3	0.08	0.06
4	0.05	0.02
5	0.03	0.01
1	1.68	0.38
2	0.40	0.32
3	0.14	0.12
4	0.10	0.06
5	0.07	0.03

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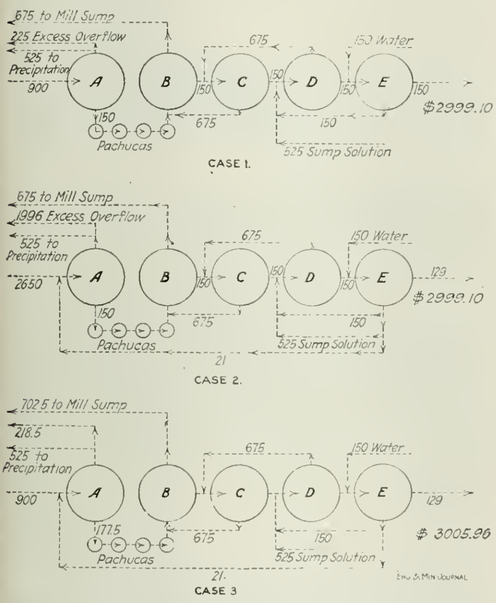
*This is the sixteenth of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvements. Preceding articles of the series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, 1913; Jan. 31, Mar. 7, Mar. 21, Apr. 25, May 23, June 20, July 25, Aug. 29, Sept. 12 and Oct. 17, 1914. The next article will deal with "Combined Cyanide and Other Processes" and will appear in the issue of Dec. 5, 1914.

In order to relieve the No. 1 thickener from handling so much solution, and also to save one air lift, the overflow from No. 2 thickener is piped directly to the mill sump, where it is mixed with the excess overflow from thickener No. 1 and thence it is pumped to the battery tank. The same result is accomplished as if the flow from No. 2 were carried directly to No. 1 and the flushing of No. 1 thickener with excess solution is avoided.

METHODS OF CONTINUOUS FLOW

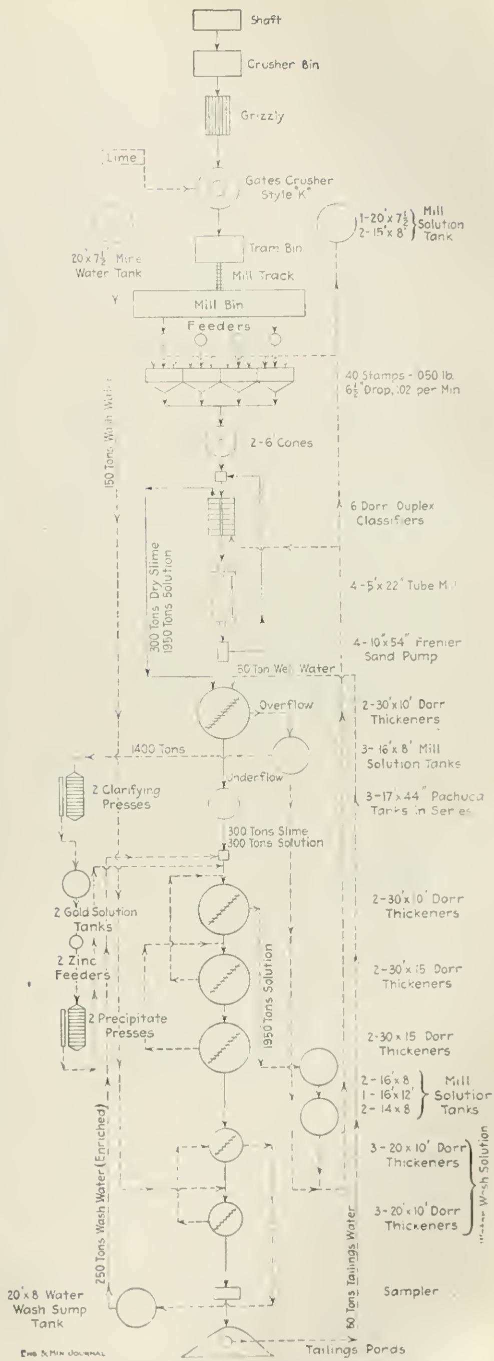
The accompanying diagrams show the three methods by which this plant is, or may be, handled. In the first case, it will be noted that 150 tons of water are added to the final thickener and 150 tons of overflow taken off directly, another 150 tons going with the tailings. In the second case, while 150 tons of water are added to the final thickener, only 129 go with the tailings, the rest going back to thickener No. 1. In the third case, the same thing takes place, but there is a difference in the inflow and outflow from thickener No. 1. These differences are made plain in the three sketches. The accompanying equations show the value of overflow solutions, of ore and of barren solutions in the various cases specified. These flow-sheets and equations have been worked out at the Tom Reed mill, and are those applied in practice to the work.



THREE ARRANGEMENTS OF SOLUTION FLOW

THICKENER EQUATIONS

V = Value of ore;
S = Value of barren solution: in checks, the value of ore is assumed to be $20 per ton.
A = Value of overflow from thickener No. 1;*
B = Value of overflow from thickener No. 2.
C = Value of overflow from thickener No. 3;
D = Value of overflow from thickener No. 4.
F = Value of overflow from thickener No. 5.


Shaft
Crusher Bin
Grizzly
Lime
Gates Crusher Style "K"
1-20'x 7½' 2-15'x 8' Mill Solution Tank
20'x 7½' Mine Water Tank
Tram Bin
Mill Track
Mill Bin
Feeders
40 Stamps - 1050 lb. 6½" Drop, 102 per Min
150 Tons Wash Water
2-6' Cones
6 Dorr Duplex Classifiers
300 Tons Dry Slime
1950 Tons Solution
4-5'x 22" Tube Mills
4-10"x 54" Frenier Sand Pump
50 Ton Wet Water
Overflow
2-30'x 10' Dorr Thickeners
1400 Tons
3-16'x 8' Mill Solution Tanks
Underflow
2 Clarifying Presses
3-17'x 44" Pachuca Tanks in Series
300 Tons Slime
300 Tons Solution
2 Gold Solution Tanks
2-30'x 10' Dorr Thickeners
2 Zinc Feeders
1950 Tons Solution
2-30'x 15' Dorr Thickeners
2 Precipitate Presses
2-30 x 15 Dorr Thickeners
2-16'x 8 1-16'x 12' 2-14 x 8 Mill Solution Tanks
250 Tons Wash Water (Enriched)
3-20 x 10' Dorr Thickeners
3-20'x 10' Dorr Thickeners
Wash Solution
80 Tons Tailings Water
Sampler
20'x 8 Water Wash Sump Tank
Tailings Ponds
Eng. & Min. Journal

FLOW SHEET OF GOLD ROAD MILL

CASE 1

$$E = \frac{D}{2}$$

$$D = \frac{75\,D + 525\,S + 150\,C}{825} = \frac{525\,S + 150\,C}{750} = 0.7\,S + 0.2\,C$$

$$C = \frac{675\,D + 150\,B}{825} = \frac{472.5\,S + 135\,C + 150\,B}{825} = \frac{472.5\,S + 150\,B}{690}$$
$$= 0.6848\,S + 0.2174\,B$$

$$B = \frac{675\,C + 150\,A + 0.5\,V}{825} = \frac{462.24\,S + 146.745\,B + 150\,A + 0.5\,V}{825}$$
$$= \frac{462.24\,S + 150\,A + 0.5\,V}{678.25} = 0.6815\,S + 0.2211\,A + 0.0007372\,V$$

$$A = \frac{675\,B + 225\,A + 0.5\,V}{900} = \frac{460.0125\,S + 374.2425\,A + 0.99761\,V}{900}$$
$$= \frac{460.0125\,S + 0.99761\,V}{525.7575} = 0.8749\,S + 0.001897\,V$$

$A = 5.866 = 0.8749\,S + 0.001897\,V$
$B = 3.645 = 0.8749\,S + 0.0011566\,V$
$C = 0.929 = 0.8750\,S + 0.00025\,V$
$D = 0.326 = 0.8750\,S + 0.00005\,V$
$E = 0.163 = 0.4375\,S + 0.000025\,V$

CASE 2

$$E = \frac{D}{2}$$

$$D = \frac{75\,D + 525\,S + 150\,C}{825} = \frac{525\,S + 150\,C}{750} = 0.7\,S + 0.2\,C$$

$$C = \frac{675\,D + 150\,B}{825} = \frac{472.5\,S + 135\,C + 150\,B}{825} = \frac{472.5\,S + 150\,B}{690}$$
$$= 0.6848\,S + 0.2174\,B$$

$$B = \frac{675\,C + 150\,A + 0.5\,V}{825} = \frac{462.24\,S + 146.745\,B + 150\,A + 0.5\,V}{825}$$
$$= \frac{462.24\,S + 150\,A + 0.5\,V}{678.255} = 0.6815\,S + 0.2211\,A + 0.0007372\,V$$

$$A = \frac{675\,B + 1996\,A + 0.5\,V + 21\,E}{2671},$$

$$21\,E = 9.0992\,S + 0.10094\,A + 0.0003366\,V$$

$$A = \frac{675\,B + 0.5\,V + 9.0992\,S + 0.0003366\,V}{695.89906} = \frac{469.1117\,S + 0.9979466\,V}{525.65656}$$
$$= 0.8924\,S + 0.001898\,V$$

$A = 5.870 = 0.8924\,S + 0.001898\,V$
$B = 3.646 = 0.7791\,S + 0.0011568\,V$
$C = 0.930 = 0.8542\,S + 0.00025119\,V$
$D = 0.298 = 0.8708\,S + 0.00005029\,V$
$E = 0.149 = 0.4354\,S + 0.000002514\,V$

CASE 3

$$E = \frac{D}{2}$$

$$D = \frac{525\,S + 150\,C + 75\,D}{825} = \frac{525\,S + 150\,C}{750} = 0.7\,S + 0.2\,C$$

$$C = \frac{675\,D + 150\,B}{825} = \frac{472.5\,S + 135\,C + 150\,B}{825} = 0.6848\,S + 0.2188\,B$$

$$B = \frac{675\,C + 177.5\,A + 0.5\,V}{852.5} = \frac{462.24\,S + 117.69\,B + 177.5\,A + 0.5\,V}{852.5}$$
$$= \frac{462.24\,S + 177.5\,A + 0.5\,V}{704.81} = 0.6558\,S + 0.2518\,A + 0.000709\,V$$

$$A = \frac{702.5\,B + 218.5\,A + 5\,V + 21\,E}{921},$$

$$21\,E = 9.0894\,S + 0.1157\,A + 0.0003258\,V$$

$$A = \frac{469.7889\,S + 0.9983983\,V}{525.4948} = 0.89399\,S + 0.0018999\,V$$

$A = 5.8785 = 0.89399\,S + 0.0018999\,V$
$B = 3.7383 = 0.8809\,S + 0.0011874\,V$
$C = 0.9549 = 0.7754\,S + 0.0002598\,V$
$D = 0.331 = 0.87551\,S + 0.00005196\,V$
$E = 0.165 = 0.43775\,S + 0.00002598\,V$

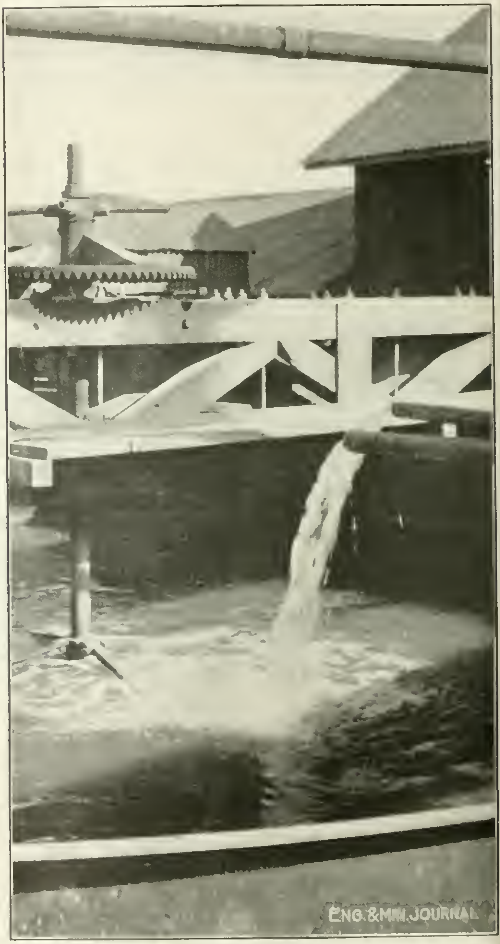
Value of overflow solution from No. 1 thickener is independent of the amount delivered to it from the stamp mill, since the excess is returned to the battery tank.

The accompanying drawing shows a chart derived from the thickener equations, assuming different amounts of solutions drawn from No. 1 thickener for precipitation. The chart is applicable only for a 5-tank series, of course applying to the Tom Reed work. Assuming that the total value of the ore for any period was \$3000, and the solution drawn off during the same time was 500 tons, then the value of such solution would be 0.00199 × 3000 = \$5.97 per ton. For the discharged solution, 0.0000285 × 3000 = \$0.0855. The total extraction is, therefore, \$2991.27, or 99.6%. Assuming the same conditions as to value, but with 750 tons drawn off 0.00133 × 3000 = \$3.99. For discharged solution, 0.0000115 × 3000 = \$0.0302. Total extraction, \$2995.52, or 99.85%. This chart has also been developed by the management of the Tom Reed mines, and is in use by them.

The operators have been much pleased with the results of the change from filtration to counter-current decantation, the process being continuous, requiring less labor and effecting economies as has already been indicated.

THE GOLD ROAD MILL

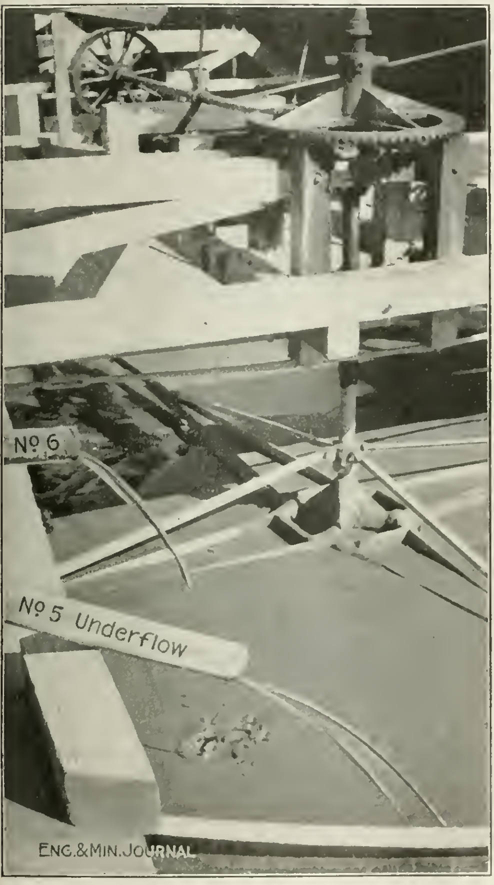
Another plant in the same district, which has made use of counter-current decantation, is the mill of the Gold Road Mines Co., at Kingman, Ariz. Here also a large vacuum leaf filter had been installed, but experiments with counter-current decantation showed that some advantage could be gained by discarding it.



OVERFLOW FROM NO. 1 THICKENER

Six hundred tons daily for 150 tons of pulp. Clarified by ten 3x10-ft. filter leaves.

The operators state that the principal disadvantage they found with the vacuum-filtration system upon their ores was that it was almost impossible to wash satisfactorily the cakes on the leaves. Cakes of uniform resistance could not be formed. They would crack badly and large sections would fall from them, making satisfactory washing impossible. Besides, the expense of labor, repairs and power is considerably more than is necessary in following the counter-current decantation system. They find practically no difference between the two systems in the amount of cyanide and lime consumed, perhaps a slightly greater quantity, amounting to about 0.1 lb. of cyanide, is being consumed in the decantation system.



Discharge from Thickeners 5 and 6, Tom Reed Mill

Note thickness of pulp under No. 6.

An advantage found with counter-current decantation is that the dissolution of gold is so perfect, due to the longer contact between the solutions and the pulp. The difference, considering all things, between leaf filtration and counter-current decantation is at least 60c. per ton of ore treated in favor of the latter.

On account of having to precipitate at least 1100 tons of solution daily (it will be remembered that this plant treats 300 tons of ore per day of 24 hr.) in order to wash thoroughly the pulp in the decantation system, it is necessary to use 280 to 300 lb. of zinc dust per day. Consequently, there is rather a large amount of comparatively low-grade precipitate, which is difficult and expensive to melt and refine. It seems, however, that it would not be impossible to change the system so that a smaller quantity of higher-grade solution might be precipitated, and consequently a higher-grade precipitate made.

Essentials for Successful Results

Among the essentials for successful operation of the counter-current decantation system, many operators have believed that the thorough and comparatively prompt settlement of the slime pulp is one, and another that the greatest dissolution of values be obtained before the pulp leaves the agitators and enters into the decantation tanks. The latter is particularly true in the case of the Gold Road mill, because of the character of the ore, which is such that the gold dissolution seems to be almost directly dependent upon the length of time the ore is in contact with cyanide solution. It is probable that additional time, even after the present process was finished, would develop more gold dissolution. This, however, would probably not be economical, since it might cost more to keep the pulp in agitation than the value of the gold derived through the additional time given. It is also essential that a thorough mixture of the pulp with wash solutions as they are passed from one decantation tank to another, be given. The main points in the decantation process are to get the pulp as thick as possible before discharging it from the decantation tank; to have as little dissolution of value take place in these tanks as possible and get as perfect a mixture of pulp with wash solution as can be obtained. Sufficient wash solution must also be added. At the Gold Road mill, it is found that best results are obtained by precipitating 1100 tons of solution per day, and this solution is used for washing in the decantation tanks.

Pulp Thickening not Dependent on Settling Area

It might be mentioned here that many people have the idea that pulp thickening is dependent solely upon the settling area available per unit of pulp, or of dry slimes. This is true to a large extent, and is a principal factor with ores which do not settle readily. On the other hand, there are instances of slimes which have settling tendencies which do not depend principally upon the area of the settling tanks. There are all kinds of ore, from the purely granular, heavy variety, which settles almost immediately, to the almost purely colloid china-clay slimes, which will not settle at all. The dependence is divided among chemical conditions, such as alkalinity or acidity of solution, the dilution of the pulp and, perhaps, its electrostatic condition. For these reasons, it is well to be careful in outlining a plant to decant an ore whose slimes settle with difficulty. If settling will not take place within a reasonable tank area, it may be true that even a greatly excessive tank area will not accomplish the work. Also, with heavy, quickly settling slimes, extra heavy thickening apparatus is needed in the tank to take care properly of conditions which may arise.

At the Gold Road mill, there are 1.7 sq.ft. of settling area per ton of ore milled per day, and the pulp is discharged from one decantation tank to another at a little better than one of solids to one of solution. And by using an auxiliary tank, the final pulp is discharged [illegible] tailings dump at one ton of solids to two-thirds of a ton of solution. In all, the pulp is washed five times by decantation after it leaves the Pachuca agitation tanks, three times with low-grade cyanide solution, containing 2 to 4c. gold per ton, and twice with barren mine water.

Mechanical Equipment

There are three 17x44-ft. Pachuca tanks operated continuously in series, and by keeping these tanks in good order and not allowing them to build up from the bottom and sides with pulp, a satisfactory agitation is obtained. The pulp enters and leaves the tank, at a dilution of one to one.

Mixing launders are used to get the pulp and wash solution mixed. The upper end of the launder contains a well or pocket extending 8 to 10 in. below the bottom of it. Into this pocket, the pulp of the preceding tank is discharged by means of an air lift. The clear solution from the following tank flows across the pocket and floats the pulp out of it. The mixture is further assisted by baffles nailed to the bottom of the launders. The launders are from 10 to 15 ft. long, and discharge into a settling well in the center of the tank. These wells are 5 ft. in diameter, 3½ to 4 ft. long and extend 2 ft. below the surface of the solution in the tank. It is believed, after trying different ways of mixing, that this arrangement gives a fairly satisfactory result. The accompanying flow sheet shows the arrangement of the Gold Road mill and will clear up any questions which may occur in regard to the treatment there.

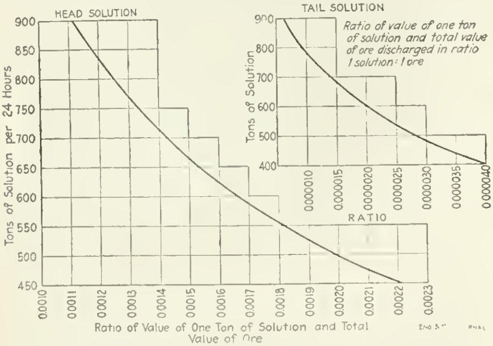


Chart for Five-Tank Series Derived from Thickener Equations

When considering the last two installations, it is well to remember that both of them made use of vacuum-filtration systems which had already been installed at considerable cost. Undoubtedly, to displace them, a new process had to prove clearly and distinctly that it would effect a material saving over the use of these plants, and this demonstration had to be so clear and positive that there should be no chance for error. That the plants have been in operation as long as they have is quite sufficient to show that they have justified all expectations and that they are working in an entirely satisfactory manner.

Continuous Decantation in Copper Treatment

That the silver-gold treatment field is not the only one in which counter-current decantation can be used to advantage is indicated by the experiments which have been and are being carried out on copper ores. The modern methods of pulp handling have added impetus to copper hydrometallurgy, and highly successful methods are being evolved. Many of the principal copper companies are experimenting with the system, and it seems probable that in the near future there will be opportunity to study such a plant in practical operation.

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New Mine and Metallurgical Construction

Delarof Development Co., Unga Island, Alaska, broke ground June 15 for 200-ton cyanide plant, to cost $25,000, and to be completed Nov. 1. The plant is being built to treat 400,000 tons of tailings of the Apollo company, now on the tide flats of Unga Bay.

Argonaut Mining Co., Jackson, Calif., expects to remove 40-stamp mill to a new site and increase to 50 stamps.

Engels Copper Mining Co., Taylorsville, Calif., broke ground June 1 for 250-ton Minerals Separation flotation mill, capable of being extended to 400 tons by small additions to the flotation apparatus. The plant was to cost $10,000, and was to be completed Nov. 1, 1914.

Melones Mining Co., Melones, Calif., broke ground Aug. 1, for 250-ton cyanide sand-leaching plant, to cost $10,000 to $12,000, and to be completed Oct. 1.

Royal Consolidated Gold Mines, Copperopolis, Calif., contemplates overhauling old 120-stamp mill and installing new machinery.

Sierra-Alaska Mining Co., Pike, Calif., is building experimental cyanide plant of 10-ton capacity, to be enlarged if process is successful.

Tulare Mining Co., Porterville, Calif., contemplates installing machinery to manufacture epsom salts from magnesite waste.

Cariman Mining & Milling Co., Caribou, Colo., broke ground in July for 150-ton concentrating and cyanide plant, to cost $6000 and to be completed Nov. 1, 1914.

Hector Mines Development Co., Westcliffe, Colo., broke ground Aug. 10 for 50-ton cyanide plant, to cost $40,000 and to be completed Nov. 10.

Wanakah Mining Co., Ouray, Colo., broke ground May 1 for 200-ton copper-matting furnace, additional to 100-ton plant already in operation, to cost $50,000 and to be completed Oct. 20.

Cumberland Mining & Milling Co., Joplin, Mo., broke ground, July 15, for 350-ton concentrating plant, to cost $25,000, and to be completed Oct. 5.

Porphyry Dike Gold Mining Co., Rimini, Mont., broke ground June 25 for 100-ton stamp mill with amalgamating plates, to cost $10,000 and to be completed Sept. 15.

Eastern Star Mining Co., Midas, Nev., expects to break ground Nov. 1 for 50-ton all-slime cyaniding plant.

Nevada Douglas Copper Co., Ludwig, Nev., broke ground Aug. 1, 1914, for 250-ton copper leaching plant, to cost $125,000 and to be completed in January, 1915.

Pittsburgh-Dolores Mining Co., Rockland, Nev., broke ground May 1 for 60- to 100-ton continuous-decantation cyanide plant, to cost $30,000.

Rochester Consolidated Mining & Milling Co., Rochester, Nev., broke ground Aug. 1 for 100-ton all-slime cyanide plant, using the Dorr system, to cost about $100,000 and to be completed Feb. 1, 1915.

Union Mines Co., Union, via Palisades, Nev., broke ground June 24 for 50- to 100-ton concentrating plant, to cost $125,000, and to be completed June 1, 1915.

Tough-Oakes Gold Mines, Ltd., Kirkland Lake, Ont., is building 100- to 125-ton cyanide plant.

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Bolivia Wants Its Tin Smelted Here

On account of the European war, Bolivia is unable to market its principal metal product, tin, of which the United States is the world's largest consumer. Roughly speaking, Bolivia produces about 25% and the United States consumes about 45% of the world's tin output, or about double the Bolivian production. The annual production in Bolivia is nearly 40,000 tons of *barilla*—containing about 60% Sn. Most of this product is shipped to Liverpool and normally about one-half of the *barilla* finds its way to Germany for smelting.

With the disruption of international credit, Bolivia finds itself hampered in its ability to purchase the articles of manufacture it needs, notwithstanding that it has an ample supply of tin to counterbalance those requirements. Recently, the Bolivian government began informal inquiries as to whether Bolivian tin concentrates could not be smelted in the United States, thus establishing a basis of credit with which the Bolivian people could purchase from the United States such manufactures as they needed. President Montes suggested to Adolfo Ballivian, consul-general at New York, that he take up this question with Richard M. Atwater, an American mining engineer who had been in Bolivia, but now consulting engineer for the firm of Ladenburg, Thalmann & Co., of New York.

The principal reason why the United States has not a tin-smelting industry is that it has no supply of tin ore, and Mr. Atwater judged that the only way in which an adequate ore supply could be assured was to have the Bolivian government undertake the smelting of the ore in this country, presumably near New York or some other convenient port where conditions of fuel, labor and market are more favorable than in Bolivia. He proceeded to sound the United States Government, as to its attitude toward the construction and operation of such a smelting works in this country by the Bolivian Government, for which his firm, Ladenburg, Thalmann & Co., consented to act as agents. The suggestion was favorably considered by the Department of Commerce, which has asked U. S. Minister O'Rear at La Paz to express an opinion as to the attitude of the Bolivian Government and to discover whether the latter would be likely to consider favorably an invitation from the United States to erect a tin-smelting works in this country.

For the moment there is no further progress, as the matter of adequate ore supply has not been solved. Most of the Bolivian ore is under contract with European smelters and much British and German capital is invested in the Bolivian mines. At present, it may be presumed that ore from other properties owned by South Americans such as the Llallagua and the important mines of Sr. Patiño is free to be shipped to the United States; eventually this ore would again be sought by European smelters, and the ore of the European-controlled mines would almost surely find its way to the former smelters, unless special inducements could be made by smelting works established in the United States. Competition would eventually decide the place of smelting but with a ready market in this country for the metal, which must now be sent to Europe and then freighted back to New York, it seems likely that a smelting plant in this country could easily survive if it could once get started with a fair ore supply as a nucleus.

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New California Mining Association

By Lewis J. Eddy*

A California metal-producer's association is being organized by the mine operators of the state with the purpose of subserving, promoting and protecting the interests of men and companies engaged in the production of metals, and of securing betterments in all branches of the industry. The association contemplates the promotion of health, safety and welfare of miners and other employees, and of harmonious relations between employer and employee. There is no intention of taking up labor disputes, and the association is not formed in opposition to unions or other workmen's organizations.

This is the first time, in the history of metal mining in California, that there has been a direct and positive effort of producers to get together, except by the semi-popular method of organization and convention. The California State Miners' Association has been prominent and its accomplishments have been worth while, but popularity, if not politics, has had a great deal to do with the control of the association. Its conventions are a forum for free speech. Whatever its objects may have been, it has never put forth a positive effort for the direct betterment of working conditions in the mines. In fact, there was usually little done outside of convention times. This was not the fault of the members individually, but the result of the system of organization.

The present proposed organization has on its tentative list of members, invited to meet Oct. 28, the names of managers and owners of more than a hundred of the most important metal mines in the state. All persons, copartnerships and corporations of approved standing, engaged in the production of metal, may be admitted to membership. There will be a membership fee of $25 for those employing 25 men or more, and $10 for those employing less than 25 men. Monthly dues will be paid on the basis of the number of men employed. There is no apparent reason why the membership roll should not contain the name of every producing metal mine and metallurgical works in the state.

The need for getting together was never greater. There are numerous ways of protecting and promoting the interests of producers and of securing betterments in various branches, when the undertaking carries the strength of concerted effort. With such an organization as this proposed, the needs of the individual producer will be the common interest of all the members, and by keeping the association free of politics and labor troubles, the advancement of individual and collective interests will be assured. The initiative has been taken by a number of the largest and strongest producers in the state, and the subject of organization has been under consideration by many others, who have expressed approval of the general plan outlined.

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*Associate editor "Eng. and Min. Journ.," San Francisco, Calif.

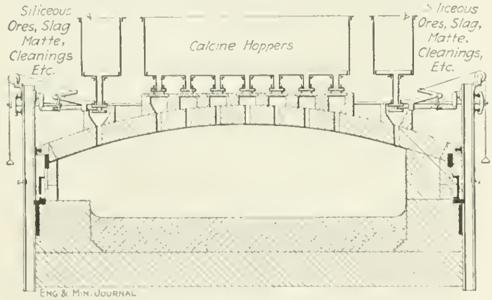
Correspondence and Discussion

Fettling Reverberatories

I notice in the Journal of Mar. 14 an editorial on the subject of fettling reverberatory furnaces, the last sentence of which says: "With the improved methods of fettling through the roof, more cold material can be placed on the furnace sides with much less cooling of the interior than was possible when fettling was thrown through the open doors with shovels."

Believing that I was the first one to conceive and work out the present method of fettling reverberatory furnaces, I wish to call attention to the fact that this method is patented and I hope that any company using it will be honorable enough, after trying it out, to communicate with me and arrange for the privilege of using it.

While some have benefited by the use of the method of fettling suggested in my patent, I feel sure that no one has gained the full benefit to be had in running a large reverberatory furnace in the way I have suggested in U. S. Pat. 871,177, granted to me Nov. 29, 1907. In describing my continuous method of feeding reverberatory furnaces, I said:



Siliceous Ores, Slag Matte, Cleanings Etc.
Calcine Hoppers
Siliceous Ores, Slag, Matte, Cleanings, Etc.
Eng & Min. Journal

Charles' Method of Feeding and Fettling

> My invention consists in a practically continuous feeding of ores to the furnace, through dropping very small charges at frequent intervals, or continuously, at various places over the hearth without interrupting the smelting or reducing the temperature.
>
> I propose to feed siliceous material or ores through a series of small holes in the roof located near the edge of the hearth, so that such material will pile against the furnace walls and protect them from corrosive action. The raw or calcined ores I propose to feed through a series of small holes located over the remaining portion of the hearth.

I discovered that by feeding the raw siliceous ores close to the side walls of the furnace and by reducing the size of the charges and feeding them in oftener and in various places over the hearth with the furnace kept at full heat all the time, the tonnage was compounded several times and a saving of labor in feeding, leveling charges and fettling was accomplished. A saving of heat was also effected as large charges bring the furnace below the smelting temperature whereas under my system a practically continuous operation results.

The feature of continuous charging as well as the fettling of the reverberatory through the roof were covered both singly and in combination in my invention. The editorial in the Journal of Mar. 14 refers to the change in material used for fettling, but it will be noticed from the drawings submitted with my application for patent that I had anticipated the use of slag, matte, cleanings, etc., as I recognized that it was only necessary to feed sufficient cold material on the side to prevent corrosion of the furnace wall. Three of the subjoined claims of my patent will suffice to indicate how fully the present practice was covered by my invention:

> (1) The within described method of feeding ores into reverberatory furnaces consisting in dropping the same over the hearth in small charges at frequent intervals.
>
> (4) The within described method of feeding ores into reverberatory furnaces consisting in feeding raw siliceous ores between the calcined ores and the edges of the hearth.
>
> (7) The within described method of feeding reverberatory furnaces consisting in feeding silica or siliceous material for fettling continuously from a hopper or trough extending around the edge of the hearth and in feeding the ore in small charges over the hearth of the furnace by any convenient means.

I desire to set at rest for all time who was the originator of this method of fettling reverberatory furnaces through the roof. One of the illustrations from my letters patent, inclosed herewith, will show plainly that there is no essential difference between the present fettling practice and the method I developed.

H. L. Charles.

La Fundicion, Peru, Aug. 18, 1914.

Cutting Up a Boiler with Dynamite

In connection with A. O. Christensen's article in the Journal of Oct. 10, I thought the following taken from § 127, Part V, *Professional Paper* 29, Corps of Engineers, U. S. Army, would be of interest:

"All charges will be external. The standard formula is $C = 2.5\ Bt^2$, in which C = the charge in pounds, B the width of the section in feet, and t its thickness in inches. The charge must extend entirely across the plate or sheet. The accompanying table gives the charges necessary to cut through a plate 1 ft. wide of the thickness given. It is computed from the above formula for 50% dynamite:

CHARGES FOR CUTTING STEEL PLATES

Thickness of Plate, In.	Charge of 50% Dynamite, Lb.	Thickness of Plate, In.	Charge of 50% Dynamite, Lb.
¼	0.16	1¼	3.90
½	0.62	1½	5.62
¾	1.40	2	10.00
1	2.50	3	23.50

"A single 'chain' (1 lb. per running foot) will cut a plate up to ⅝ in. thick. Two, three and four 'chains' will cut plates ⅞, 1⅛ and 1¼ in. thick, respectively. The charge must be held snugly against the plate . . . . and whenever possible must be tamped. For structural shapes figure the width as the sum of web and flange widths, and the thickness as the area of cross-section in square inches."

F. Harold Brown.

Elizabeth, N. J., Oct. 17, 1914.

Editorials

Some War Reflections

In the gradual recovery from the hysterics immediately following the great calamity, we are beginning to see some things with a truer perspective, although there is no one keen enough and wise enough to see all things clearly.

The greatest problem has been, and still is, the restoration of international exchange. The world could not suddenly settle all of its debts with gold without becoming bankrupt. The blockade of financial transactions has been relieved, but is still far from being solved.

The ocean carrying capacity appears to be ample. Indeed some big ships have been laid up because there is no use for them. Let it be remarked that there has been relatively little destruction of ships. The German flag has been swept from the seas, but the captured ships will remain available for use as soon as their ownership be adjusted.

The great cost and waste of the war are things to be recognized, but they are probably exaggerated. The destruction of material is largely what was intended for just this purpose, which has been paid for, and which may not have to be replaced. Moreover, the main parts of the armies in the field had to be supported in the previous time of peace and were withdrawn from industry anyway. If the result of the war should be disarmament and the saving to the world of a large part of the $2,000,000,000 which Europe has spent annually on her military establishments and the release of millions of men from unproductive occupations, there will be some gain. It was these enormous military expenditures previous to the war that were crushing Europe's financial and industrial structure and were consequentially affecting the American.

Immediately after the war started there was a building of great hopes upon what an expansion of export trade would do for the United States. When no material expansion occurred a pall of pessimism spread over everybody. It was forgotten that the machinery of a new trade could not be developed over night. But now after three months we are witnessing the beginning of a real expansion, which is shown both by the statistics and by the easing of sterling exchange.

An increased export trade, however, is not alone going to restore prosperity in the United States. People and corporations have merely been living, buying only from hand to mouth and refraining from building for the future. Supplies of foreign capital have been cut off, present domestic capital is insufficient for all of our needs, and what there is of it is being husbanded for emergencies. This is why business in this country has been dull.

There is a curative process in operation, however, which has not been sufficiently estimated. This is the new spirit of economy that has developed in this country. Our national and personal extravagance has been for years the subject of unavailing exhortation. It needed the shock of Aug. 1 and the pinch of curtailed incomes to change our way of thinking. There is now a new and nation-wide idea of saving and thrift, where previously there was no thought of it. The saving of about 15c. per day is $50 per year: and $50 per year saved by 20,000,000 families is $1,000,000,000, a result by no means impossible, not even if incomes are lower than they were. With such an addition to our resources we should be able to do our own building without drawing money from anywhere else. Something of this kind is going to happen, and to America it may be the most important result of the economic earthquake.

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Nero Fiddles while Rome Burns

For many months before the war, American business experienced the agony of waiting for the Interstate Commerce Commission to render a decision in the railway-rate case. Finally the mountain labored and produced a mouse. The Eastern railways were granted a partial increase of freight rates and were advised to take the rest of what they wanted out of the public by an increase of passenger rates. Mr. Average Man has no Brandeis to look out for him, and consequently he has lately been paying 2¼c. for his mileage instead of two cents.

However, the war conditions have produced new problems for the railways, and they have gone again to the Interstate Commerce Commission, asking permission to make a further increase in freight rates. The executive department of the Government and Congress itself have lately been acting promptly and sensibly in emergency measures, and there was hope that the members of the Interstate Commerce Commission had also read the signs of the times. The characteristic postponement of this hearing caused some qualms; but when the hearing itself finally came off, the attitude of the commission produced a very distinct chill. Must we then run the gamut of another period of uncertainty, indecision, and final refusal, with Mr. Brandeis, like the Pied Piper of Hamelin, leading the way to destruction.

In these extra-legislative bodies—the Interstate Commerce Commission, and the new Trade Commission, and the Federal Reserve Board the country is obtaining experience in the new system of government by commission. Congress, unwieldy in numbers, and overloaded with work, delegates certain of its powers to a commission, which is supposed to be composed of experts. The Interstate Commerce Commission, however, has come to regard itself as a judicial body, which must split hairs in determining the merits of every case. Questions of policy do not enter into its calculations at all.

The railway case is probably not so abstruse as the commission thinks, if it would only forget Mr. Brandeis, and consult business administrators. The president of a Western railroad, not concerned in these cases, himself a distinguished philosopher, expresses the opinion that passenger rates ought not to be raised; that class rates or freight ought not to be raised; but that commodity rates ought to be raised very materially, being far too low.

However, decision in the present case is demanded promptly by the dictates of policy. If the Interstate Commerce Commission cannot act upon such grounds, let Congress recall its delegation of authority, and act itself.

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Australia under Labor-Union Rule

The labor unions of Australia have got about everything they want. Having captured the governments of the several states some years ago, they are in official control of things and can dictate much as to what employers may and may not do. The hours of labor are fixed and the rates of wages. Also, the quantity of work that any man may do. The hours for quitting at noon-time and at the end of day and the recess for tea in the afternoon are named and there may be no deviation from them. It matters not if the stevedores loading a ship have only one more bar of copper to put aboard when the gong strikes at the end of the day; the ship waits for the next day. And so on.

Yet there seem to be some discordant notes in the situation, some things that are not wholly to the satisfaction of the unions. A paragraph in a recent letter from a correspondent in Sydney, reveals something of this. He writes:

> Broken Hill is operating on part time, I believe, and the unions seem to be having everything their own way. They have a nice (?) class of men there. As the troops were leaving the town they were hooted and jeered by the miners who failed to respond to the call for volunteers.
>
> Some of the causes and effects of strikes here are so ridiculous that I wish I dared to write an article about them. Some day I will, but at present I dare not even refute the statement made in our leading morning paper of yesterday, that there were men in Chicago earning but 10@15c. per day, and that farm laborers were being offered $1.20 per week.

We opine that the leading morning paper of Sydney, N. S. W., has not heard about the $9-per-day plumbers of Butte, Mont.

Our Sydney correspondent remarks further, "There is one thing, however, that I can say for Australia. Certainly it is a great country." It is, no doubt, that very thing and the long period of prosperity that has lately been enjoyed has permitted some things to come about.

If Australia has been afflicted in recent years by a series of its old-time droughts, things might have been different. Not even labor unions can butt successfully against the laws of nature. The shadow of the great war has been teaching some lessons in Australia, as elsewhere. In an official report of the Wallaroo & Moonta Mining & Smelting Co., dated Adelaide, Sept. 15, 1914, it is said that "Notice having been given by the purchasers of our copper of suspension of the contract, it became imperative to conserve the funds available to the company, in order to provide for pumping operations and other work necessary to keep the mines in such a condition as to be able to resume work with as little delay as possible when the situation warranted such a course." Consequently, the mines and smelting works were closed about the middle of August. However, this did not suit the State government which wanted to keep the men employed. After some communication between the government and the company, an arrangement was made whereby the government undertook to advance to the company 80% of the then value of copper on all metals shipped or produced. At the same time, the employees of the company agreed to a 10% retention of their salaries and wages as a fund to assist in meeting any loss that might be sustained under these resumed operations. Operations were resumed on Aug. 28.

The company soon found, however, that the state-aid arrangement was not going to be a panacea, and that the only way out of the difficulty was a reduction of wages by 20%, which reduction was made Oct. 1.

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Copper Near Its Nadir

When the war burst upon us, copper stood at about 12½c. For two months, producers made no efforts to sell, but let consumers have what they wanted, and the price held fairly firm. During the last month, however, the market has been gradually losing its one-sided character, and some producers have more openly exhibited their desire to sell copper. The result has been a crumbling of prices, until at last the market was down to about 11c. Even at that there was no noteworthy increase of interest among the wire-drawers, brass-makers, etc., who continued to buy only from hand to mouth, refusing to enter into forward contracts.

When copper was available at about 11½c., there were intimations that the manufacturers would show some courage at about 11c., but when copper was actually available at 11c., the manufacturers revised their ideas and thought about 10½c. The question was asked, What did they want? They wanted to buy at the very lowest price. The man who buys at 11½c. and two weeks later sees that if he had waited he could have got his copper at 11c., feels chagrined. During the last week, producers offered more resistance and consumers tended to revise their ideas.

In fact, copper is already far below the cost of production. The average cost for labor, material, power and transportation in the production of the copper of America is about 10c. per lb. The capital invested in plant is about 15c. per lb. of annual production. Add, therefore, 2c. per lb. for the interest on capital invested in plant and the depreciation of that plant, which is constantly wearing out. The cost on account of the capital invested in the mines themselves is additional. The average mining company selling copper for less than 12c. per lb. is not only depleting its principal, but also is throwing away money in doing so. This is figured on the basis of production at full capacity. Operating at half capacity the cost is materially increased.

On the present scale of operations, we do not believe that even the Utah Copper Co. can really make any money in selling copper at 11c. We do not believe that our copper-mining companies as a whole can come out even unless they get at least 13c. This is without any regard to the capital represented by the orebodies themselves.

Why, then, is production not more rapidly extinguished by force of circumstances? Simply because the closing of a mine means destruction of organization, and consequently loss in starting up again; the deterioration of equipment, and consequently loss; the continuation of overhead charges and some maintenance charges, such as pumping, and consequently loss. It is, therefore, better up to a certain point to suffer loss in operation than the loss by idleness. But the time comes when the pendulum of losses swings past the neutral point and then closures begin. Reports of them are becoming more frequent. Truly the copper industry is now near its nadir.

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The loss of over 800 tons of Straits tin on two vessels sunk in the Indian Ocean by a German cruiser calls attention to the risks to which our supply of tin is at all times subject. All of it, or nearly all of it, comes from the Far East and reaches us by a long water transit, which is more or less hazardous even in times of peace. Production and consumption of the metal are so nearly balanced that the loss of 1000 tons may make a serious deficit and will affect the price, possibly to a considerable amount. Efforts to find a nearer supply of any quantity have failed, and the tin consumers are still dependent on the East.

BY THE WAY

A recent phrase in the Raritan Copper Works *Ingot* strikes us as happy: "Any fool can take a chance—it takes brains to be careful."

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The cashing of a number of worthless checks, purchasing supplies and not paying for them, and successfully perpetrating other frauds by a young man posing as an engineer of the U. S. Geological Survey engaged in special work on the Green, Grand and Colorado Rivers, would not have been possible had the victims asked to see the identification card with which every field man of the Survey is provided. Such cards carry the engraved signature of the Secretary of the Interior and the personal signature of the Director of the Survey, George Otis Smith, as well as the signature and photograph of the employee himself, with the seal of the Survey stamped through all three. This may be worth remembering.

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Heilbron, which is reported captured by the new outbreak of rebellious Boers under the leadship of Generals De Wet and Beyers, is about 75 miles south of Johannesburg, in the northern part of the Orange Free State; Premier Botha has issued a proclamation calling upon all residents of the Union of South Africa to assist in the suppression of this new rebellion. The first outbreak, led by Colonel Maritz, was quickly suppressed and some of the rebels captured, but Maritz, though wounded, succeeded in escaping into German Southwest Africa. Dispatches from Lisbon state that German troops have invaded the Portuguese colony of Angola, West Africa; preparations are being made to send troops and warships to Angola and also to Mozambique, Portuguese East Africa.

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In view of the statements to the effect that the destruction wrought by German shells upon fortresses in Belgium points to their possessing a secret explosive much more powerful than any known to the other European armies, the *Engineer* gives the warning that such rumors should be taken with a great deal of reserve. It became known some 12 months ago that Germany had adopted trinitrotoluene in the navy for high-explosive shells, torpedoes and sea mines, and in all probability it is this substance that has caused consternation in some quarters. As an explosive, trinitrotoluene is eminently safe to handle, and needs to be detonated by mercuric fulminate. A shell or mine loaded with it bursts into larger fragments than when picric acid is the explosive, and although wet guncotton is more powerful if exploded in close proximity to the target, the effect produced by trinitrotoluene is much greater when the explosion takes place at some distance. Whereas picric acid readily forms metallic picrates which are dangerous to handle, trinitrotoluene does not react with metals, and can be manipulated safely even when hot, as it burns slowly without exploding.

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The Government attorneys who are trying the case against the U. S. Steel Corporation have an ingenious theory of how prices are made in the steel industry. In the trial at Philadelphia they read alleged minutes of a secret meeting of the board of directors of the Steel Corporation, held a few months after its organization. Judge Gary was in the chair. Rails were taken up for discussion. They were selling at $28 a ton. Judge Gary said they should be made $30 a ton at once. There was a general disagreement. Someone feared that the press would say nasty things about the advance—so soon after the formation of the corporation. Someone remembered the smaller companies which, while not members of the combination, were accustomed to send representatives to the Gary dinners as if they had been bidden. "Let them raise the prices first," some one said. "Tip them off. There'll be no talk then." Six weeks later the small companies quoted rails at $30 a ton and a week after that the U. S. Steel Corporation's price went up to a like figure. This, the Government charges, is the price-making system which still prevails over 90% of the steel industry in this country. The Government attorneys also intimated that the panic of 1907 was a pool arrangement to boost prices. These are new ideas, and queer ones.

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Some memories of fake mining promotions of 10 to 15 years ago are revived by the arrest in Toronto of Dr. Richard C. Flower, for whom the police have been looking for several years. Flower—otherwise known in Boston, Richmond and elsewhere, as Oxford, Montgomery, Courtland, etc., etc.—was a gentleman of various activities. After operating in different cities, he came to New York and was first known there as the proprietor of a "medical institute," which attracted some attention from the police. Not content with the profits—mostly nefarious—derived from his patients, he started the brokerage firm of R. C. Flower & Co., which did a profitable business. The firm actively dealt in some reputable stocks, but sandwiched in some mining projects of doubtful worth—perhaps we should say of undoubted worthlessness—the most notorious of which was the Arizona & Eastern Mining Co. The police finally came down on the concern, and Dr. Flower left New York for parts unknown. One of his specialties was jumping bail, and bonds have been standing against him in various states. For some years nothing was heard from him, but recently he was found in Canada. He is now about 70 years old, and the detectives report that he is in feeble health and addicted to the use of drugs. It was believed at one time that he had accumulated quite a fortune, but most of it seems to have been hidden or scattered.

PERSONALS

Ludwig Schlegler has taken charge of the Esmeralda mines, Chontales, Nicaragua.

P. W. Davis, of the Eastern Metal & Refining Co., has been visiting in New York.

J. Parke Channing, fully recovered from his recent operation, is again attending to business.

W. D. Pearce, who has been in New York for several weeks, has returned to Chihuahua, Mexico.

Arthur J. Hoskin has examined the George Law property in the Argentine district, Georgetown, Colorado.

Leo K. Kennedy has resigned as superintendent of the Jualin mines in Alaska, and has gone to Mexico.

Forbes Rickard has made an examination of the Auburn group near Middleton, in Ouray district, Colorado.

James H. Payne, of Baltimore, is on his way to Chile to start the nodulizing kilns for the Braden Copper Co. there.

Henry Gardner, senior director of Henry R. Merton & Co., Ltd., of London, is expected in New York early next week.

James Wilding, Jr., has completed the flotation work in which he was engaged at Silverton, B. C., and has returned to San Francisco.

Morton Webber, who recently examined the McIntyre mine, Porcupine, Ont., on behalf of the Nipissing Mining Co., has left for the Western States.

O. B. Perry, general manager of the Yukon Gold Co., has returned to the States from Alaska and is expected in New York at the end of this week.

Gen. Walter Scribner Schuyler, U. S. A., retired, manager of the Alaska mine at Pike, Sierra County, Calif., made a business visit to San Francisco recently.

M. A. Wolff, of Hauxhurst & Wolff, has joined the 72d Regiment, Seaforth Highlanders, of Canada, and has proceeded to the seat of war in Europe.

K. P. Campbell, chemist for the A. S. & R. Co., who was obliged to leave his duties because of troubles in Mexico, has returned to Monterey to resume work.

Walter E. Koch, mining and metallurgical engineer, of El Paso, Texas, has been severely ill at Pittsburgh, Penn., since last August, but is now getting along nicely.

R. L. Herrick has returned to the practice of his profession as a mining engineer and is making temporary headquarters with A. J. Hoskin, 308 Commonwealth Building, Denver, Colo.

Sumner S. Smith, federal mine inspector of Alaska and mining engineer of the U. S. Bureau of Mines, is visiting his family at Oakland, Calif. He will return to Alaska in November.

H. A. J. Wilkens, president, and W. B. Devereux, Jr., general manager of the Mines Management Co., are now in California, looking over some properties in that state with a view to commencing operations.

Lawrence Addicks, of Douglas, Ariz., is visiting New York. The experimental leaching operations which he is directing for Phelps, Dodge & Co., are progressing well and a 75-ton pilot mill will soon be put in operation.

Charles L. Thomas, formerly superintendent of the Hay Foundry & Iron Works, Newark, N. J., now is engaged in the Russian Government service at Petrograd, where he is directing the use of a special steel in the manufacture of large guns.

Arthur Thacher, J. H. Troutman, J. A. Van Mater, L. G. Rowand, P. B. Paul, C. A. Schmidt and C. T. Brown, officers and directors of the Mineral Point Zinc Co. and its associated companies, have been visiting the properties of the Empire Zinc Co. in New Mexico.

W. J. [illegible], who has been exploring in northern Alberta for coal and oil lands in the interests of D. A. Thomas, the Welsh coal operator, has returned to Vancouver. He reports having encountered banks of pure asphalt along the Athabasca River, and oil indications farther north.

Robert B. Kelly has been appointed engineer and head of the Safety-First Department at the Washoe Reduction Works, Anaconda, Mont. His thorough knowledge of machinery and of all processes of [illegible] work give him a peculiar fitness for his new position. In addition to his work at the smelters, he will have supervision over all the operations of the Anaconda company throughout Deer Lodge County, with special attention to safety-first.

OBITUARY

Peter Lebeau died at Bozeman, Mont., Oct. 14, aged 85 years. He was born at Trois Rivieres, Quebec, and after traveling extensively through the western country, he went to Montana with the pioneers in 1865, working placers at Virginia City, French Gulch and Butte. He retired a number of years ago.

W. E. Proctor, superintendent of the Trinity River Mining Co., Trinity County, Calif., died of apoplexy on Oct. 12, at the mine. He was 45 years old and always appeared to be in good health. His home was in Oakland. He was formerly superintendent of the Amador Canal Co., at Sutter Creek, Amador County.

Henry Mayers, 84 years old, died at Oakland, Calif., on Oct. 1. Mr. Mayers was a native of England. He went by way of New York to San Francisco in 1853, and engaged in the jewelry business. He was one of the early manufacturers of gold quartz-set jewelry. He made a fortune in the Comstock mines. Since the fire in San Francisco, in 1896, he had made his home in Alameda.

Alfred Sang, for some years a resident of Pittsburgh, died Oct. 13, from wounds received in the siege of Antwerp. He was a lieutenant in the English bicycle corps and had been in active service since the British declaration of war. He was born in Paris, in 1874, of English parentage, and was graduated from a leading French technical school. In 1900 he located in Pittsburgh and resided there until 1909, when he went to England. While in Pittsburgh, he was known as an expert analytical chemist and a writer on metallurgical subjects. He was a member of the Engineers' Society of Western Pennsylvania, the American Society for Testing Materials and of the Electrochemical Society.

James E. York died in Brooklyn, N. Y., Oct. 10, aged 68 years. He was born in England and came to this country when a young man. He was known as an expert in rolling-mill work and an inventor of several improvements. In 1906, he, with some associates, took a lease on some ore property in Venezuela, interested capital and commenced to mine and ship ore, when President Castro canceled the concession. The Venezuelan Government subsequently made an award of $385,000 to reimburse American companies having Venezuelan concessions, and Mr. York's company may eventually recover its expenses. Suffering from ill health in recent years, he was unable to give active attention to business matters.

Capt. Harry Roberts died on Oct. 20, at Augustana Hospital, Chicago, at the age of 59 years. He was a pioneer of the Minnesota and Gogebic ranges, and one of the best known of the mining men of Lake Superior. A native of Cornwall, Eng., where he worked in the tin mines when a boy, he came to this country when in his youth, locating first near Sharon, Penn. In the early '80s he journeyed west to Ishpeming, on the Marquette range, where he was employed by the late Joseph Sellwood in the open pits, where Mr. Sellwood had contracts from the Cleveland Iron Mining Co. In the latter '80s he went with Mr. Sellwood to open the Colby mine at Bessemer and other Gogebic range mines. He and Mr. Sellwood went to the Vermilion range when the first ore was discovered there and opened the Chandler mine at Ely, the largest on that range today. Later, Capt. Roberts opened the McKinley at Biwabik, on the Mesabi. He was associated with Mr. Sellwood in various enterprises until the latter's death a few months ago. In 1896 he commenced explorations for himself and obtained interests in several Minnesota mines. At one time he held a lease on the great Leonard mine at Chisholm. Of late years he paid considerable attention to the Roberts-Kingston Construction Co., of which he was the head. The company had contracts to strip many of the large pit mines of Minnesota. He had a wide acquaintanceship in the district and was highly respected. The body was taken to Houghton, Mich., for burial. He was a prominent Mason and a member of the Lake Superior Mining Institute.

SOCIETIES

University of Wisconsin—Prof. A. N. Winchell is trying the experiment of teaching the microscopic study of minerals and rocks by correspondence. The work is done under the auspices of the extension division of the university, and is proving satisfactory. Each student must be equipped with his own petrographic microscope and thin sections.

American Institute of Chemical Engineers—The seventh annual meeting will be held in Philadelphia, Dec. 2-5. A program of excursions to a number of the large chemical manufacturing plants in and around Philadelphia is being arranged for. A number of addresses and papers on "The Present Opportunities for American Chemical Industries" will be delivered by prominent chemical engineers and business men.

Canadian Mining Institute—This society has made a proposition of union to the Mining Society of Nova Scotia. That society is to retain its name and local self government; the members to become members of the Canadian Institute and receive its publications on payment of $5 yearly. The approved papers read before the Mining Society will be published in the transactions of the Canadian Mining Institute and the name of the Mining Society of Nova Scotia will appear on the cover and title page of the volume.

Engineers' Society of Pennsylvania—A special meeting of this society has been called for Oct. 28, as a get-together meeting to discuss matters pertaining to the exhibit of the Pennsylvania Industrial Welfare and Efficiency Conference, and the winter activities of the society. On the same day, a public hearing will be given at the society headquarters in Harrisburg, by the Engineers' Commission of the Commonwealth of Pennsylvania, to obtain expressions of opinion and to take testimony on the desirability of fixing, regulating and controlling engineering responsibility for the design, construction and operation of engineering works, public or private, where there is unusual hazard to life, health and property. A draft of a proposed legislative bill has been circulated among the members of the society as a basis for discussion.

The Pennsylvania Industrial Welfare and Efficiency Conference will be held under the joint auspices of the Department of Labor and Industry of the State of Pennsylvania, and the society. Matters pertaining to sanitary measures and to the safety, welfare and efficiency of employees will be discussed by engineers and leaders of industry and labor at a conference to be held in the House of Representatives, in Harrisburg, Nov. 17 and 19. A manufacturers' exhibit of appliances and equipment will be held in the same connection on Nov. 16 to 20, inclusive.

INDUSTRIAL NEWS

The S. Flory Manufacturing Co., Bangor, Penn., announces the death on Oct. 20 of its manager of sales, Andrew A. Bruch, who had been with the company since its inception.

The Justrite Mfg. Co. has recently purchased a tract of land, 226 ft., on Southport Ave., and 125 ft. on Hawthorne Ave., Chicago. Plans have been drawn for a 5- or 6-story building, to be used as a manufacturing plant, and which will be constructed probably next year.

TRADE CATALOGS

Link-Belt Co., Chicago, Ill., Link-Belt Locomotive Cranes 38 pp., illus., 10¾x8½ inches.

General Filtration Co., Inc., 326 Cutler Bldg., Rochester, N. Y. Catalog. Filtros. 28 pp., illus., 7x5 inches.

E. M. Freese & Co., Galion, Ohio. Catalog. Brick, tile and fireproofing machinery. Illus., 8½x11 inches.

Lehigh Car, Wheel & Axle Works, Catasauqua, Penn. Catalog No. 50. "Fuller Quality" face hardened sprocket and traction wheels, chilled charcoal iron castings. 64 pp., illus., 6x9 inches.

Marion Malleable Iron Works, Marion, Ind., Handbook, shoes for wood stave pipe. 135 pp., illus., 7x4½ in. This little book describes the malleable-iron fittings this company makes for continuous-stave pipe, much of which is used in bringing water to mining operations. It also contains much tabular data useful in installations of this character.

Armstrong Cork & Insulation Co., Pittsburgh, Penn. Catalog. Nonpareil insulating brick for boiler settings. 16 pp., illus., 6¼x3½ in. The Nonpareil insulating bricks described in this pamphlet are made chiefly of diatomaceous earth and are intended for insulation of boilers and other furnaces. Examples are shown of the Nonpareil brick set between firebrick and common brick, and also with the Nonpareil on the outside.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

AGGLOMERATING—Process of Agglomerating Fine Ores. James H. Payne, Baltimore, Md. (U. S. Nos. 1,114,029 and 1,114,030; Oct. 20, 1914.)

ALLOYS—Process of Producing Alloys Stable against Strong Acids. W. and R. Borchers, Aachen, Germany. (Brit. No. 18,212 of 1913.)

AMALGAMATOR. Fred Stringham, Denver, Colo. (U. S. No. 1,113,065; Oct. 6, 1914.)

CHLORIDIZING—Process of Chloridizing Ores and Residues. A. D. Ledoux, New York. (Brit. No. 17,411 of 1913.)

CONCENTRATION—Improvements in or Relating to the Concentration of Ores. A. H. P. Lowry, Prahran, Victoria, Aust., and H. Lavers, Broken Hill, N. S. W. (Brit. No. 16,302 of 1913.)

CONCENTRATION—Improvements in or Relating to the Concentration of Ores. T. M. Owen, Broken Hill, N. S. W. (Brit. No. 16,141 of 1913.)

CYANIDING—Leaf of Vacuum Filters for Cyanide Process. Yeikichi Ohtsuka, Tokyo, Japan. (U. S. No. 1,111,609; Sept. 22, 1914.)

DRILL. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,113,620; Oct. 13, 1914.)

DRILLS—Improvements in and Relating to Rock Drills and Detachable Bits or Cutters Therefor. R. Jones, Johannesburg, Transvaal. (Brit. No. 16,125 of 1913.)

ELECTRIC FURNACES—Improvements in or Relating to Cooling Lower Electrodes for Electrical Smelting Furnaces. (Brit. No. 6731 of 1914.)

ELECTROLYTIC CELL. Court C. Titus, Helena, Mont., assignor to Montana Metallurgical Co., Helena, Mont. (U. S. No. 1,111,977; Sept. 29, 1914.)

FILTER. George Spence, Mexico, Mexico. (U. S. No. 1,111,275; Sept. 22, 1914.)

FUME-CONCENTRATOR for Smelters. Stephen W. Smith, San Jose, Calif. (U. S. No. 1,112,860; Oct. 6, 1914.)

FURNACE CRUSTS—Improvements in or Relating to Devices for Use in Removing Sediments or Crusts from Rotary Furnaces or the Like. N. Ahlmann, Copenhagen, Denmark. (Brit. No. 16,893 of 1913.)

IRON—Process of Producing Iron and Steel Directly from the Ore. K. A. F. Hiorth, Christiania, Norway. (U. S. No. 1,112,007; Sept. 29, 1914.)

LAMP—Miner's Acetylene Lamp. Yeikichi Ohtsuka, Tokyo, Japan. (U. S. No. 1,113,042; Oct. 6, 1914.)

LOCOMOTIVES—Reel for Mine Locomotives. George C. Abbe, Lansdowne, Penn., assignor, by mesne assignments, to The Baldwin Locomotive Works, Philadelphia, Penn. (U. S. No. 1,110,995; Sept. 15, 1914.)

MAGNETIC SEPARATOR. George Ullrich, Magdeburg, Germany, assignor to Fried. Krupp, Aktiengesellschaft, Grusonwerk, Magdeburg-Buckau, Germany. (U. S. No. 1,114,071; Oct. 20, 1914.)

MINE-CAR-DUMPING APPARATUS. Charles A. Griffith, Pruden, Tenn. (U. S. No. 1,111,830; Sept. 29, 1914.)

ORE DRESSING—An Improved Process and Apparatus for Hydraulic Jigging, Ore Separating and the Like. K. Kleinberg, Libuschin nr. Kladno, Bohemia. (Brit. No. 13,191 of 1913.)

ORE TREATMENT—Treatment of Zinc or Copper Ores, Ashes, Waste and Chippings. F. Bourgeot, Lastours, France. (Brit. No. 15,913 of 1913.)

PIG IRON—Improved Manufacture of Pig Iron. C. A. Keller, Paris, France. (Brit. No. 22,692 of 1913.)

PULVERIZING APPARATUS. Alexander Granger, Bulawayo, Rhodesia, South Africa. (U. S. No. 1,111,454; Sept. 22, 1914.)

PUMP. Mine Pump. Lewis McIsaac, Inverness, N. S., Canada. (U. S. No. 1,112,820; Oct. 6, 1914.)

RADIUM—An Improved Process of Concentrating Ores and the Intermediate Products of Radium and Mesothorium. E. Ebler, Heidelberg, Germany. (Brit. No. 1173 of 1914.)

RARE METALS. Improved Means for the Extraction of Rare Metals such as Thallium and Radioactive Metals from Lead Ores and Production of a White Pigment. Deutsche-Felsen Oel Ges. Franzen & Co., Berlin, Germany. (Brit. No. 16,891 of 1913.)

ROASTING—Ore Roaster. George H. Dern, Salt Lake City, and Theodore P. Holt, Park City, Utah. (U. S. Nos. 1,113,961 and 1,113,962; Oct. 20, 1914.)

ROASTING FURNACE. Frederick Laist, Anaconda, Mont. (U. S. No. 1,114,371; Oct. 20, 1914.)

SCREEN. David Cole, Tucson, Ariz. (U. S. No. 1,111,217; Sept. 22, 1914.)

STEEL—Alloyed Steel. Samuel S. Wales, Munhall, Penn., assignor to Carnegie Steel Co., Pittsburgh, Penn. (U. S. No. 1,111,711; Sept. [illegible], 1914.)

STEEL ALLOY. Samuel S. Wales, Munhall, Penn., assignor to Carnegie Steel Co., Pittsburgh, Penn. (U. S. No. 1,111,710; Sept. 22, 1914.)

TRANSPORTATION—Ore, Bulk or Dense Cargo [illegible]. Hugo P. Frear, San Francisco, Calif., assignor to Be[illegible] Steel Corporation, South Bethlehem, Penn. (U. S. No. [illegible]; Sept. 29, 1914.)

ZINC—Metallurgy of Zinc. A. L. J. Queneau, T[illegible], Penn., assignor to Queneau Electric Zinc Furna[illegible] [illegible]delphia, Penn. (U. S. No. 1,114,036; Oct. 20, 1914.)

Editorial Correspondence

SAN FRANCISCO—Oct. 21

The Contest for the State Senatorship in the 36th district is between two lawyers and one mining engineer. There are 22 lawyers in the senate, but no engineers. So the voters of the district, which embraces a part of Los Angeles and all of Pasadena and the mining camp of Tropico and others in that vicinity, will have opportunity to reduce the number of lawyers and add one engineer by electing J. Nelson Nevius, of Pasadena. It does not matter much what Mr. Nevius' politics may be. So far as the interests of the mining industry are concerned the less politics the better. California has had so much politics mixed in with the conduct of mining affairs and the making of mining laws that the industry has suffered rather than benefited by legislation. Mr. Nevius has announced one plank in his platform to be the favoring of further coöperation between state and Federal authority for the protection of forests from destructive fires. It was he who secured the insertion of such a plank in the Democratic state platform. Preservation of forests from fire is of essential interest to mining. But Mr. Nevius need not stop at that should he be elected to the state senate in November. There are other matters of vital and direct interest to the mining industry of California that can be advanced by coöperation with the Federal Government. Just now California is having a demonstration of such coöperation in laying the foundation for a system of mine inspection. Mr. Nevius will find plenty of work if elected. His standing as a mining engineer and his practical knowledge of constructive legislation in the interests of mining are beyond question. He is entitled to the support of every man and woman interested in the preservation and advancement of California's mines.

DENVER—Oct. 22

At the Colorado Fuel & Iron Annual Meeting, held in Denver, Oct. 19, president J. F. Welborn rendered an informal report, at the same time explaining that he would in a few days furnish each stockholder a full printed report. The value of manufactured steel products during the fiscal year was about $12,000,000, of which fully $10,000,000 was distributed in Colorado as wages and regular expenses. The company now employs approximately 12,000 men in its coal mining, coking, steel manufacturing and allied operations. There was a 40% decrease in the company's coal production during the last year, due only in part to strike conditions, there having been a notable decrease in orders for rails. All officers were reëlected for another year. The numerous subsidiary companies, such as the Colorado Supply Co., held annual meetings the same day.

BUTTE—Oct. 22

The Seventh Week of Military Rule finds Butte more or less settled down to normal conditions. Hold-ups and robberies, however, after the withdrawal of an additional 250 soldiers, Oct. 16, have again become almost daily occurrences. The announcement that eight prisoners had made their escape from the county jail during the week and that this was not discovered until Oct. 19, came somewhat as a shock to the community. That the prisoners found it possible to break out of jail and pass unnoticed through the lines of military guards surrounding the court house and jail on all sides, indicated to say the least, lax surveillance. The laxness is the less excusable because of the fact that the prisoners had recently become unruly and obstinate in their refusal to obey orders. Muckie McDonald and Joe Bradley were leaders in stirring up tumult in the jail and inciting the prisoners to resist authority. Inspection of the jail following the escape, showed that they too had made plans for a getaway.

About 160 officers and men are left. When the reduction was made, Major Donohue announced that there would be no abolishment of martial law, and that the military force would continue in supreme control of public affairs as before, provost marshall Conley having general supervision over the sheriff and the chief of police and their men, and the court continuing to transact civil proceeding, but not any criminal business. The order stands for the present, and there will be no resumption of criminal jurisdiction by the courts until another order is made. The guard lines have been withdrawn from the courthouse and the soldiers are no longer required to do police duty.

The attorneys of the several prisoners illegally tried and sentenced by the military courts, are busy making arrangements for retrial in the civil courts. The motion of the county attorney to have the trials of the leaders of the new miners' union removed to some other county, is being bitterly resisted by their attorneys who claim that there are 12 men in Silver Bow County not afraid to give a fair judgment. Damage suits filed against the Governor and the military authorities aggregate up to date at least $60,000 and it is reported that more are to come. Evidently, somebody made a colossal blunder. It is to be hoped that those responsible will be made to bear the consequences and not the innocent taxpayer. He already has to foot the large bills for the military occupation which in full swing cost over $2000 per day, and for the illegal court proceedings as well as for the legal ones to follow.

On Oct. 20, attorneys for Driscoll made application to the state supreme court for a writ of supervisory control. This was denied Oct. 21. Counsel has announced a second appeal to be made in another form. The case of Duncan will, no doubt, take the same course.

On Oct. 17, a report was made to the military officers that the I. W. W. movement had not stopped. The national convention of the organization approved the request of Joe Bradley that direct actionists come to Butte. On Oct. 16, 40 men got off Northern Pacific trains from the east. They said they were I. W. W. coming "to help their brothers" and that before Nov. 1 there would be "a big crowd of I. W. W. in Butte and there would be some action." Spokane advises that more are coming from that direction. Military officers are confident that they can handle any situation that may arise.

SALT LAKE CITY—Oct. 22

The Suit in Partition between the Silver King Coalition and the Silver King Consolidated companies of Park City over ground owned jointly was ended Oct. 21, by a division of the ground in question, agreed to by both companies. This will prevent the sale of the claims, advertised to take place Oct. 24, this sale has several times been postponed. By the division agreed to, the Consolidated deeds all of its rights in four claims, the Vesuvius, Delaware, Lady's Drum, and Mayflower No. 1 to the Coalition, receiving in return from that company all of its rights and interests in two claims, the Andes and Custer. The partition suit ends all litigation between the two companies. It was thought that ore had been mined from the jointly owned ground by one of the companies, but surveys failed to show trespass.

Utah Copper is treating 12,000 tons of ore daily at the Magna mill. The mine works one shift, except Wednesdays and Sundays—two or two and a half days off a week—which is all that is necessary to keep up the mill supply. A small amount of stripping is being done. All told, eight to 10 shovels are worked. Mining is being done with great economy, and a new system of cost keeping is in use, by which all supplies and expenses are checked up daily, instead of monthly as heretofore. Construction work, repairs, and overhead expenses have been reduced. Between 1000 and 1200 men are being worked at the mine, and 65 men per shift at the mill, exclusive of the machine shop, etc. Flotation experiments are still being carried on, and a large number of tests have been made with a slide machine, in the laboratory. Twenty-eight flotation cells designed by the Utah Copper are in use. Of these, 14 are installed on the lower vanner floor, and are cleaning the low-grade concentrates. This removes silica satisfactorily, and produces good concentrates, but there have been some mechanical difficulties. Each cell consists of a circular iron casing about 24 in. deep by 36 in. diameter, and is driven by a 10-hp. motor. The second unit of 14 cells is also on the lower vanner floor. These treat the vanner feed from the fourth and fifth spigots of the secondary classifiers, but material from the primary classifiers has also been treated. This unit is still in the experimental stage. The low-grade concentrates from the vanners and tables of the mill are elevated to a Richards-Janney classifier; the first two spigots make high-grade concentrates, and the next two low-grade concentrates containing silica, which is the feed for the flotation. About 200 tons of low-grade concentrates per day are being treated. Three shifts are being worked in the mill, and all men are working half time—two weeks on and two off; the Magna shift changing with the Arthur.

SEATTLE—Oct. 21.

Between $7,000,000 and $8,000,000 will probably be interior Alaska's output for the season of 1914 according to the estimates of several of the largest operators. It is figured that Fairbanks will produce $3,500,000; Iditarod, $3,000,000 and the Ruby district about $800,000. New strikes were scarce last summer, only one new district being opened up, that at the head of the Tolavana River, where it was reported pay was found. Some quartz mining was done in the Fairbanks region, but the cost of fuel, $18 per cord for brush, made it unprofitable to mine anything but the highest-grade ores. A tunnel is being driven at the 150-ft. level of the Newsboy mine, the Rhoads mine was in operation and a lease was let on the Rainbow property. These hardrock properties will be worked all winter. The Nome district should yield about $3,000,000 in gold this year. Conditions in the north were a little better during the summer. There was plenty of rain, which means increased production. The dredges at Nome all did fairly well, particularly those on Ophir Creek, in the Council district, and the dredge operating for tin at Cape York. The latter machine made between 120 and 150 tons of concentrates, which brought a good price. There was little quartz mining at Nome this year.

The Alaska Gold Mines Co. is putting the finishing touches to the mine, mill and power plant, in order to have these in operation by the first of the year. At the Salmon Creek dam the reservoir with 110 ft. of water in it is more than two-fifths full. It is probable that the company will go into the winter with the reservoir at least 80% full; anyhow, there is an abundance of water to furnish all the power requirements until spring. At the mine, work is now being done with a view to have everything in smooth running order to supply the mill. One of the most important details is to have the transportation way in good shape and therefore the Sheep Creek tunnel is being leveled up and the final track is being laid between the tunnel and the mill; the grade is all finished up to height and surface and the track will be in good shape before it commences to snow. In the mine the 6, 7, 8 and 9 levels have been driven west to the surface in Icy Gulch, giving entrances to the mine on six levels, from the 5 to the 10, inclusive, the entrance to the 10, of course, being through the Alexander tunnel. While there has been no work done with the sole idea of developing ore, the actual preparation of the mine, cutting out stopes, driving crosscuts, etc., has been productive of indications of further extensions. At the reduction plant everything is finished in the coarse-crushing department, with some slight exceptions; the tunnel from the coarse-crushing plant to the main mill is all completed and the underground ore bin is nearly finished. All of the foundation work at the mill has been completed and by this time practically all of the steel work is erected. Some of the permanent riveting will be postponed, but by about the middle of November the buildings will have been entirely roofed. The forms for flooring and machinery foundations are pretty well finished in the upper portions of the two sections. Everything at the three divisions is well up to schedule and provided deliveries of equipment are promptly made, there is no reason why the company should not start by the specified time of Jan. 1. A crew of trained men from other mills controlled by the same interests will start this mill.

DULUTH—Oct. 24

The Tonnage Extracted from the Great Northern Leases by the Steel Corporation during the time of the leases is given as follows, the tonnage for the remaining few weeks of the present season having been approximated and included in the figures:

Fay	610,000	Dale	3,157 500
Leonard	8,365,000	Hill	3,810,000
Harold	1,065,000	North Star	1,165,000
Mace	580,000	Walker	987,500
Mississippi	1,270 000		
North Uno	1,840,000	Total	26 600,000
South Uno	3,750,000		

HOUGHTON—Oct. 24

The Copper Depression Has Awakened the Public to a realization of the fact that there are many other industrial opportunities in this district and already plans are on foot for the organization of at least three different corporations to manufacture refined copper into articles of value. Aside from the commercial expansion along lines more or less closely allied with copper, the agricultural development of this district has been astonishing. There is a ready market for all farm products at the highest prices in the country. And the expansion in agriculture has only commenced.

Practically the Last Western Federation Agitator has left this district, answering the summons from Butte. At the conclusion of the strike in this district some of the worst of the Federation men were kept here as paid agents of the United Mine Workers and they were employed in seeking memberships among the miners for that organization. They used the argument that none of the crimes chargeable to the Western Federation could be blamed on the United Mine Workers, and they succeeded in getting a few members. However, the developments in Butte in the past few months have worked against them. And now their source of income has been cut off through the defections there. Furthermore there was a pronounced feeling among the majority of the men here that they had heard enough talk from agitators. They realized that the same chaps were working for the Mine Workers that formerly shouted for the Western Federation. They blamed them for all of the troubles that grew out of the strike, and for everything in the way of misfortune that has come afterward. And they were not at all backward in making known their personal feelings of antipathy toward the agitators.

There is Comparatively Little Pessimism Among the people of the Copper Country. It has been the custom of the Calumet & Hecla group voluntarily to raise wages 10% whenever the selling price of copper got to 15c. and staid there for any length of time. With each raise of this nature there would be an announcement that the old scale would be resumed if the price went below the 15c. mark again. But as a matter of fact the higher wage scale was in effect recently for a long period during which the price received for the metal was materially under 15c. Therefore when the cut in wages was announced it caused no particular complaint among the men. It was, in fact, generally anticipated and generally understood. The men were well pleased that operations were not suspended altogether. One feature of strength in the situation is the large treasury balance ordinarily carried by practically every copper-producing company in the district. This system has in the past sometimes occasioned complaint among shareholders who believed that mining companies ought to divide all profits as soon as possible. But the directorates never agreed with that theory and the majority of the shareholders backed up the policy of heavy treasury balances and equalization of dividend disbursement. The Quincy mine first established this plan; President Agassiz of the Calumet & Hecla always insisted upon it; and other officials of companies operating here have maintained the same system in all cases of profitable producing mines. The Quincy, for instance, ran for over 50 years without missing a dividend disbursement. The Wolverine's record was not so long but was more important in the amounts paid. The Calumet & Hecla's dividend disbursements were so steady that people here generally look upon Calumet & Hecla stock as in the same classification as government bonds. These treasury balances came in handy recently. Without large cash surpluses none of the companies could have maintained its head above water during the protracted contest with the Western Federation. That contest was followed almost immediately by a decline in the metal market and by the war. And now, following two years of serious depression and disastrous and unforseen commercial difficulties, not a single copper mine in this district has been forced into the hands of a receiver. Unusual and extraordinary methods of financial conservation have been necessary, to be sure, but the producing mines are keeping their organizations intact to date and maintaining their working forces. It has been necessary to suspend dividends in most instances; the managements took the stand that the shareholders were better able to put up with this loss in income than the workmen.

ST. LOUIS—Oct. 23

The Disseminated Lead Belt of Southeastern Missouri was visited by a cloud-burst, Oct. 16, when over 4 in. of rain fell, doing much local damage, carrying out or injuring several bridges and trestles and drowning out one of the Desloge mines. There is a great excess of labor in the district, as all the companies are curtailing output and reducing expenses Thus far there has been no cutting in wages, but with the steady sinking of the price of lead, a cut is inevitable. The present conditions are more trying for the companies than when lead went to $2.65 in the Bryan campaign of 1896, for then surface labor was paid only $1 and underground labor $1.25, while the shifts were then 10 to 12 hours

TORONTO—Oct. 21

A Rich Strike of gold and silver in the Broad Pass district of Alaska has been reported to the Canadian Mines Department by G H. Collins, of Prince Rupert, B C. It is stated that great lodes have been discovered, causing a rush of miners and prospectors to the district The Department will send two geological experts to Broad Pass to make an inspection and report on the formation with a view to determining the probability of an outcrop to the East in Yukon Territory.

The Mining News

ALASKA

CYANIDE SCARCITY felt in Alaska as elsewhere. Hoped [illegible] by operators result will be manufacture of cyanide in Alaska.

ALASKA'S SECOND LARGEST NUGGET reported found [illegible] in September at Ruby on Long Creek property operated by Xavier Ditz and associates. Has value of $1900. Two smaller nuggets also found recently on same claim, one valued at $400 and other at $300.

ARIZONA

Maricopa County

ALVARADO (Congress Junction)—Property one time controlled and financed by James A. Houston, of Boston, sold by sheriff to E. W. Durfee, former manager. Property is extensively developed, equipped with cyanide plant. Negotiations for sale and operation under way.

Yavapai County

DEPOSIT OF TUNGSTEN ORE reported discovered in Crown King district southeast of Prescott. Ore is hübnerite, occurs in pegmatite. H. R. Wood and associates of Prescott working property in small way, propose to install mill later.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Impounding dam and flume being constructed for disposing of tailings. Flume will be carried on high trestle across county road west of mine.

KENNEDY EXTENSION VS. ARGONAUT—Plaintiff has filed notice of motion for new trial in superior court of suit contesting apex of Argonaut vein. Motion will be heard Oct. 26.

ARGONAUT (Jackson)—New hoist will be installed on 3900-ft level. Capacity of surface hoist about 4000 ft. Decided to make two lifts instead of installing surface hoist of increased capacity.

Eldorado County

PACIFIC (Placerville)—Since Placerville Gold Mining Co. suspended development on account of stringency of European money market, orebody on 500-ft. level is being worked under lease by J. H. Santo and P. D. Burtt. Are installing five-stamp mill. Mine owned by Alexander Baring interests in London. Extensive development was undertaken, deepening the shaft to 2000 ft. War necessitated curtailment in expenditures for development and leasers are finding opportunity to make some money by mining on limited scale.

Nevada County

NORTH STAR (Grass Valley)—Deepening of shaft continuing below 5700-ft. level. Station cut at that level and another will be cut at 6000-ft. point. Drifting on both levels contemplated.

San Bernardino County

PHOENIX (Johannesburg)—New electric installation used for operating five-stamp mill and hoist. Ore largely extracted from 350-ft. level. Mine operated under bond and lease by Barney Osdick.

Shasta County

MIDAS (Harrison Gulch)—Water reduced to point below 500-ft. level. Electric pumps at 600-ft still under water. As soon as released unwatering will proceed more rapidly. Cyanide plant remodeled; 12-stamp mill crushing good ore from Gold Hill dump. First month's cleanup under new ownership was $10,000. Sixty men employed.

AMERICAN (French Gulch)—Compressor plant installed; [illegible] ft. tunnel being cleaned out and retimbered, 10-stamp mill will be overhauled and remodeled. When mine shut down under former management ore was said to average $20 per ton. Reopening, begun recently by James Sallee, owner of [illegible] mine at Old Diggings. Mr Sallee conducted early development of Iron Mountain and Bully Hill copper mines of which he was then owner.

Siskiyou County

DREDGING GROUND being prospected along Klamath River by J. E. Wade, who formerly operated dredge at Callahan [illegible] Klamath River dredged in neighborhood of Hamburg for several [illegible]. Good dredging prospects all along river. Problem to be solved is one of economic construction of small dredge that can be operated in stream. Has led to use of orangepeel [illegible] shell dredges. Pay gravel not largely confined to [illegible] some rivers, but found in bed of river which has [illegible] been worked with bucket-elevator dredge.

JOLEY ([illegible])—New two-stamp mill installed. Property at head of [illegible] Gulch.

CONZETTI ([illegible])—Small stamp mill will be increased, since development warrants more extensive work and some [illegible] producer.

Tuolumne County

ELEANOR MINING [illegible]—New corporation to operate in Tuolumne County with capital stock of $500,000. Directors: Cappel Cohen, M. L. [illegible], Willis D. Parker, of San Francisco; C. J. Doelering and J. A. McGowan, of Oakland and H. C. Anderson and W. H. [illegible], of Alameda.

MILL VILLA (Sonora)—This gravel mine sold by Henry Cavill to San Francisco men. Price reported, $9000. Property in early days occupied by flour mill and residence, and in [illegible] times flour mill was considered about as valuable as gravel mine.

COLORADO

Clear Creek County

GOLD HILL MILL (Idaho Springs)—New concentrating table known as Egan being tried out on Vindicator ore.

Dolores County

LILLIE D. (Rico)—Robert L. Greene, of Providence, R. I., and Hal. J. Sisty, of Rico, have taken bond and lease and will begin development.

Gilpin County

PENNSYLVANIA (Central City)—New mill containing crusher, feeders, ten 1050-lb. stamps, two Gilpin bumpers and two Wilfley concentrators erected.

Lake County

MILLER (Leadville)—While excavating for mill foundations, fine gold-bearing vein struck, is being developed. In mine proper adit encountered shoot yielding 3-oz. gold ore.

PENROSE (Leadville)—In preparation for plant to unwater Downtown district, according to plans of Downtown Pumping Co., electric transmission line being built and transformer house erected. Many other improvements under way.

San Juan County

OPHIR (Cripple Creek)—This Raven Hill mine secured by Conners & Harris under long-term lease. Underground workings being overhauled and repaired and property being equipped preparatory to campaign of systematic development.

SILVER LEDGE (Chattanooga)—Mine unwatered by Bonavide & Matties, underground workings being placed in repair. Systematic development contemplated on main vein. Mill placed in operating condition and force of men now at work repairing tramway damaged two years ago by snowslides. New equipment will be installed.

Summit County

TONOPAH PLACERS (Breckenridge)—Reported No. 3 boat, in Galena Gulch, made recovery during September, of approximately $80,000. No. 1 boat, in Blue River at mouth of Swan River, has crossed right-of-way of Colorado & Southern which was tied up 12 days in operation.

Teller County

ABOUT 200 TONS OF WASH from west slope of Bull Hill shipped to sampler. Material assaying about $[illegible] per ton, was washed down gulch by cloudburst last summer and banked against old railroad grade. Prospectors trying to determine its source.

MOUNTAIN BEAUTY (Bull Hill)—Goldsworthy - Shephard Leasing Co has secured property under favorable terms and will commence exploration at once. Supplies shipped to property and work of repairing and cleaning out old workings begun. Development work will be carried on through joint shaft.

IDAHO

Cœur d' Alenes

CŒUR D' ALENE PRODUCERS AT LAST CURTAILING on account of low lead prices, according to report.

TUSCUMBIA (Wallace)—Fine shoot of ore reported encountered in raise from lower tunnel of the Idora Hill, tunnel leased to Tuscumbia. Raise will be continued, completion likely to be followed by deal to make Tuscumbia shipping property.

MICHIGAN

Copper

WINONA (Winona)—Operations on limited scale resumed, 30 miners entering into contract arrangement. Mining in No. 3 shaft on tribute; of course taking copper from richest portions.

VICTORIA (Victoria)—Operating to full capacity; copper well sold up, money enough in treasury to carry mining operations through remainder of season. Costs above 11c. but management feels it can afford to carry copper rather than to shut down mine and lose efficient working force. Moreover general underground conditions are better than ever before.

MINNESOTA

STEEL CORPORATION ORE FLEET will practically all be laid up for winter by Nov. 7.

Cuyuna Range

CROFT (Crosby)—Dale & Baumgartner, railroad contractors, have started work on Northern Pacific extension to mine.

KENNEDY (Cuyuna)—Season's shipments completed including entire stockpile. Daily product now being stocked again.

ROWE (Riverton)—Shipments discontinued; no reason assigned. Stripping operations continue wth one shovel and two hydraulic units.

CUYUNA RANGE TAXATION of iron ore will hereafter be on a per ton basis, similar to plan followed on Mesabi.

Hearings now in progress at St. Paul to determine equitable basis for such taxation.

HILL CREST (Ironton)—Clearing in progress preparatory to stripping operations on this fourth Cuyuna openpit. Dumping ground also being drilled. Northern Pacific will haul tonnage. No organization details announced.

CUYUNA-SULTANA (Ironton)—No. 2 shaft now down 32 ft. Orebody should be reached Nov. 1. Company intends to strip northern part of its 40-acre tract this winter and operate by milling system. Product is manganiferous iron ore, similar in composition to Cuyuna-Mille Lacs ore.

CUYUNA IRON & MANGANESE ORE CO. (Crosby)—Clement K. Quinn and associates, of Virginia, Minn., have taken over lease at advance from 40c. per ton to 60c., making cash payment of $25,000 to apply on advance royalties. Property will be stripped next spring and shaft also sunk for milling operations. Property adjoins Pennington pit on north and northwest, but is not extension of that ore deposit; contains some ore running over 30% in manganese, but main deposit is low-manganese iron. Land was recently check drilled by Jones & Laughlin, but not taken over. Incidentally, $25,000 furnished dividend No. 1 to Cuyuna Iron & Manganese stockholders, first dividend paid by any of typical stock companies on range.

Mesabi Range

SPRUCE (Eveleth)—Stockpile all shipped and 25 cars going forward daily from shipping pocket. Operations will continue through winter.

THORN (Buhl)—Shaft just started on this new property of Great Northern interests; north of Sharon mine, near Sect. 17 shaft; orebody said to cover large area, but of shallow depth.

MISSOURI-KANSAS-OKLAHOMA

Joplin District

NEW CENTURY MINING CO LAND again coming to front after being idle some time. New company took lease on mill and 40 acres of land, drained ground and is subleasing it to miners. Several shafts already in operation and some good prospects struck. Company in most cases cleans ore for miners in company mill.

SCARLET KID (Galena, Kan.)—Mine shut down several weeks installing new boiler for pumping. Expected to start mill soon.

DIPLOMAT (Galena, Kan.)—Mine one of largest producers in Galena district, running mill steadily from new shaft, mill shaft being shut down. Only one crew working cutting prospect drift.

NEW ENGLAND—Operations resumed after shutdown for three weeks on account of water which filled mines during recent heavy rains. New development work will soon be started in east shaft with hope of striking new run of ore believed to exist there.

MONTANA

Deer Lodge County

SILVER KING—Butte miners who have this mine on upper Lost Creek under lease and bond, opened deposit of high-grade silver ore; appears of considerable extent.

Missoula County

AMADOR MINING CO. (Iron Mountain)—Nine miles of railroad and townsite of Amador, both owned by company organized to promote Amador mine sold under hammer, Oct. 18, to satisfy judgment secured some weeks ago by former stockholders. Creditors represented by J. A. Kelley of Chicago. He stated nothing would be done with property until spring, when extensive improvements to make summer resort of the town of Amador are contemplated.

Silver Bow County

TUOLUMNE (Butte)—Crosscut from station on 2600 level struck lode Oct. 19, 275 ft. from station. Ore shows indications of being best yet taken from mine. Reports that Tuolumne had pulled pumps and would shut down indefinitely are declared by company officers absolutely without foundation.

BUTTE & SUPERIOR (Butte)—Shut-down of Black Rock mine night of Oct. 18, threw out of work 900 men, 150 to 200 being retained to assist in repairs to shaft and improvements at concentrator. Manager Bruce says repair work can be finished in about 60 days which will enable entire plant to start up again before Christmas. Known for some time extensive repairs to the shaft would be necessary during latter part of year. Portion caved in Oct. 17, without injury to anyone. Skip suspended under cage was caught in the squeeze at cave, torn loose and dropped 1250 ft. to point between 1500 and 1600 levels, where it rebounded into chippy compartment, breaking out several wall plates and center pieces. As temporary repairs would put shaft in no better condition than before accident, and would make recurrence of such accident probable, was decided to retimber from 300 to 700 level and make necessary repairs elsewhere, including improvements in mill.

NEVADA

Clark County

GOLD STRIKE EAST OF LAS VEGAS 22 miles, on old Quo Vadis property, rich producer in past but abandoned; 4-in. shoot of quartz, rich in free gold, opened. Rush made from Las Vegas, every available automobile and other conveyance pressed into service.

Esmeralda County

REOPENING OF SAMPLER AT GOLDFIELD strongly advocated following recent discoveries in district, especially in Jumbo Extension. Local or Columbia sampler of Western Ore Purchasing Co. closed year ago. Stated if plant is not reopened, local company will be organized to build new sampling plant.

Humboldt County

GOLDBANKS QUICKSILVER CO (Goldbanks)—Shipment of 43 flasks of mercury made recently.

GREAT WESTERN GEM CO. (Winnemucca)—Articles of incorporation filed with county clerk. Capitalization, $25,000. Winnemucca principal place of business. Company will mine for precious stones in Nevada, operating in Virgin Valley opal district.

Lincoln County

RAND MINING CO. (Pioche)—Company will incorporate and work mining property recently located in Jack Rabbit district. Stated contract will be let for considerable development work. Several cars ore shipped recently.

AMALGAMATED PIOCHE (Pioche)—Development work on 1200-ft. level proved oreshoot to be much larger than expected, work on 1400-ft. level making satisfactory progress. Water in winze lowered 145 ft. below 1200-ft. level. Change room at No. 1 shaft enlarged recently. Lessee south of No. 1 shaft operating three jigs and making good-grade zinc product. Results of tests on mine water, to determine suitability for use in boiler plant at No. 1 shaft satisfactory. Changes necessary for use of this water may be made this winter.

Lyon County

WESTERN NEVADA (Mason)—Stated lease granted to Constantine Bros. who are also operating property east of Yerington.

MASON VALLEY (Thompson)—Since closing, former employees at Thompson allowed to live in company houses free. Experimental leaching plant, Weidleis process, will continue operations. Results from test runs, up to 20 tons daily, entirely satisfactory.

Nye County

NORTH STAR (Tonopah)—Contract made to deliver to West End mill 150 tons per week. Mine force will be increased.

PIONEER CONSOLIDATED (Pioneer)—Ten-stamp mill now treating 40 tons daily. Ore stoped on 150- and 250-ft. levels, where shoot is 8 ft. wide and assays $10 per ton. Treatment is stamping, amalgamating, regrinding in Huntingtons, amalgamating, and leaching of sands. Stated 60% recovery made by amalgamation. Development work progressing with satisfactory results and large tonnage ore blocked out. Heating plant being installed in mill. Other properties operating in district are Yellow Jacket, Buguni, Rickard Lease and Indiana. Good showings also made on Bullfrog Pioneer Extension, Mullen & Murphy, Savage, Pioneer Syndicate, Mayflower, Marx, K. K., and Starlight claims.

Ormsby County

COMSTOCK DEVELOPMENT CO. (Empire)—Old mill tailings in Carson River being successfully retreated in plant below Empire. New channel being cut to divert river. Operations will be continued until ground freezes.

Storey County

MILLING PLANTS OPERATING IN VIRGINIA CITY DISTRICT are Butters, Fischer and Pfeifer in Six-Mile Cañon, that of Techow & Waterhouse lease on Cedar Hill and Yellow Jacket on Gold Hill; latter treating half Yellow Jacket dump and half Belcher mine ore.

OPHIR (Virginia City)—Central tunnel being reopened. Objective point original workings, where large tonnage of low-grade ore can be mined; this will be treated at company's milling plant.

MEXICAN (Virginia City)—Fire broke out Oct. 19. Following dispatch sent to presidents of United Comstock Pumping Association, Ophir and Con. Virginia by superintendent T. F. McCormick: "Fire proved to be in main Mexican stope. Probably started on 2500 level, but now high up in timbers. Smoke passes through both Ophir winzes but does not go south of them. Think damage will be confined to Mexican stope timbers and that fire will soon burn itself out sufficiently so that it can be more and more closely confined. Mexican already has bulkhead on 2000 crosscut to Mexican winze, and has battened Mexican door near Union line on 2500 level. Will seal Union shaft below old drain tunnel near surface. This will make strong draft from C. & C. side, holding back gases. Helmet men from Ophir side will then try to strip floors on 2500 coming south from Mexican stope to prevent spread of fire. Also putting two bulkheads on 2000 and one on 2100 of Ophir to guard against back drift of gases from up-casts. My opinion, Con. Virginia, Ophir and pumping plant absolutely safe from all danger and think workings of Union and Sierra Nevada can suffer no damage from fire. On 2100 level, there is long distance from Mexican stope to Ophir with no timbers, so should be no danger of spread of fire through there. On 2300, no connection to Ophir. Above 2300, Mexican stope untimbered, so will be little fire above 2300 and its connection to 2200 is bulkheaded. It seems certain is little danger from spread of fire, danger only that due to gases, requiring cautious handling of men. Am warning all men under me to preserve strict discipline, and take no risks whatever on their own initiative, and if my orders are obeyed, none will be risked." Whitman Symmes, superintendent of Mexican, in San Francisco at time started immediately for Virginia City. Reported fire under control, stope bulkheaded. Stated ground would be allowed to cool before removing bulkhead and returning to work. Fire supposed to have resulted from old fire that had slumbered for long time in ore sulphides having sufficient air to keep it alive.

White Pine County

HAMILTON POWER, MINING & TRANSPORTATION CO. (Hamilton)—Work resumed on Grand Prize group and considerable production being made.

NEVADA CON. (Ely)—Rumors that Veteran mine is to be closed denied by company. Force of 175 men [illegible] and no further reduction to be made as long as the [illegible] production. Work resumed on Veteran mine, Nov. [illegible] 1911, after year's shut-down on account of labor trouble. At that time ore reserves estimated sufficient to last one year at regular rate of production. Stated sufficient ore now developed to last several months.

NEW MEXICO

Grant County

COMMUNITY MILL at Pinos Altos under consideration by successful operators. Plans are to combine electrostatic methods and wet separation, etc.

TWIN PEAKS (Steins)—Sale of bonds progressing rapidly. Intention of company to erect 50-ton mill soon.

MOUNTAIN KEY JR. MINING CO. (Pinos Altos)—Company under organization at Silver City by George Jude recently of Mexico. Planned to take over Pinos Altos property of merit.

BURRO MOUNTAIN COPPER CO. (Tyrone)—Newspaper report of extensive mill construction exaggerated. Small force will be employed during winter erecting auxiliary buildings near mill site.

Santa Fé County

AMERICAN GOLD COPPER MINING CO. (Bonanza)—Property sold by receiver to George Heineman, Kansas City and A. P. Towne, Cerrillos, N. M., for $3168. Claims patented, carry low-grade copper-gold ore.

AMERICAN TURQUOISE CO. (Cerrillos)—Famous Tiffany turquoise mines sold to Frederick K. Gilbert for $24,000. Under mortgage to American Turquoise Co. J. H. Crist, commissioner. Claims formerly involved in litigation with M. F. Sena.

Socorro County

EMPIRE ZINC CO. (Kelly)—Tri-Bullion mill being remodeled and made into practically new plant. Company continues periodical shipments from properties in district.

NORTH CAROLINA

Cabarrus County

PIONEER—This mine, 17 miles east of Charlotte, optioned to John H. Furman, of London, England; plans now being made to reopen. Property not worked since Civil War. Yields gold and copper; proposed to concentrate and to cyanide tailings.

SOUTH DAKOTA

Lawrence County

IN TWO BIT DISTRICT near Deadwood, discovery of rich gold ore by Sweet & Hanson, lessees on small block of Monarch territory, attracted attention and stimulated work by owners of nearby property. Sweet & Hanson were driving tunnel from site on Monarch property to develop some of their adjoining holdings when ore was found. Mining of rich material steadily going forward for some time; over 80 tons shipped to Omaha. Ore shipped averaged $70. Monarch company is working nearby, and R. I. Zipp is sinking shaft on property, following vertical of $15 ore, which he is piling on dumps, owing to fact that there are no custom mills in district equipped to handle free-gold ore. Nearly two-thirds of Zipp's values in free state; balance could be cyanided. Is endeavoring to develop sufficient to warrant erection of mill.

JUNGLE (Roubaix)—Construction work on copper-leaching plant suspended on account poor market.

HEIDELBERG (Two Bit)—Shaft now 35 ft. deep; being sunk with windlass; plans call for installation of steam plant. At this depth ore shows sustained width and value.

NEW RELIANCE (Trojan)—Forest fire destroyed Bunker Hill hoist house in which was installed electric hoist operating skipway over which large portion of mill supply was sent. Repairs being made; meanwhile ore being drawn from other sources.

MOGUL (Terry)—Company has secured lease on Clinton group, Nevada Gulch, is installing air compressor, drills, etc., and will mine large body of quartzite. Mining will be done by sublessees. Freight on ore will be 65c. per ton, it being necessary to transfer from narrow-gage to standard-gage cars between mine and mill.

UTAH

Beaver County

MINING COMMITTEE OF SALT LAKE COMMERCIAL CLUB, which visited new gold camp of Fortuna reports favorable outlook, such as would warrant investment of capital to determine merit of properties. Strong quartz veins outcrop over considerable area, carrying free gold. Country rock is monzonite. Development work being done. Camp can be reached from Milford on Salt Lake Line by automobile.

MOSCOW (Milford)—During September 750 tons of ore produced. This came from neighborhood of 800 level, and according to management, had gross value of $15,000. In Back vein in old workings good lead-silver ore opened in four places. This vein carries more lead and less silver than Silver vein. Winze sunk in ore, 100 ft below 800. Drifting being done on 800 level of new shaft to make connections with old workings which will give about 250 ft. of stoping ground on dip of ore. About 150 ft remains to be driven. Both Silver vein and Back vein have been cut and drifted on from new shaft workings.

Juab County

TINTIC STANDARD (Eureka)—Fifty-ton shipment of ore carrying lead and silver being made. New hoist installed on 1000 level, ore being broken on 1200.

Salt Lake County

MICHIGAN-UTAH (Alta)—Company being reorganized, more than 75% of bondholders having signed agreement to that effect. Reorganization being promoted by Judge Haire.

OHIO COPPER (Bingham)—Effort of Heinze to have bankruptcy proceedings set aside ruled against by Judge Mayer in New York. Heinze claims conspiracy of interests hostile to him, and that Ohio copper should not have entered bankruptcy court. Judge Mayer said he was satisfied that company, acting through directors had power to be adjudicated bankrupt. Apparent company could not for various reasons pay debts, and situation was accentuated by condition of copper market; situation is precarious and can only be worked out through court action as preliminary step.

Tooele County

WILSON CONSOLIDATED MINING (Wendover)—Company in Deep Creek district will ship 25-ton lot of bismuth ore, carrying gold and a little silver. Vein runs up to 7 ft. in width. Ore carrying about 8% bismuth hand jigged so as to bring shipments up to about 20%. Gold is largely free.

Utah County

MOUNTAIN DELL (American Fork)—Property recently sold by sheriff to R. N. Baskin.

VIRGINIA

LITTLE ELLIOTT (Calverton)—This gold mine sold by Clayton E. Emig, of Washington, to Colorado company, which will develop and operate. Vein opened to 200 ft. depth; ore shipped to Norfolk several years ago. Recently, small extemporized mill erected and operation claimed to be successful.

WASHINGTON

Ferry County

KELLER & INDIANA CONSOLIDATED MINING CO. (Republic)—Property sold under judgment recently, bid in by Lester P. Edge, prominent Spokane attorney, for $1160. Included in purchase is Boyle smelting plant, dam, flumes, generating machinery and other equipment at Keller, erected at cost of $300,000 by Indiana investors. Mining property developed by 2000-ft. tunnel not included in transaction.

WISCONSIN

Zinc and Lead

B. M. & B. (Mifflin)—Company has taken over Biddick lease and removed Slack mill to Biddick shaft.

WISCONSIN ZINC (New Diggings)—Champion mill of 500 tons capacity made initial run; is largest mill in district. Mine is new producer.

ALDERSON—Mill of Charles Kistler and H. E. Stephens assembled and being wired and equipped with dynamo and motors to operate with electric power furnished by Interstate Light & Power Co.

MINERAL POINT—Coker No. 2 mill completed and placed in operation at Livingston; Penna-Benton mill, at Benton, completed and will be started milling within next two weeks upon completion of shaft.

CANADA

Ontario

COBALT TOWNSITE—Hoisting begun from new shaft, 400 ft. deep, with capacity of 300 tons per shift.

BEAVER (Cobalt)—New vein carrying 3 in. of high-grade encountered on 530-ft. level, 125 ft. west of main shaft.

JUPITER (Schumacher)—On 400-ft. level, 200 ft. good ore developed. Vein on 475-ft. level widened to 4 ft., with gold averaging high.

LAKE SHORE (Kirkland Lake)—Three-drill compressor and 50-hp. boiler in operation and 40-ft. shaft will be put down 100 ft.

SAVAGE (Cobalt)—New vein recently struck on 110-ft. level stated to be rich. At bottom of winze now down 22 ft., ore is 4 to 5 in. wide, reported to run 10,000 oz.

KIRKLAND LAKE GOLDFIELDS (Kirkland Lake)—Shaft being sunk; property formerly known as McKane claim; extension of No. 3 vein of Teck Hughes, adjoining. Station will be cut at 100 ft.

CASEY-COBALT (Cobalt)—After sinking 100 ft. in clay overburden, company is putting down new shaft to 400-ft. level to pick up vein indicated by diamond drilling. Mill is treating 100 tons daily.

CROWN RESERVE (Cobalt)—Profits following draining of Kerr Lake will probably be postponed until next year, as lake bottom will have to be cleared of clay before development can proceed. Present expenses being met out of milling rock; high-grade ore almost all stoped out.

PORCUPINE CROWN (Timmins)—Position of this mine latterly considerably improved. Vein picked up beyond fault on both 300- and 400-ft. levels. On 300-ft. there is 160 ft. of $18 ore over width of 4 ft. On 400-ft., vein has been traced 30 to 40 ft. beyond fault, carrying 5½ ft. of $20 ore.

HOLLINGER RESERVE (Timmins)—Company gone into liquidation, with liabilities estimated at $75,000; principal creditors being Ben Hollinger, $40,000, and General Development Co., $30,000. Ore on dump has estimated value of over $65,000, but prevailing financial stringency rendered it impossible for company to meet obligations.

LA ROSE (Cobalt)—Quarterly report shows surplus, Oct. 1, of $1,396,619. Dividend of 2½% calls for disbursement of $187,500, paid from accumulated surplus and not from profits, as total earnings for first eight months of year amounted only to about $154,000. After ore now known to be in Princess claim is exhausted that property and Fisher-Eplett will be closed down.

MEXICO

Sonora

PILARES (Nacozari)—This Moctezuma Copper Co. mine reported as having reduced production to 60%. Was running full time up to time of war, having paid taxes to military party, getting protection and having been almost immune from interference since first revolution started in 1910.

SOUTH AMERICA

Bolivia

CIA HUANCHACA DE BOLIVIA (Huanchaca)—Efforts being made to increase efficiency of water-power plant to provide sufficient power for pumping out mine and undertaking deeper work. Only lead and silver being recovered from ore now mined, but preparations being made to recover zinc. Concentrates shipped to United States.

The Market Report

METAL MARKETS

NEW YORK—Oct. 28

In the early part of the week, a rather large business in copper was done, and hopes for this market became stronger, but late events threw everything into confusion again. A large business has been done in lead and the market is stronger. Spelter has been dull. Tin advanced sharply and then declined. Silver declined seriously on account of the operations of the German cruiser "Emden" in the Indian Ocean.

The London Metal Exchange will be opened on Nov. 4.

Some international metal houses have lately been making more money by selling sterling exchange and buying marks than by trading in metals.

Copper, Tin, Lead and Zinc

Copper—The gradual improvement in the conditions of this market proceeded further, and during the last calendar week it could have been said rightly that the market appeared to have regained approximately normal conditions upon the basis of the curtailed production. The shipments abroad had increased, domestic consumers had become more ready buyers and sellers were more free to act. Producers, lately, have not been quite so stiff as they have been represented. Several of those who have been mentioned as holding at 11½c., delivered, regular terms, have, in fact, been accepting 11¼c., but at the latter figure there seemed to be real resistance, and consumers who were waiting to buy copper at 11c. made up their minds they were not going to get it at that. On Oct. 23, a business of some millions of pounds was done at 11¼c., delivered, regular terms, with domestic consumers.

Some substantial business was also done in the early part of the week at 11⅜c., delivered, regular terms. Sellers who subsequently raised their price to that figure, however, reported inability to realize it. Sales have also been reported at below 11¼c. In fact, there was a good deal of uncertainty and confusion after the early interest of the domestic consumers waned. This uncertainty and confusion increased very seriously when, on Oct. 28, came the news of the detention by the British of five ships carrying copper to Italy and Scandinavia. If the foreign outlet for copper is going to be limited to Great Britain, producers do not yet know where they are going to stand. At present, the English market is glutted with copper that has been sent over there on consignment. Late events of this week show the uncertainties which still overshadow the copper market. Just as it was supposed that conditions had regained approximate equilibrium, new events transpired that exhibited the disorganization of commerce in this metal.

The steamships "Regina de Italia," "San Giovanni" and "Kroonland," carrying copper from New York to Italian ports, have been detained at Gibraltar. The "Prosper III" and another ship, whereof we do not know the name, carrying copper to Scandinavia, have been detained at Scottish ports. These ships are said to be carrying 4000 to 5000 tons of copper. The consignors are framing a new protest to the Department of State. The steamship companies have notified shippers that they will not accept shipments for Italy and Scandinavian countries unless it be guaranteed that the shipments are for consumption in those countries. Shippers are naturally unable to give such guarantees.

It is reported that Italy has placed an embargo on shipments of copper out of that country.

Russia, so far as reported, has bought only about 250 tons of copper in this country, but has bought a great deal of lead, antimony and nickel, the shipments of which are now afloat.

Base price of copper sheets was reduced ½c. on Oct. 22 and is now 16½c. per lb. for hot rolled and 17½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 12@12½c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 5349 long tons. Our special correspondent gives the exports from Baltimore at 1055 tons.

The Kyshtim Corporation is expected to produce about 7500 tons of copper this year against 7800 tons last year. An increase was expected this year but the war interfered. However, the Russian government is affording special facilities to get the copper to market and the company is realizing £75 per ton.

Copper wire is said to have been offered at 12c. per lb.

Electrolytic copper realizes about 20c. per lb. in Germany

Tin This market became very firm at the middle of the last calendar week, when it became known that a steamship carrying about 1000 tons of tin had been sunk London dealers became excited over the loss of visible supplies and bid up the market violently. Buyers here declined to follow the advance and refrained from purchasing. The absence of American orders had a dampening effect on London, wherefore the market declined and closes weak.

Tin exports from the Straits seven months ended July 31. United States, 10,766; Great Britain, 20,503; other Europe, 7511; China, 150; India, 1117; total, 40,047 long tons, an increase of 3289 tons over last year

Arrivals of Bolivian tin in England in September were 2280 tons concentrates and 4 tons bars, the whole equivalent to 1372 tons fine tin. Arrivals from Nigeria were 197 tons concentrates, carrying 138 tons tin.

Lead The drastic curtailment of production in Idaho and Missouri apparently impressed the minds of consumers, who purchased very freely, especially on Oct. 22 and 23, when the transactions amounted to many thousands of tons, the average of the business being 3.50c., New York, and about 3⅜c., St. Louis. Since then a steady business has been done and the market has been very firm. Some relatively small sales for export were made during the week.

Spelter The advance continued a little further Some carload lots realized as high as 5c., but the larger business was done at an average of about 4.95c The total volume of business was of only moderate proportions, and the market having lost all of its snap, the price has gone off quite a little since Saturday A small tonnage of spelter was sold for export

We hear that all of the zinc smelteries of Belgium are now idle Those of Rhenish-Prussia are said to be operating at about 30% of their ordinary capacity

DAILY PRICES OF METALS

NEW YORK

			Copper	Tin	Lead		Zinc	
Oct	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
22	4.9475	50	*	31½	3.50	3.35 @3.40	5.05 @5.15	4.90 @5.00
23	4.9475	49⅝	*	31¼	3.50	3.35 @3.40	5.05 @5.15	4.90 @5.00
24	4.9238	49⅛	*	31½	3.50	3.35 @3.40	5.05 @5.15	4.90 @5.00
26	4.9050	48⅞	*	31¼	3.50	3.35 @3.40	5.05 @5.10	4.90 @4.95
27	4.9000	48¾	*	30½	3.50	3.35 @3.40	5.05 @5.10	4.90 @4.95
28	4.8950	48½	*	29¾	3.50	3.35 @3.40	5.05 @5.10	4.90 @4.95

*No quotations.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St Louis is given as the basing point. St Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St Louis-New York, 15½c; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c; Chicago-Baltimore, 10½c; Chicago-New York, 13½c.

Other Metals

Aluminum—[illegible] is rather quiet, but a little better tone. [illegible] quotations are 18@19c. per lb. for No. 1 [illegible]

Antimony—[illegible] is in a peculiar position. Nearly [illegible] been bought up by Russia, Eng- [illegible] over 300 tons have already been shipped [illegible] have been stopped, so that no more [illegible] received here for sale. The only supplies [illegible] limited quantity of Chinese The market has [illegible] ted condition. Quotations for ordinary antimony [illegible] unsettled at 14@15c. per lb. Cookson's has sold [illegible] is held at 17½@18c. today.

Quicksilver Demand is fair and the price here has remained around $50 per flask of 75 lb. In London, there has been a sharp advance and the price has gone up to £11 per flask

Gold, Silver and Platinum

Gold—On Oct. 22 shipments of $4,747,000 gold were made from New York to Canada. Later shipments made a total of $7,400,000 for the week.

Sales of gold bars by the New York Assay Office in September amounted to $2,415,017, being $397,471 less than in August and $967,198 less than in September, 1913. For the nine months ended Sept. 30 sales were $25,177,494 in 1913, and $24,315,433 in 1914; a decrease of $862,061. These sales do not include export transactions.

Gold and Silver Movement in the United States nine months ended Sept. 30, as reported by the Department of Commerce:

	Gold		Silver	
	1913	1914	1913	1914
Exports ...	$74,079,279	$157,656,778	$49,022,237	$38,480,444
Imports	46,199,608	39,941,946	27,430,312	17,791,486
Excess, exports	$27,879,671	$117,714,832	$21,591,925	$20,688,958

Expors of merchandise for the nine months this year were valued at $1,467,538,446; imports, $1,409,565,530; excess of exports, $57,972,916. Adding excess of gold and silver gives $138,403,790 as the total export balance.

Imports of Gold in Great Britain nine months ended Sept. 30 were £48,121,752, exports, £29,374,025; excess of imports, £19,047,727, against £12,434,843 last year.

Iridium- This metal is scarce and prices are largely nominal Dealers are reluctant to give definite quotations. Sales have been small.

Platinum—The market is still unsettled and it is hard to get quotations with any exactness, most transactions being the result of special negotiation. Nominal quotations are $48@50 per oz. for refined platinum; hard metal, $53@57 per oz., according to quality.

Silver The market continues dull; supplies, though limited as compared with normal shipment, are still sufficient to meet all demands

Official quotations of silver in London for the week were: Oct. 22, 22$\frac{1}{16}$d. per oz. standard; Oct. 23, 22$\frac{11}{16}$d.; Oct. 24, 22½d.; Oct. 26, 22½d.; Oct. 27, 22½d.; Oct. 28, 22⅜ pence.

Zinc and Lead Ore Markets

JOPLIN, MO.—Oct. 24

Blende showed high price, $43; assay base, $40@43; metal base, $39@41, per ton of 60% zinc. Calamine base, $22@23 per ton of 40% zinc. Average, all grades of zinc, $38.30 per ton Lead had a high price, $42.50; base, $40, per ton of 80% metal content, average, all grades of lead, $40.18 per ton.

One producer claimed tonight to have an offer of $45 for next week's delivery, declining on the ground that it would probably be no lower and might be higher. Best blende advanced only $1 to $3, while second grade and heavy [illegible] advanced $5 to $7 per ton

SHIPMENTS WEEK ENDED OCT. 21

	Blende	Calamine	Lead	Value
Totals this week ...	9,320,170	556,840	1,597,690	$221,140
Totals this year ...	427,686,450	31,590,500	73,993,360	$10,587,870

Blende value, the week, $182,870; 43 weeks, $8,482,190.

Calamine value, the week, $6190; 43 weeks, $368,850.

Lead value, the week, $32,080; 43 weeks, $1,736,830.

PLATTEVILLE, WIS.—Oct. 21

The base price paid this week for 60% zinc ore was $40@41 per ton. No [illegible] reported

SHIPMENTS WEEK ENDED OCT 21

	Zinc Ore, lb	Lead Ore, lb	Sulphur Ore, lb
Week	2,[illegible]	..	168,700
Year	[illegible]	[illegible],730,700	27,945,210

Shipped during week [illegible] plants, 2,555,200 lb. zinc ore

IRON TRADE REVIEW

NEW YORK—Oct. 28

The Navy Department has awarded the contracts for the armor plates for three new battleships. The Bethlehem Steel Co. gets the contract for 16,256 tons, for which it will receive $7,121,808; the Midvale Steel Co., 8128 tons, for which $3,559,404 is the contract price

The United States Steel Corporation reports for the quarter ended Sept. 30, net earnings after paying working expenses, ordinary maintenance and renewals, as follows.

	1913	1914
July ...	$12,936,658	$7,475,993
August ...	12,657,430	7,584,926
September ...	12,856,312	7,215,083
Quarter ...	$38,450,400	$22,276,002
Sinking and depreciation funds, etc. ...		$7,593,980
Interest and sinking fund ...		5,746,111
Total charges ...		$13,340,091
Balance, surplus for the quarter ...		$8,935,911
Dividends ...		8,846,432
Undivided surplus ...		$89,479

The usual dividend of 1¾% on preferred stock was declared; but the dividend on common stock was reduced from 1¼ to ½%. The total net earnings for the nine months ended Sept. 30 were $60,727,959, against $114,097,014 last year.

Production of Pig Iron in Germany in July is reported at 1,095,443 metric tons, a decrease of 553,375 tons as compared with July, 1913. For the seven months ended July 31 this makes a total of 11,225,081 tons in 1912, and 10,383,639 in 1914; a decrease of 841,412 tons, or 7.5%, this year .

IRON ORE

Light shipments from Lake Superior are expected in November. It is announced that the Steel Corporation ore fleet will be laid up about Nov. 7. Other companies will follow soon after.

Iron-ore imports in Great Britain nine months ended Sept. 30 were 5,774,351 long tons in 1913, and 4,527,776 in 1914; decrease, 1,246,575 tons.

An embargo has been placed on exports of manganese ore from India to any ports except those in Great Britain.

COKE

The Connellsville coke market continues slow and shipments are chiefly on contract.

Coal and Coke Tonnage of Pennsylvania R.R. Lines east of Pittsburgh and Erie, nine months ended Sept. 30, short tons:

	1913	1914	Changes
Anthracite ...	7,665,020	8,149,935	I. 484,915
Bituminous ...	37,774,323	36,112,774	D. 1,661,549
Coke ...	10,859,413	7,603,937	D. 3,255,476
Total	56,298,756	51,866,646	D. 4,432,110

The total decrease this year was 7.9%; the greater part of the loss being in coke tonnage

CHEMICALS

NEW YORK—Oct. 28

The general markets are quiet and there has been little change from recent reports.

Arsenic—The demand is moderate and there is no material change The current quotation is $3.75 per 100 lb. for white arsenic.

Copper Sulphate—The market is not specially active, but is steady. Quotations are unchanged at $4.50 per 100 lb. for carload lots, and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business remains quiet, with no special change and moderate sales Quotations are 1.87½c per lb. for spot and November-December deliveries; 1.90@1.92½c. per lb for futures from January.

NEW CALEDONIA ORES

Ore shipments from New Caledonia seven months ended July 31 are reported by the "Bulletin du Commerce" of Noumea at 52,498 metric tons nickel ores, 920 tons cobalt ore and 39,789 tons chrome ore. Metal exports were 2275 tons nickel matte.

The Engineering and Mining Journal

VOLUME 98 NOVEMBER 7, 1914 NUMBER 19

The Calumet & Hecla Dredge

By L. E. Ives*

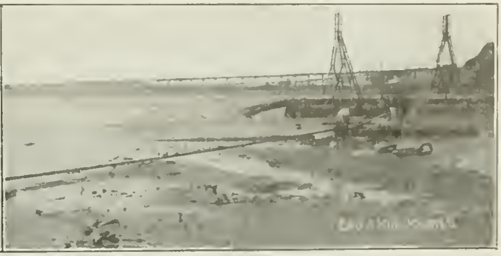
SYNOPSIS—The Calumet & Hecla company will reclaim the sands in Torch Lake by a suction dredge fitted for the deepest digging yet done by that system. Some of the sand will require screening on the dredge, this screening presenting an interesting problem.

⁂

In the Journal for July 18 and Aug. 22, 1914, rather brief mention was made of the fact that the Calumet & Hecla Mining Co. was completing the erection of a large hydraulic dredge, to be used in handling the tailings in Torch Lake, Mich., adjacent to the stamp mills. A more complete and detailed description of this dredge is now available.

For more than 40 years the Calumet & Hecla company has been depositing its mill tailings in this lake, and they were long considered worthless. Improved methods of mining and treatment, leading to lower costs, coupled with a gradually decreasing copper content as the depth of mining increased, eventually caused serious consideration to be given these deposits. Subsequent experiments indicated a recoverable value and a method. An important part of the problem was an economical means for getting the sands out of the lake and into the treatment plant on shore. The amount of these sands, including those on shore and that portion entirely covered with water, has been estimated to be about 40,000,000 tons. A hydraulic dredge of unusual design was decided upon and this has been under construction during most of the last summer at Lake Linden, Michigan.

The Calumet & Hecla Dredge Completed



End of Discharge Line, Showing Pontoons

The dredge, which was designed and built by the Bucyrus Co., South Milwaukee, Wis., is intended to dig to a depth of 100 ft. below the surface of the lake, a greater depth than has ever before been attempted by a hydraulic dredge. Up to the present, the maximum depth dredged in this manner has been attained by the sand suckers in Long Island Sound, a depth of 70 ft. Certain conditions that had to be met rendered the design of the dredge a somewhat complex problem. Portions of the tailings piles have been used as a public dump in the past, and consequently contain some foreign matter. This necessitated screening the material thoroughly before delivering it to the plant on shore. But since only a portion of the material requires screening, such an arrangement of the dredge was also necessary as would permit the screen to be cut out when not required. This has led to the use of two pumps and a complicated control. The hull is of steel, 110 ft. long, 56 ft. wide and 9 ft. deep. In addition, the deck has an 8-ft. overhang, making the extreme width of the hull 72 ft. The digging ladder is 136 ft. long requiring a ladder well 70 ft. long and 10 ft. wide. This unusual length of well demanded an exceedingly heavy overhead truss. There are two centrifugal dredging pumps, each 20 in. in diameter. No. 1 pump is driven by a 750-hp. motor and No. 2 by a motor of 1250 hp. Pump No. 1 delivers the material directly from the lake to the screen on the dredge.

When the screen is disconnected, which is done by changing the pipe connection, this pump delivers the material ashore through a pipe line 800 ft. long, with a maximum elevation of about 30 ft. No. 2 pump delivers ashore from the sump under the screen through a pipe line 2500 to 3000 ft. long, with a maximum elevation of about 10 ft. This pump is designed for connection to the suction pipe to deliver the material directly from the bottom of the lake to the shore in place of No. 1 pump. Either pump may be used independently when the screen is not in use, the decision as to which pump should be used depending on the length of the pipe line at the time. It is impossible, of course, to make one pump suffice, as the screen, when in use, breaks the flow. This screen is 7 ft. in diameter, about 45 ft. long, and is made of manganese plates with 1-in. circular perforations. It delivers the refuse to a scow alongside the dredge.

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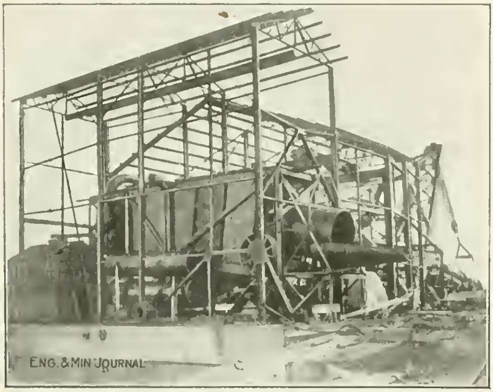
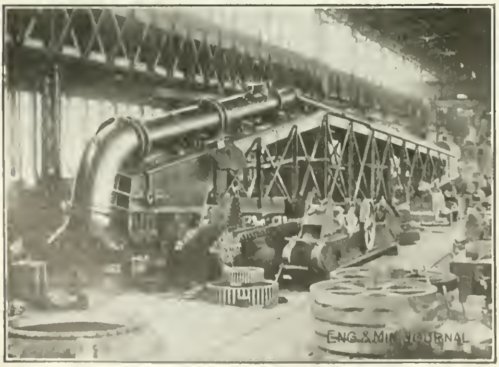
*Chicago editor, "Engineering and Mining Journal."

DREDGE WORKS ON HEAD AND SIDE LINES

The sands are of a loose character, having no binder, and the use of a cutterhead is unnecessary. Hydraulic jets, however, are provided to break up the material if required, and are operated by an 8-in. 2-stage, horizontal, double-suction turbine pump, driven by an independent motor. Because of the great depth of the lake and the soft nature of the material, the dredge works on head and side lines instead of spuds. It is customary on dredges of this type to have one winch, but the length of the ladder well in this one makes the use of two winches necessary. Each of these winches has four drums, one each for the ladder hoist, two bow swing lines, two ladder swing lines, two stern swing lines and a tail line. Each is driven by an independent 50-hp. motor.



THE DREDGE DURING CONSTRUCTION

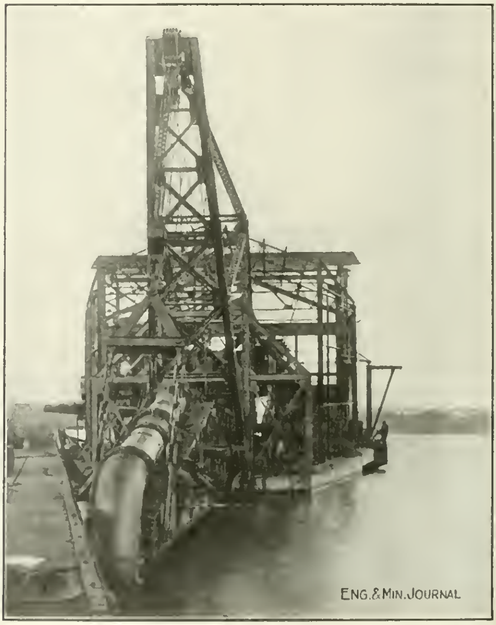


LADDER AND SUCTION IN BUCYRUS SHOPS

A compressor furnishes air to operate the air cylinders which control the friction clutches. Provision has been made to seal the swivel joints in the suction pipe, to prevent air leaks, by using a 6-in. service pump of the same type as the jet pump. There is also an overhead crane for serving the machinery. It was necessary to make some provision for heating the dredge, and a 75-hp. boiler has been installed which will also furnish power for driving the capstans and for the electric-light plant when the dredge is being shifted and no electric power is available.

PUMPS ARE BALANCED

The use of two pumps caused some unusual features of control. In the first place, the pumps must be balanced, so that No. 1 will not deliver more material than No. 2 can take care of. No. 1 works under a constant load, while the load that No. 2 carries varies according to the length of the discharge pipe which is being used. A careful adjusting of the speeds of the pumps was therefore necessary. To accomplish this, a water rheostat has been adopted, and this is said to be the first time it has ever been tried in the United States for large motors. This rheostat gives an infinite number of speed-control points, and is therefore flexible. The speed is governed by the height of the liquid in the rheostat tanks, and the flow is controlled by a pivoted overflow pipe, which is full on when in a vertical position and off when horizontal. The operator controls the position of the pipe. Because of the danger of heating, the liquid must be kept in circulation; it is pumped through cooling coils and returned to a storage tank overhead, from which it flows by gravity into the

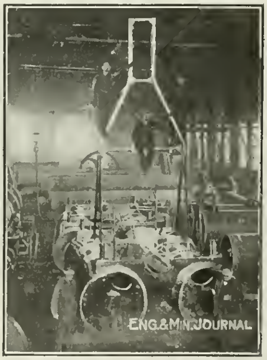


BOW END OF DREDGE

rheostat tanks. The flow is controlled by a valve with an automatic solenoid control, and a 3-in. centrifugal pump driven by an independent motor, does the pumping. Another interesting feature is the interlocking electrical control which prevents starting and stopping the pumps in the wrong order. The electrical-control apparatus on the dredge was furnished by the Cutler-Hammer Mfg. Co., Milwaukee, and the motors are from the General Electric Co. The electric power to be used is 2100 volts, 25-cycle, 3-phase.

Discharge Line

The discharge line and the means used to support it are specially interesting. The great amount of material to be dredged made it desirable to employ unusually durable pipe. Lap-welded steel pipe was finally installed throughout. The line consists approximately of 500 ft. of floating pipe and 1250 ft. of shore line, and is all 20 in. internal diameter. The majority of it is ½ in. thick, but a few lengths of ¾-in. pipe were inserted for experimental purposes as to durability. Most of the floating pipes have oval bands welded on the ends for joining by rubber sleeves, but two flexible joints have been used for comparison with the sleeves. One of these is a Parker joint and the other is a special design of manganese steel with a manganese liner. The floating line is made up of 20-ft. lengths, and the shore line of 30-ft. lengths. The latter has rolled-steel flanges shrunk on the ends for joining the pipes together. When the pipe wears out, these flanges will be cut off, bored out and shrunk on new pipe, permitting the renewal of the line with plain-end pipe, and the indefinite use of the old flanges.



Pontoon and Tower for Wire Supports

Pontoons

Twenty-six pontoons carry the floating discharge line. Each pontoon consists of two steel cylinders, 48 in. in internal diameter and 17 ft. 2 in. long, with the necessary structural work. The sides of these cylinders are ¼ in. thick, heads 5/16 in., and they are forge-welded throughout. Rivets were employed only to secure the structural work and cross-bracing between the cylinders, and these rivets were all placed above the water line. An accompanying illustration shows one of these pontoons being erected, and brings out well the structural tower which carries the high-tension wires for operating the dredge. Each tower is provided with a ladder to permit easy access. It is hoped that the use of welded pontoons and an absence of rivets below the water line will result in a longer life for the pontoons, due to the smooth surface and consequent freedom from erosion.

The severity of the winters in the Michigan copper country led to another feature in this installation. It was important that enough material be stored within a small radius, close to the regrinding plant, to insure operation of the latter through the winter. It is possible to keep the ice broken over only a small area. To accomplish this a portion of the discharge from the 20-in. line from the dredge is carried to the selected area, during the summer, through a Y-valve and a separate line. In the winter, the regrinding plant can get a supply from this storage bank. A structural bridge, swinging over the entire bank, carries the suction line which connects to a centrifugal pump in the regrinding plant. This suction line is made up of 12-in. lap-welded pipe, ½ in. thick, with forge-welded flanges. A special suction head is provided with a manganese cutting blade, swivel joints, flap valves, etc., all made with manganese wearing parts. The pipe line and pontoons were furnished by the M. W. Kellogg Co., Engineers and Contractors, 50 Church St., New York. The dredge will not be operated to full capacity, probably, until next spring.

*

How a Bureaucracy Runs the Post Office

The Boston *News Bureau* has seen a recent report on postage on second-class mail matter and compensation for the transportation of mail submitted by a congressional joint committee, and says that it is a sweeping arraignment of the "vacillation and inconsistency" of the post-office department. While it is only fair to state that four out of the six members of the committee dissented from the vigorous criticisms of the post-office department, all were agreed that the report correctly states the finding of facts on the subject of railway mail pay. The committee was composed of Jonathan Bourne, Jr. (chairman), Harry A. Richardson, John H. Bankhead, James T. Lloyd, William E. Tuttle, Jr., and John W. Weeks. The following quotations are from this report:

> Before closing this report, we deem it our duty to inform Congress that our work has been greatly handicapped by a deplorable lack of definite information in the post-office department regarding its own operations and by the attitude of the representatives of both the post-office department and the railroads.
>
> Notwithstanding numerous concrete instances of departmental vacillation and its lack of comprehension of the essentials of successful business operations, we are confronted with the fact that the present postmaster-general and his predecessor have each furnished an illustration of the greed for additional power innate in humanity by advocating government ownership and operation, under the post-office department, of the telephone and telegraph systems of this country.
>
> With any reasonable degree of effort, the department should be able to give accurate statistics regarding the extent of its activities, the cost of the service, and the revenue therefrom. The fact is, on the contrary, that the department has not been and is not now so conducted as to be able to do this, although attention has been called to the defects in the accounting system.
>
> While it is an injury to the pride of an American citizen to know that the most important of our governmental institutions is so utterly lacking in knowledge of its own business affairs, as this record has disclosed, we believe it is a duty we owe to the country, to Congress, and to ourselves to state these facts in order that others may not be misled by assuming that departmental statistics are reliable.
>
> This exposé of the inadequacy of departmental statistics and the vacillation and inconsistency of the department is not prompted by partisan feeling. The record has been made in the administration of two political parties.
>
> Possessed of the power the post-office department has requested in the various measures it has proposed and advocated, the postmaster-general might well exclaim in the language of a famous European monarch, "The state! I am the state!"
>
> In view of the evidence showing the inability of the department to procure and present reliable statistics regard-

ing its own operations, it is difficult to conceive how the department could imagine itself competent o make an apportionment of expenses between freight and passenger train service and among passengers, express and mail.

Equally difficult is it to comprehend by what course of reasoning the department could bring itself to believe that Congress might enact a law which required the railroads to carry mail and then bestowed upon the postmaster-general the power to fix the rates.

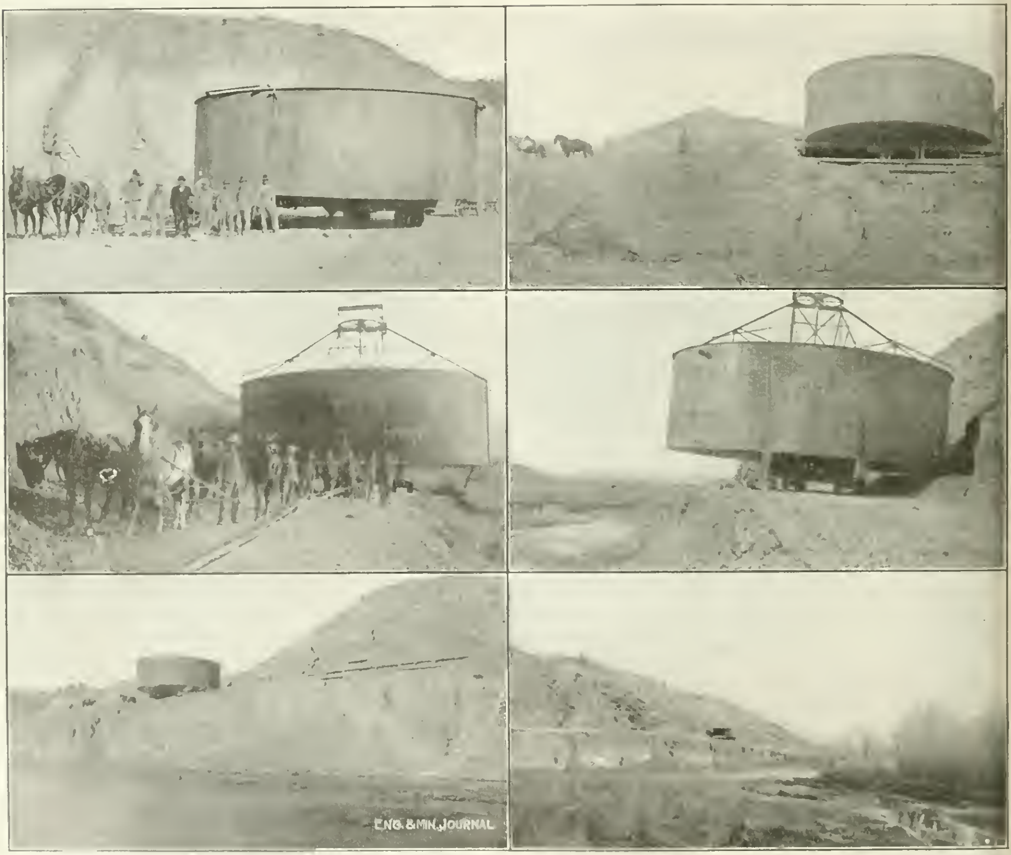
Verily, this is bureaucracy gone mad!

*

Moving Steel Tanks without Dismantling

By Henry Eggers*

After obtaining a lease on the old Metallic tailings dump, situated about two miles from the once thriving mill city of Florence, Colo., it was necessary to secure a plant suitable for the treatment of the tailings by the cyanide process.



Moving Steel Tanks without Dismantling

Starting on the last section.
Tank with thickener mechanism.
Skirting the river.

Road cribbed to permit passage of tank.
Overhanging the river.
Distant view of tank en route.

The United States Reduction & Refining Co., of Colorado Springs, Colo., had just completed the treatment of a dump which was located at the foot of the hill in the vicinity of the Union mill, this plant consisting of one large tube mill and five steel tanks, 36x13 ft., to handle 500 tons of material daily. These tanks were purchased to form the nucleus of the new plant.

The Metallic dump is located about one mile from the site of the Union plant. In order to place the tanks on the Metallic grounds, it was necessary to construct a road along the hillside on the north bank of the Arkansas River. An old road was already there, but having been abandoned for some time, it was too narrow, so it was widened and brought to an even grade. The road was completed about Jan. 15, 1914.

The equipment used was a set of three house-mover's trucks. The front or forward truck was of four wheels, while the two rear ones had but two. They were set in a triangle, making what is called a three-point load. This system of loading and moving objects keeps them from getting a twist, and was the only way these large tanks could successfully be handled.

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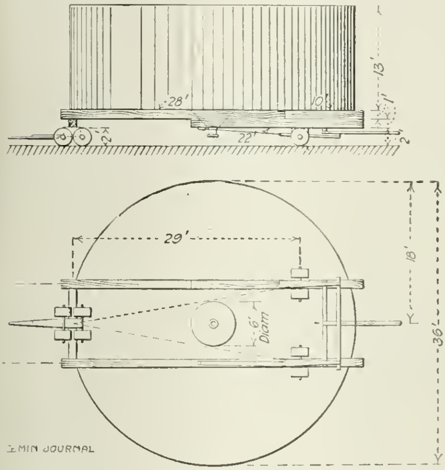
*Mine & Smelter Supply Co., Denver, Colo.

The timbers used under the tanks were 12x12 in. x 38 ft. long. They were spliced, as none were to be had of such great length. Horses were used, one team when the roads were good, but when in bad condition a second was added. Most of the moving was done with one team. The teams pulled on a set of steel blocks, one being a double 12-in. and the other a 12-in. triplex block. They were reaved with 200 ft. of 1¼-in. manila rope. Some steel cable was strung out in various places to hitch to; a number of posts were buried along the road convenient to tie to and a ¾-in. steel cable was carried along, and with it hitches to the blocks were made, the cable being made fast to the posts or deadmen. On the hills, there was danger in lowering the tanks of having them get away, so a 12x12-in. post, about 12 ft. long, was buried 6 ft. in the ground. An old 1-in. steel cable, 600 ft. long, was used by fastening one end of it to the tank and throwing it around this post. It made a good drag, and the brake difficulty was overcome in what seemed to be the only safe way to get to the bottom without mishap.



Trucks Placed under the Tank

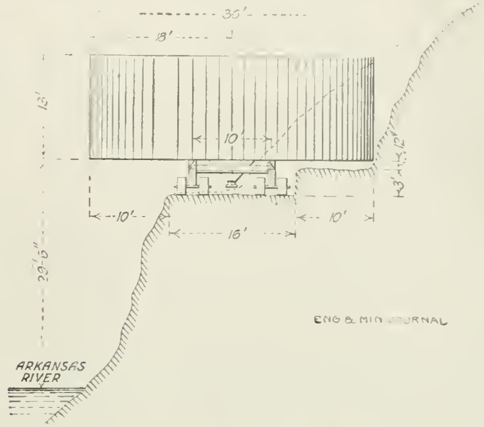
The weight of the tanks was approximately 15 tons. They were 36 ft. in diameter, 13 ft. deep and constructed of $\frac{3}{16}$-in. steel. The moving crew consisted of four men, one team and driver, and one of the leasers who had the work in charge. The first tank moved was somewhat heavier than the others, since it contained a Dorr thickener and its necessary machinery.

The road was divided into four sections, No. 1, of 1000 ft., having its starting point across the dump made by the plant we were moving. This section was in soft sand, which necessitated using plank under the wheels of the trucks. In this section a power and a telephone line were encountered, which was another hindrance. Section No. 2 was 1320 ft. long and the most treacherous part of the trip, being the dug-way along the bank of the river. The accompanying photographs explain the situation clearly. Section No. 3, 1500 ft., was the part that had the hills and cuts. This section took perhaps more engineering than the others, as the turns, curves and grades were bad. Section No. 4 was 1320 ft. long and was an old river bed composed of soft, loamy soil and sand. This section had no bottom at all, so planks had to be used again.

COST OF MOVING TANKS

Cost of trucks f.o.b. Florence	$279.25
Cost of road construction	460.00
Cost of rope, chains, tools, etc.	197.50
Moving tank No. 1	277.60
Moving tank No. 2	253.00
Moving tank No. 3	228.00
Moving tank No. 4	242.78
Moving tank No. 5	211.00
Total	$2149.13

The cost of moving the tanks is shown in the table. The prices include all costs of loading, moving, tearing out old foundations and unloading from trucks to the new foundations.



How the Road Had to Be Cut Out

Dotted line shows old road.

The work was planned and carried out by Morrison Bros., of Florence, Colo., who deserve great credit for its success. The tanks, when set up in their new situation, were found to be in proper shape, true and tight.

⁂

Iron Ore in the Philippines

The Philippine *Journal of Science* reports that H. F. Cameron, department engineer for Mindanao and Sulu, has discovered a deposit of iron ore in Surigao province on the island of Mindanao, which appears to be of large extent, probably covering an area of 10 square miles. The ore is a clayey red limonite, carrying 55 to 60% metallic iron; no sulphur or phosphorus, but traces of chromium. The area over which the deposit extends has been reserved from mineral location, by order of the government, until further information can be obtained as to the extent and value of the deposit, through surveys to be made by the Bureau of Science.

An article on the "Iron Ores of Bulacan Province," by F. A. Dalburg and Wallace E. Pratt, has been published by the *Journal of Science*. The Bulacan ores are hematite and magnetite in intimate mixture with quartz as the typical gangue material. They are found in proximity to limestone usually, and a few veins of the ore occur in limestone. The deposits form detached lenses along the base of Miocene sedimentaries and the underlying older igneous base. The walls are replaced in part by ore and consist of a decomposed green aggregate of [illegible] basic silicate minerals, a material probably somewhat analogous to the "skarn" of the Scandinavian geologists. The Bulacan ores are considered to be the result of contact mineralization following the intrusion of igneous dike rocks; much of the ore appears to be a replacement of limestone and other intruded rocks. There is no development work which affords a basis for estimating the quantity of ore available.

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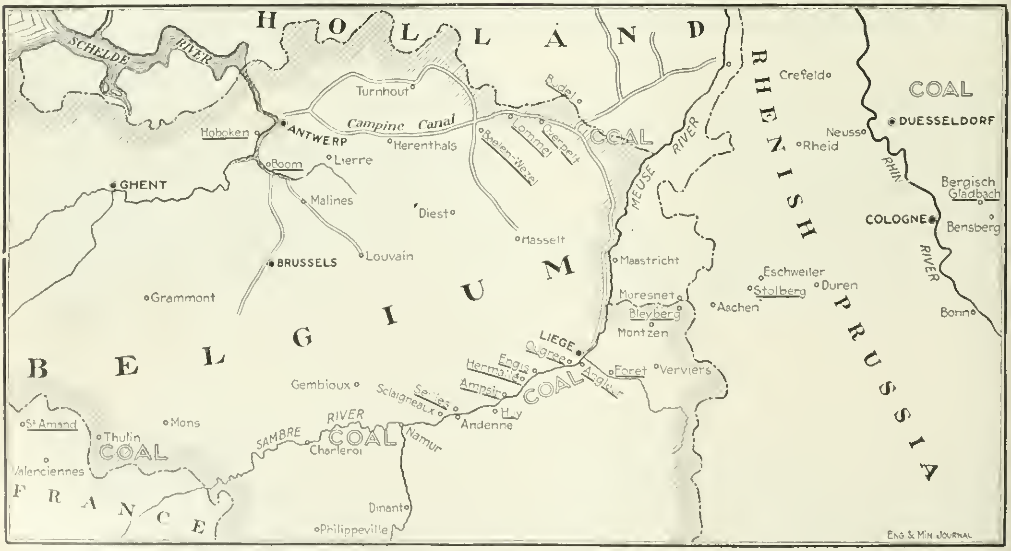
The Metallurgical Centers of Belgium

The accompanying map shows the situation of the principal lead- and zinc-smelting works of Belgium. Most of these are in the regions that have been devastated by the military operations. Besides the Belgian works, certain adjacent works in France, Holland and Rhenish-Prussia are shown. The names of the places where there are lead- and zinc-smelting works are underlined.

The first zinc smelting in Belgium was done at Liège. One of the principal smelteries of the Vieille Montagne company is still at Angleur, or as is more commonly called now, Chenée, which is a suburb of Liège. The works built later were strung out along the Meuse River. This whole region is in the heart of one of the important coal fields of Belgium. The ore supply was derived originally from the famous mines at Moresnet, the little neutral territory that is of so great historic interest. The home supply of ore has been insignificant for a great many years and the immense tonnage smelted in the Belgian works has come from foreign countries. This has chiefly entered Belgium through Antwerp, the Liverpool of Western Europe.



THE LEAD AND ZINC SMELTING WORKS OF BELGIUM

The wonderful canal system of Belgium, especially the famous Campine Canal, has enabled the ore to be taken to Liège and the other smelting works on the Meuse very cheaply.

The discovery of coal in the Belgian and Dutch provinces of Limburg, led in late years to the erection of a new group of smelting works north of Liège, in Belgium, just over the line in Holland. These works are situated in a flat sandy country, known as the Campine, where the smoke does no particular harm. There are zinc smelteries at Budel in Holland, and at Overpelt and Lommel, in Belgium. At Baelen-Wezel is the large blende-roasting plant and sulphuric-acid works of the Vieille Montagne company.

Thus it may be seen that there are two main zinc-smelting districts of Belgium, viz., the Liège district and the Campine. There is also a zinc-smelting works at Boom, near Antwerp. At Hoboken, near Antwerp, there is a large and famous lead-refining establishment. Since the war began, we have not received much information about the zinc works on the Meuse, but those in the Campine are known to be intact.

*

Bureau of Mines Petroleum Library

The U. S. Bureau of Mines has begun the collection of a general library of petroleum literature, under the direction of W. A. Williams, chief petroleum technologist. The details of this work have been assigned to Dr. David T. Day, who has recently been transferred from the U. S. Geological Survey as petroleum technologist, and who will also assist in a thoroughly organized research into the chemistry of oils, which is being undertaken by the Bureau of Mines. The importance of such a library is so manifest that it is hoped all technologists will aid in the work by exchanging with the bureau all available books and maps on this subject.

Handling Gold Dust at Fairbanks

By Hubert I. Ellis[*]

SYNOPSIS—With the discovery of placer gold in the Yukon, gold dust became the usual medium of commercial exchange. It was valued at a fixed amount and dilution was a regular practice. Most of it averaged from $15 to $17 an ounce, and $16 was the value in exchange. Banks competed for its purchase until some were bankrupt, when an assay basis and percentage deduction were made standard. Melting and casting into bricks is now practiced for transportation by mail or express. Special methods of assay are described.

⁂

The first discovery of gold in the Yukon drainage basin was made on the Tanana in the early '70s. In 1886 the Fortymile placers, and in the early '90s the Koyukuk, Rampart, and Birch Creek deposits were found, probably in the order named. But it remained for the discovery of the bonanzas of the Klondike, in 1896, to give mining in the region tributary to the Yukon River its first big impetus. The overflow from the Dawson stampede led indirectly to the discovery of pay at Fairbanks in 1903, and the overflow from Fairbanks led to the finding of important placers in other parts of the American Yukon, notably at Iditarod and Ruby.[1]

Gold Dust as an Exchange Medium

This area, including the similar deposits of the adjacent Canadian Yukon, has produced gold to the value of more than $200,000,000. The development of a mining industry of such magnitude in an isolated region with its new and peculiar conditions naturally involved the introduction of many practices uncommon in other parts of the world. In the absence of coin and banknotes, raw gold dust became the universal medium of exchange, and for years a pair of scales was essential to every commercial transaction, even down to the purchase of a cigar or a drink. With the coming of the banks, currency was exchanged for the miners' gold, and the banks became buyers of gold dust on a large scale. This buying of dust has long been one of the most important lines of activity of the banks of the North, and it is a line unknown under similar conditions to banks in other parts of the world.

Gold dust as a medium of exchange reached its highest and most interesting development at Dawson. That camp was discovered in 1896, and in the course of two or three years the production leaped to a maximum of nearly $20,000,000 for a single season. Thousands of Argonauts flocked into the Klondike, but since they were seekers of gold, they naturally brought no currency with them. Banks were early established, but the production was so great and the demand for a medium of exchange so insistent that the few millions of currency which they put in circulation annually was but as a drop in the bucket. It was only about 1902, when the exhaustion of the bonanzas had brought in its wake a dwindling of production, that banknotes became sufficiently abundant to supply the needs of the population.

Dawson gold dust circulated at $16 an ounce flat, but it was worth, on the average, appreciably less than that. The more it was handled, the lower became the grade. Just as it was not regarded as a heinous offense to "highgrade" at Goldfield, so it was considered perfectly fair to dilute a "poke" of gold dust with black sand at Dawson—for did not the succeeding owner save himself from loss by passing it on to someone else? On a few occasions brass filings were also used for purposes of dilution, but this was generally held to be a reprehensible practice bordering on downright dishonesty, and died from the lack of public sanction. The last holder of the dust, the one who sold it on an assay basis, invariably lost money on the transaction, which was probably one reason why gold dust held its popularity so long as a medium of exchange, since nobody wanted to be the "goat."

Many Swindling Methods

There were other methods of robbery in vogue at Dawson besides diluting the dust. The scales were usually set on a strip of carpet, and sometimes a tub was placed beneath the counter, out of sight of the customers; the few grains of gold carefully spilled each time a weighing was made were thus saved, and in the course of time they made a respectable total. It was considered good form, especially in the saloons, to hand the poke to the cashier and allow him to help himself. Needless to say, the "house" never got the worst of the bargain, especially on occasions when the owner of the poke had reached that psychologically interesting stage in his alcoholics when every cloud had a golden lining and each chance bystander took the place of a long-lost friend. The position of porter in the saloons and dance-halls, carrying with it the inestimable privilege of sweeping the floor (and, incidentally, of panning the sweepings) was eagerly sought; usually the "house" got a certain proportion of the gold recovered as "rake-off."

Most of the gold produced at Dawson ranged between $15 and $17 an ounce in value but, as noted above, the grade depreciated in handling; yet it all had an exchange value of $16. Operators whose gold was worth more than $16 frequently exchanged it at a premium for dust of a lower grade with which to pay their bills.

There never was much coin at Dawson, owing to the cost of bringing it in; but the gamblers imported considerable silver for their own use, and this gradually became more widely distributed. It may be interesting to note that even now there are no coins in circulation either at Dawson or Fairbanks of a smaller denomination than the 25-cent piece. No attempt was made in the North to cast "slugs" of gold, as was done in California in the early days. In that district, the assayers made disks and bars of gold, which they stamped with the weight and fineness, and with the name of the individual assayer as a guarantee. These were made in sizes worth from five or ten to several hundred dollars, and circulated freely at their face value. The territorial government of California also made octagonal slugs of gold worth $50 each.

In the interior of Alaska, dust has passed more or less since long before the discovery of Dawson, but it never attained such importance as a medium of exchange as it did there. The first important production at Fairbanks was made in 1904, and banks were organized immediately. Some dust circulated during the first year or two of the camp, however, and some still circulates in outlying districts, especially along the Yukon and in the Koyukuk. One thing that militates against the dust from Fairbanks and other Alaska districts as an exchange medium is its great range in value. While nearly all the Dawson gold fell within the limits of $15 and $17 an ounce, the range at Fairbanks is from $12 to $19—and even these figures do not represent the extreme limits, small pokes sometimes running higher or lower.

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[*] Fairbanks, Alaska.

[1] The writer is indebted to Paul Hopkins, assayer for the American Bank of Alaska for most of the data on which this paper is based and for much assistance in collaboration.

Methods Followed by Banks in Purchasing Dust

In 1904, the Fairbanks bankers attempted to make a charge of 4% for handling the dust for the miners,[3] which would seem to be reasonable enough in view of the 5% charged at Dawson in the early days. So much objection was made by the miners, however, that the charge was soon reduced to 2½%—which means that the depositor receives 97½% of the actual coinage value of the gold, the bank paying all expenses, including the mint charges, from its 2½%. One of the heavy items of expense for the banks is due to the necessity of importing a large amount of currency each spring. During the annual fall exodus to the States, hundreds of thousands of dollars are taken from the district as actual cash, thus creating a deficiency which must be supplied before the next season. Individual banks have had to import as much as a million dollars in a single year, the expense of which must be included in the cost of handling the gold dust. At Dawson, the banks issue their own currency, as provided by the laws of the Dominion; they simply import the unsigned banknotes, sign them, and put them in circulation, all at a minimum of expense.

The nominal charge of 2½% at Fairbanks was rendered inoperative for several years by intense competition among the banks—competition which eventually helped force two of them to the wall. The practice was started of buying the dust outright at a definite price per ounce, the bankers merely taking the precaution of cleaning the dust thoroughly by "blowing" before weighing. Thus, if one bank offered $17.50 for the dust from a certain claim, another would offer $17.55 an ounce; in this manner the purchasing price was raised, a few cents at a time, until the profit for the banks dwindled to the vanishing point, and even became converted into an actual loss.

This unhealthy condition of banking affairs lasted for several seasons, during which none of the banks made more than an insignificant profit in handling gold dust, and then they ceased bidding against each other and reverted to the practice of making final payment only on completion of the assay. An advance is made within safe limits previously to assay, however, when required by the depositor. Dust from claims where experience has shown the grade to be uniform is also occasionally bought on the result of former assays. Ordinarily, each lot of dust is assayed separately, except when 10 oz. or less in weight, in which case the expense of the assay, which is debited to the depositor, would be greater than any probable variation in the value of the dust.

Silver in the bullion is paid for to the nearest five cents an ounce, no attempt being made to follow the market quotations of the outside. Several hundred dollars may be lost in a season this way, but it is sure to be regained when the quotations, in their ceaseless rise and fall, favor the bank.

Fineness of Various Kinds of Yukon Gold

The fineness of the bullion produced from Fairbanks and contiguous districts varies from less than 600 for some of the Tenderfoot gold to 965 for some of that from the Koyukuk. (Unless otherwise shown by the context, the word "fine" and its derivatives as used in this paper refers to the bullion produced after melting the dust. The shrinkage on melting varies widely, but averages 2 or 3%). On any individual creek, the fineness of the bullion increases progressively downstream from the source. This is proved by numerous assays, which are not, unfortunately, available for publication, but it is a well known fact among mining men throughout the district. Since the average size of the individual particles composing the dust decreases toward the mouth of a creek, it follows that the fineness of the bullion increases as the grains of gold become smaller. The fineness of the bullion also increases from the sides of the paystreak toward the center; that is, the main paystreak produces bullion of a higher grade than does the so called side-pay. But the gold from the main paystreak is coarser than that from the side-pay, and this brings out an interesting relation, which has never been satisfactorily explained. In the longitudinal direction of a creek, the fineness of the bullion decreases with coarser gold; at right angles to the creek, the fineness increases with coarser gold. Aside from this, however, there are few known exceptions to the rule that the coarser gold from any one cleanup produces higher grade bullion than the gold of smaller grain. The relation is clearly shown in the appended tabulation of the results obtained by actually screening a cleanup from Dome Creek and assaying the different sizes separately:

VALUE OF GOLD GRAINS OF DIFFERENT SIZES

Size	Wt. before melting	Wt. after melting	Loss %	Fineness 1000 ths	Value, per oz.
On 1.8 mm. ...	38.67 oz.	37.29 oz.	3.57	904.5	$17.61
On 1.1 mm....	70.86	69.37	2.10	893.5	17.68
On 0.7 mm. ...	62.35	61.30	1.69	887.5	17.64
Through 0.7 ..	52.52	51.57	1.81	884.0	17.55
Totals and averages..	224.40 oz.	219.53	2.17	891.0	17.62

The screen openings are given in millimeters. The value per ounce given is the price paid the depositor for the raw dust, and is the actual coinage value less 2½ per cent.

In practice, such simple relations as those outlined above become complicated when a producing stream has producing tributaries, each producing a dust with its individual characteristics. Those accustomed to handling much gold dust can tell almost at a glance from what creek a cleanup came, and even from what portion of the creek. In one cleanup it is often possible to recognize dust from several different sources, especially when two distinct paystreaks have mingled their gold.

Character of the Gold Dust

There is very little exceedingly fine-grained, or "float," gold in the paystreaks of Fairbanks. Undercurrents and amalgamated plates have been installed at various properties in the hope of increasing the savings, but in many places these have not returned their cost. Neither have many nuggets of considerable size been found, the largest recorded being worth only $529. It is estimated that fully 75% of the dust that has been produced in the Fairbanks district would pass a 4-mesh screen and that 95% would remain on a 100 mesh. For obvious reasons, actual sizing tests have never been made on a large scale, and the figures noted merely represent a rough guess based on personal observation; they are given some authority, however, by the fact that the dust is frequently screened into various sizes to facilitate cleaning.

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[3] The charge made by the banks at Dawson is now about 4%. The miner there must also pay a government royalty, which was 10% at first but which has been gradually reduced to 2 or 2½%. (Exact data as to the royalty and the bank charges at Dawson could not be obtained by the writer.)

The most common impurity of the dust affecting the grade of the bullion consists of iron accidentally introduced, such as pick points and chips broken from the point-heads. This, like the greater part of the black sand, is usually removed before melting, by means of a magnet. Some of the more common natural impurities besides magnetite are quartz, tourmaline, zircon, ilmenite, garnet ("ruby sand"), and other minerals of high specific gravity. Tin minerals, though abundant in the Hot Springs placers, are found only in unimportant amounts in the Fairbanks district proper. Platinum is common in Dawson gold in small quantities, but it is practically unknown at Fairbanks.

MELTING GOLD FOR TRANSPORTATION

One man does all the melting and assaying for one bank. Since the cleanups frequently come in bunches and returns are always desired as soon as possible, speed in manipulation is an important factor. One assayer makes as many as 75 melts in a day, completing the assays on the following day. Most of the melts are of comparatively small lots of dust, but charges of 1000 oz. are not unusual, and even 2200 oz. have been melted in one charge. The largest amount of bullion ever melted at Fairbanks by one man in one day is believed to be $220,000—about 13,000 ounces.

The details of manipulation here described refer chiefly to the practice at the assay office of the American Bank of Alaska, of Fairbanks. The dust is melted in graphite crucibles in No. 12 Braun furnaces using Cary gasoline burners. Modern tilting furnaces are unsuitable because of the large number of melts made at a time—each lot of dust being melted and assayed separately if more than 10 oz. in weight. As many as fifteen melts have been made simultaneously.

For the sake of ease and rapidity of manipulation, soda alone is used for flux on placer gold, except when the dust is so impure as to require the addition of other chemicals. The soda slag is soft and earthy and is partly soluble in water, which greatly facilitates cleaning the bricks. The addition of even a small proportion of borax gives a hard, glassy slag that can be entirely separated from the brick only after much pounding and scrubbing. No acid is used to clean the bars of bullion, owing partly to the time involved and partly to the ease with which the soda slag is completely separated by pounding, and scrubbing under water. Another great advantage of the plain soda slag for fast work lies in its rapidity of cooling, since it takes only a fourth of the time to solidify required by a borax slag. When the dust contains a large amount of basic impurities, however, some borax is used. Niter is rarely used because it is too destructive of the graphite crucibles. Even with plain soda, care must be exercised.

Melts are skimmed only when the dust contains large nuggets of quartz; the skimmings are returned to the depositor. The slag, also, is returned if requested. For large depositors, the slag from the various melts is saved, and reworked at the end of the season by grinding in a sort of cleanup barrel with mercury. The "blowings" obtained in cleaning the dust before weighing are likewise returned to the depositor.

CRUCIBLES AND FURNACE BOTTOMS

Experience has shown the best furnace bottom to be a simple disk of the same composition as Dixon graphite crucibles. These disks are made to order and are 2 in. thick by 2 in. less in diameter than the interior of the furnace. They are set in a mixture consisting of ground firebrick, 7 parts; portland cement, 2 parts; raw fireclay, 1 part; and water. The burner bosses are grouted in with the same mixture, which has proved to be very serviceable. The graphite disks in the bottom of the furnace permit chipping away the overflow slag without removing the bottom. Fireclay was tried, but it was found that the slag penetrated it to a depth of half an inch, and this had to be taken up in removing the slag. Bone-ash was found to be subject to similar objections, sticking to the crucibles and coming up in great chunks that littered the floor and cleaning tables.

BULLION SOMETIMES SHIPPED BY MAIL

For several seasons, in order to ship the bullion to Seattle by registered mail, 4-lb. bricks were cast. At present when it is desired to ship by mail, bricks are cast in molds balanced on the scales to just under the 11-lb. limit, avoirdupois, and these are insured by the consignee in Seattle upon telegraphic notification of the shipment. Great care is necessary in casting these bars, for if they weigh even a fraction of an ounce too much they are excluded from the mails. In practice, it is found that the slag bubbles up so in pouring that the mold can be filled almost exactly to the required point, many of the bricks coming within two ounces of 11 lb. Each brick, when the melt contains more than enough for one, is stamped with the serial number of the melt and with a letter to distinguish it from its fellows of the same melt. It is only rarely that bullion is remelted, the original bricks being shipped whenever possible. In shipping by express, the bars of gold are sealed in canvas sacks and stored in steel strong-boxes. The bulk of the bullion is shipped in this manner, resort being had to mail shipments only in winter when the rivers are closed to navigation.

Each lot of dust is assayed separately, but duplicate assays are made only when the melt consists of 200 oz. or more. Samples are taken by chipping one corner of the brick, or, in the case of duplicate assays, diagonally opposite corners. No assay for base metal or silver is commonly made on placer bullion, the silver being determined by subtracting the fineness in gold from 0.994, which is the average fineness of the bullion in gold and silver. While there is some variation with placer gold, it is so slight that it is practicable to ignore it. In the case of bullion from the lode mines, however, a determination of silver is made if the brick is large enough to warrant it, and in exceptional cases silver in placer gold is determined by direct assay.

The gold of the assay clippings is charged to a separate account, and when the accumulated scrap is melted, the amount realized is credited. The cornets of pure gold resulting from parting are eagerly purchased by the local dentists at $21 an ounce.

The assays are made in the usual manner, varying only in a few details from the ordinary routine. The proportion of the parting alloy varies from 2:25 to 2:5 parts of silver to 1 of gold. Silver disks are prepared from the waste of the preceding season by precipitating from the nitrate solution as chloride, drying, and melting with soda. The surcharge has been found to vary so little that proof assays are rarely made. The fineness is reported to half-thousandths—not to quarter-thousandths, as is the usual practice.

Inch cupels are used in batches of 12 in a 4x6x10-in. gasoline-fired muffle. For parting, a 12-cup platinum basket and dish is used. The first boiling is in acid of 22° B. and lasts 10 min.; the second lasts 10 min. in 32° acid. Since practically all the silver is removed in the first boiling, the strong acid from one batch is diluted roughly to 22° and used for the first boiling on the succeeding batch. When many assays are to be made, two sets of baskets are used, and these are lifted from one solution to the other to avoid the delay of waiting each time for the acid to come to a boil.

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The Centennial-Eureka Accident

Special Correspondence

The facts concerning the accident in the Oklahoma stope of the Centennial-Eureka mine, in Tintic, Utah, which occurred Sept. 17, are as follows: The country in which the cave occurred was timbered up tight to the roof of the stope. Owing to the fact that the country was more or less broken, extraordinary care had been taken by angle bracing and by doubling the sets to prevent any sudden fall of rock. According to the statements of the two men who were taken out of the stope alive, the fall of rock came without any preliminary indication whatever. The superintendent of the mine had been through the entire extent of the stope a short time before the accident; there was no undue pressure showing upon the timbers and no movement was to be seen. The shift boss in immediate charge had been all through the stope, and had left it 10 or 15 min. before the accident. There was no indication of pressure on the timbers while he was in the stope.

The cause of the accident is, therefore, not known. The only reasonable explanation that can be given is that there was a cave or opening above the orebody, and that the roof of the cave fell, the impact of the rock crushing the stope timbering. If this be the fact, it is the first instance in this mine where such a condition has existed; the ore has uniformly been found in direct contact with the limestone at the top of the stopes. That something of this sort happened is borne out by the fact that only a portion of the stope caved in; a great part of the timbering is still standing in perfect condition and shows no movement whatever. The cave took out a section straight across the middle of the stope.

That there was no warning is shown by the fact that the men were found exactly in their places, or directly under where they were at work, not having had time to move. Of 13 men in the stope, two got out. One mucker felt a puff of air and jumped into a drift, and protection was afforded to the other by the timbers when they crushed down. Several of the men caught had timbered in the mine for a long time, one of them for 14 years, and if they had noticed any working or pressure would undoubtedly have got out.

Every floor in the stope was filled as the ore was taken out. It was all filled below, and only a few sets and a narrow strip of country was open. Some ore came down in the caved material. About 250 ft. of work has been done through solid rock to reach the caved portion. Six bodies have been taken out. Work in loose material is being done at present by driving lagging.

No similar accident ever happened before in the Centennial-Eureka, and this is the first fatal accident due to mining operations in 20 years.

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Norwegian Molybdenite

Special Correspondence

The molybdenite deposits in Norway range from 1 to 3% MoS_2. The mineral generally occurs in diorite and pegmatite zones, in joints or following small quartz stringers, and many attempts to handle it profitably have failed. The Knaben deposit in South Norway, operated for some years by the Blackwell company, a British corporation, with an annual output of about 25 tons, has been partially successful, but the mines are believed to be exhausted now. Another commercial attempt was the British Molybdenite Co., Ltd., at Oersdalen, about 1906. An output of 100 tons of 3 to 4% ore, and a ton of wolfram were secured with an outlay of about £30,000 ($150,000). Another operation was conducted in 1912 at Langvand, in Saetersdalen, near the west coast, by the Gewerkschaft Bergmannsglück, Gotha. The results for seven months' work, of 5410 man-shifts, was about 3100 tons of material, which yielded 600 tons of crude ore and 2500 tons of waste rock. Of the crude ore averaging 2.4% MoS_2, 390.5 tons were milled, yielding 1020 kg. of ore, assaying 51% MoS_2 and 10,030 kg. of slig running about 23% MoS_2. The trouble is the amount of waste rock that must be handled per ton of recoverable content.

In the province of Lister and Mandal, the Kvina Co. obtained power in 1912 and transported milling machinery to the mines in Knabenheim. The Fjotland district, in the above province, is probably the richest in this mineral yet found in Norway. Near Risör, in Nedenaes province, an English company, Nedenaes Molybdenite, Ltd., is sinking a shaft previous to building a flotation mill. The ore is said to run over 3% MoS_2. At Reinshommen, in Fjotland, about 200 tons of ore were secured.

About 25 tons of low-grade ore were secured from deposits in Liredalen. Director Leo Jansen, of Hildesheimstrasse, Hanover, has worked occurrences in the parish of Grindum. At Naardal, molybdenite occurs in coarse lumps in quartz; at Flottorp ore is also found though subsequent treatment is necessary. There are also deposits in Lyngdal. Samples from the Folden molybdenite deposits in Nordland have been shown in Christiania, including nuggets, sorted ore, and some enriched by the Elmore process. The country rock there is granite in lode-like masses dipping to the southeast. These are the more important of the deposits already found.

Modern American Rock Drills--IV

By L. O. Kellogg

SYNOPSIS—Points of difference between hammer and piston machines. General features of hammer machines with differences in detail. The Leyner machine, the sole representative of its class, is mounted in a shell and used like a piston machine. It uses air and water conveyed through hollow steel to clean the hole bottom.

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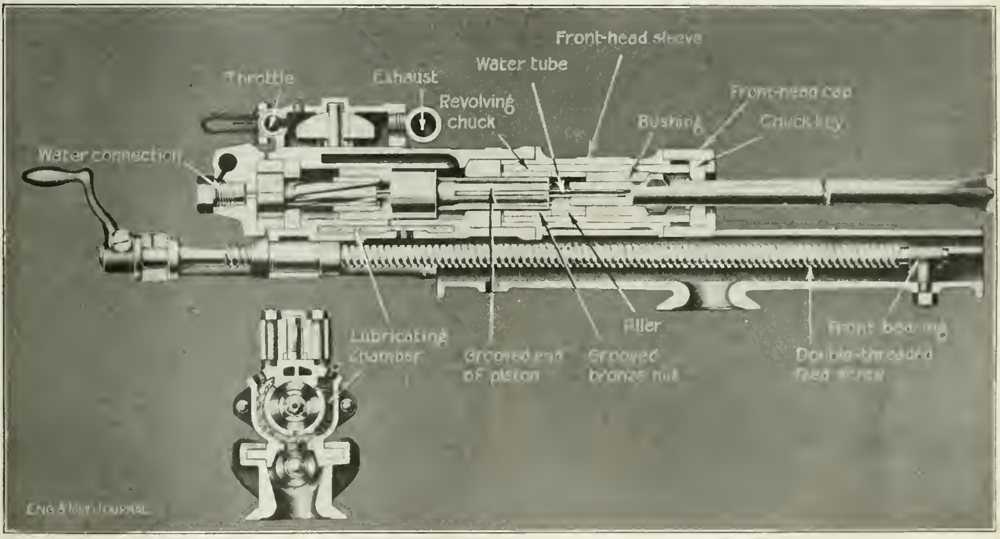
As previously explained, the hammer machines may be classified into three groups; namely, the shell-mounted drills, of which the Leyner is the only example; the stopers, in which the drilling cylinder is pressed forward by air pressure against a plunger; and the pluggers or sinkers, which are simply held in the hands.

A noteworthy point of difference between the hammer and piston machines is the fact that the free-floating hammer is not subjected to side bending in the way that a piston drill is, when the steel gets out of alignment with the hole or the hole deviates from the straight and narrow path. Consequently, there is no need of piston rings; the hammer can be made and kept sufficiently tight in the cylinder to eliminate excessive leakage; piston rings are, therefore, not used on hammer machines.

The attempt is made to keep the front head of a piston machine tight against air leakage. For this reason some sort of packing is provided around the piston rod, and this also serves to exclude dirt from the cylinder. In the hammer machine no such care is taken to make the forward end of the cylinder airtight. A certain amount of leakage is permitted and expected, and this is depended upon for keeping out the cuttings. The front of the cylinder may be roughly closed by an anvil block, through which the blow of the hammer is transmitted to the steel. This further serves to prevent the steel from entering the cylinder farther than it should. If an anvil block is not used, some other means must be adopted for keeping the steel in its proper position and for closing the end of the cylinder. To this end, lugs may be forged on the steel shank or the end may be closed. In the case of the round steel used for the Leyner machine, two lugs are applied to the shank, which catch in the chuck and compel the rotation of the steel along with the chuck.

The anvil block is more commonly applied than not to stopers. It is considered that the loss in efficiency is overcome by the simplification in steel changing and in other respects. In the Leyner and in most of the pluggers, the anvil block is not used, inasmuch as specially shanked steel is usually required anyhow.

The hammer machines are either valveless or have air-thrown valves. In general, the air-thrown valve machines are more common, and except for the Ingersoll-Rand butterfly valve and the Chicago Pneumatic ball valve, the spool valve is the most common. The valves may be set parallel with the axis of the cylinder, and in such case resemble the spool valve of the piston machine; or they may be set in the same axis with the piston, in the back head, in which case they are much shorter and of greater diameter. Tappet-valve and auxiliary-valve motions are practically unknown in hammer machines.



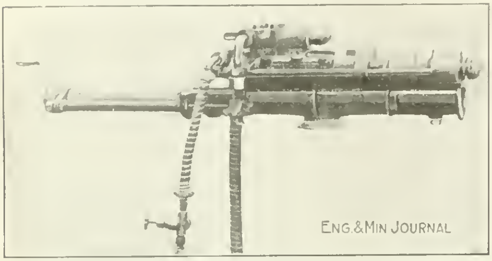
Longitudinal and Cross-Section of Ingersoll-Leyner Hammer Machine

The valveless machine is superior in dispensing with a rather delicate moving part; it is generally held to be a somewhat slower driller and to be more subject to deterioration with wear. The choice between valve and valveless machines is largely a matter of local prejudice. At least two companies make both types.

The hammer machines may or may not be automatically rotated. The Leyner machine always has been. There is at present on the market one automatically rotating stoper. It would seem a logical development that the rotating stoper should come into use. The rotating plugger has four or more representatives in this country. In fact, it is rapidly displacing the older type.

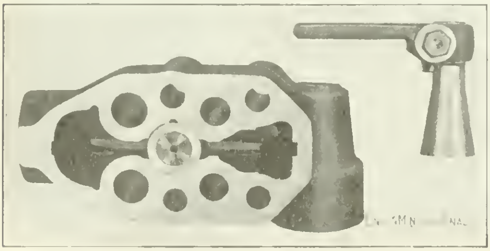
THE LEYNER

The water Leyner drill, if not the first hammer drill on the market in this country, was at least the first to attain any real success. It is also still the sole representative of its type. In a way, it is transitional between the piston drill and the commoner types of hammer drill. It is a hammer drill mechanically, but in weight is corresponds closely to the lighter piston machine and in drilling capacity it is about equal to the larger piston machines used in mining. In fact, the hammer drills are admittedly more efficient, however they may compare with piston machines in other respects.



OUTSIDE VIEW OF THE LEYNER
Bleeder valve is missing from hose connection.

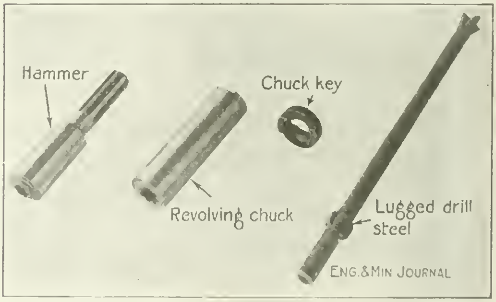
The Leyner machine was until recently the only one to which the system of cleaning the bottom of the hole by means of water and air through the drill steel itself was applied. The modification of the Leyner which is now being manufactured by the Ingersoll-Rand Co. differs from the older type chiefly in the substitution of a butterfly valve for the older valve action, and in the use of different materials of construction.



THE LEYNER VALVE CHEST AND THROTTLE

The action of the valve is similar to its action as described for the butterfly-valve piston machine. The air passages extend along the top of the cylinder in much the same fashion; and the piston itself, or rather the hammer, extends forward in the form of a reduced section corresponding to the piston rod of the butterfly piston drill; in this case, however, this smaller section is not fastened to the drill steel, of course, but strikes on the head of the drill-steel shank. This small section of the hammer is grooved and the grooves engage projections on the inside of a chuck bushing. Thus the hammer is permitted to reciprocate and its rotating motion is communicated to the chuck bushing. Another bushing in the front of the chuck is designed to receive the shank of the drill bit and pass on the rotating motion of the chuck to the bit itself. The front of the chuck is closed with the chuck key, which permits the insertion of the shank lugs and retains them, so that the steel can be pulled from the hole by backing up the cylinder. This revolving chuck is contained in the front head sleeve of the machine, and its rear end is placed a little forward from the end of the internal flange of this sleeve, so that the blow of the forward-moving hammer when the bit is not in the machine will be carried through the cylinder front washer to the front-head sleeve and not communicated to the relatively delicate revolving chuck. A front-head cap comes back over a short flange projecting from the forward end of the front-head sleeve, and cap, sleeve, cylinder shell and back head are held together by through bolts which work against helical springs socketed into lugs on the front-head cap.

The rotation mechanism is the same as that used on the butterfly piston machine, but the rifling is steeper, so that in spite of the shorter stroke, the same amount of rotation is obtained. A lubrication chamber is cast below and around the cylinder and contains packing material; oil is sucked into the cylinders through an orifice by the variation in the pressure of the air.

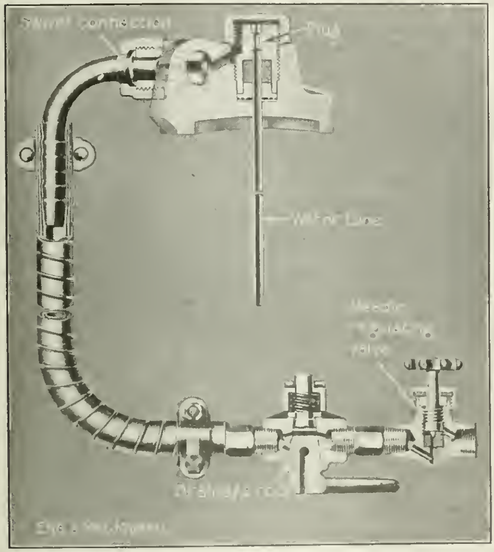


STRIKING PARTS OF LEYNER MACHINE

The shell differs from the butterfly-valve piston-machine shell in having no adjustable gibs, and in the fact that the studs do not extend the full length of the shell. The feed screw is double threaded and for the same rate of feed the machine is cranked more slowly. The forward end of the feed screw revolves in a bearing which also acts as a stop to the cylinder in its forward motion.

One of the most interesting features of the Leyner machine is its water connection. A swivel-jointed connection to the water pipe is screwed into the back head at an angle, and a passage through the back head leads to a small central chamber. Into this is screwed a plug carrying the water tube. The tube is open to the water-supply and extends through the rotation mechanism and the hammer. Its tapered end projects some distance into the shank of the steel. The tube does not make a tight joint with the steel, but no water leakage back into the machine is possible, so long as the air pressure is maintained, since the water pressure is not supposed to be as great as that of the air, and even should the pressure be greater it can be regulated by the needle valve mentioned later. Water should be turned off, however, before the air when stopping the drill. Air from the drill mingles with the water as it leaves the tube for the drill steel, and this mixture is the medium which cleans the hole.

To obtain a water-supply under sufficient head, the pump column may be tapped at a proper height, or water may be collected in a receptacle at some higher point in the mine and conveyed to the machine, or a special pressure tank may be used in connection with the air line. This tank can be set to fill under a drip of water, or it can be filled by hand from a small sump, or by other means. When full of water, it is connected to the water line leading to the drill at the bottom and to the air line at the top, and in this way the air pressure forces the water to the drill steel. It is, of course, understood that a separate pipe and hose line for the water are used with Leyner machines. The flow of water requires careful control, and for this purpose the needle valve shown in the hose connection was designed. This permits a close regulation of the rate of water flow. An intermediate valve is now set in the water-hose connection, by means of which the water can be drained from the machine when a run is completed.



THE LEYNER WATER CONNECTION

Note drainage cock or bleeder valve.

The cylinder diameter of the Leyner machine is 2½ in., its stroke is 3 in., and the overall length 47¾ in.; the machine weighs 150 pounds.

(To be continued)

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Lead and Radio Lead

In the JOURNAL of Sept. 12, 1914, there was an abstract of a paper from *Metaux et Alliages,* in which it was intended to state that radio-lead from radium had an atomic weight of 206, while radio-lead from thorium had an atomic weight of 208. Unfortunately a typographical error gave them both at 206.

In the *Journal of the American Chemical Society* for July, 1914, is a very interesting paper by Prof. Theodore W. Richards, of Harvard, and Max E. Lembert, reporting an investigation of the atomic weight of lead derived from various sources in various parts of the world. The following were the final results:

North Carolina uraninite	206.40
Joachimsthal pitchblende (2 samples)	206.57
Colorado carnotite (2 samples)	206.59
Ceylonese thorianite (2 samples)	206.82
English pitchblende	206.86
Common lead	207.15

It is to be observed that these results agree with those of Curie in showing the atomic weight of the lead from the uranium minerals to be much lower than that of ordinary lead.

The ultraviolet spectrum of a radioactive sample of lead was compared with that of ordinary lead. No difference was found, except for a trace of copper too small to affect the result, and a negligible trace of silver. The inference appears to be that radioactive lead contains a mixture of some substance different from ordinary lead, and very difficult to separate by chemical means. This substance cannot be identified by the ultra-violet spectrum, either because it has the same spectrum as lead or because it has no ultraviolet spectrum, or because it is masked by lead. "This amazing outcome," say the authors, "is contrary to Harvard experience with several other elements, notably copper, silver, iron, sodium, and chlorine, each of which seems to give a constant atomic weight, no matter what the geographical source may have been."

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Mortality Rate from Accidents on the Rand

By A. COOPER KEY*

A year ago R. N. Kolze, the government mining engineer for the Union of South Africa, made some trenchant comments on the number of accidents on the Rand mines. This year he is by no means so critical. The underground and surface mortality of whites and natives was 3.8 per thousand, a record low rate since 1903, a year which was abnormal in that the ratio of underground to surface workers, instead of being, as usual, over 2 : 1, was approximately 1 : 1, owing to the large amount of reconstruction going on after the Anglo-Boer war. As the death rate among surface employees is lower than among underground men, the average death rate was correspondingly reduced during that year.

In the years 1910 to 1912, inclusive, the rate averaged over four and in 1905 and 1906, well over five. It was not until the close of last year that the "safety-first" campaign, a term adopted from the United States, was initiated, and the improvement resulting therefrom is not reflected on the figures for the period under review (the year 1913). While the underground accident mortality among natives was reduced from 5.25 to 4.88 per thousand, that of the whites advanced from the exceptionally low 3.88 to 5.65, still the second lowest recorded.

THREE HIGH-RATE MINES

Mr. Kolze points out that the Simmer Deep, Ginsberg and City Deep have individual rates double the Rand average. At the Simmer Deep, the rate was 7.87 (surface and underground) more than double that in 1912.

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*Editor, "South African Mining Review," 71 Permanent Buildings, Johannesburg, Union of South Africa.

when it was below the average for the year. Falls of rock and explosives were the prolific causes. Owing to the high percentage of machine work, the hanging wall gets an unusual amount of shaking and rough handling, causing frequent falls and unsound roof. Reclamation was resorted to more than usual, but the trimming down of foot wall and guarding against falls of rock in stopes were not properly attended to. The high rate of explosive accidents must be attributed mainly to poor supervision and discipline underground. The accident rate rose, and the mine death rate was further affected by septicæmia, which carried off several natives suffering from comparatively trivial underground injuries. Some deaths would have been avoided if natives had consented to operations, but this they would not do. The government mining engineer does not say so, but it may be that the rate advanced, owing to the small proportion of surface employees due to the lavish use of labor-saving devices. This is a factor which should not be overlooked, as it may be of importance.

At the Ginsberg, the rate was 7.74, but reports on accidents and underground inspections show that no complaint can be laid against the management, that the average supervision underground is good, and that satisfactory attention is being paid to the mining regulations. The high rate is attributable largely to hazardous reclamation work on a steep dip of 50° to 70°. From 25% to 33% of the ore won is by reclamation.

At City Deep, the accident death rate based on the average number of persons in service was 7.6. This mine has given the department a good deal of trouble during the year, and from a safety and health point of view, leaves much to be desired. From manager to shift boss, there were so many changes that the government engineer says his remarks can hardly be taken personally by any one and must be divided among four managers, nine mine overseers and 42 shift bosses and other persons who have been responsible for underground work during the last three years. It is impossible thus to fix much individual blame on the constantly changed staff and the department has therefore been compelled to bring its complaint direct to the notice of the owners and their advisers. In 1913, 36 persons were killed and 118 injured and there were no abnormal occurrences to swell the rate. Health conditions were found to be bad on more than one occasion, and inspectors' official reports contain records of careless mining, slack discipline underground and an unusual number of contraventions of mining regulations. The indictment against the controllers of this large property is a long and serious one, and contains facts and figures impossible to ignore. There were 13 prosecutions, one against the manager for permitting work in places containing dust and fumes, 11 against miners chiefly for contraventions against regulations referring to use of water and blasting; the remaining 31 were against natives for drilling dry holes and entering working places before being instructed so to do.

Falls of Rock Cause 30% of Fatalities

Thirty per cent. of the fatalities in the Rand mines were due to falls of ground. The cause still deserves a large amount of attention and must continually be brought to the notice of managers. It is the duty of the mine owners (the shareholders, not the controlling house, are the owners) and their technical staffs to arrange for proper and safe support of mine workings, without any interference on the part of government officials, but in certain cases such dangerous conditions have resulted from the stoping of large, unsupported areas that the department has been obliged to interfere. Such direct interference will probably have to continue, since it is a common practice to postpone adequate measures until the last moment.

Perversion of Mining Instincts

The unusual strength of the hanging wall on the Rand appears to have gradually perverted the mining instincts of every one working in the mines. Elsewhere in the world, the usual presumption of mining men is that the hanging wall will fall unless supported. Here the presumption is that it need not be supported unless there are obvious signs of its coming down. This fallacious idea is undoubtedly responsible for the large number of accidents from falls of "hanging." Pack building is still unpopular, is seldom systematic, and is carried out largely on the varying opinions of junior underground officials. The useful pack near the face is considered a nuisance on account of blasting, and catching the fines, and the ordinary slope pack is too frequently only slowly erected in odd times when there are natives to spare. There are, however, bright exceptions, the Modder B, Brakpan Mines, Robinson Deep and City & Suburban have done excellent work in packing heavy ground and exhausted areas. At Modder B the packing is exceptionally well done, the packs being built by experienced masons, and the fines do not get blasted into them.

Miners Should Do Timbering

Splendid timbers are still found in drives and traveling ways, but too little temporary and permanent timber is found in stopes. It is not at all clear why the miner who, on the Rand has practically no manual work to do, should not timber and set props in all cases, instead of waiting for a timberman. Lack of stulls below pillars has caused a number of accidents during the last year. Proper stulling is required, as nearly all pillars are under pressure and liable to crack and flake and sweep the whole stope below when steeply inclined. The shift boss, once hardly recognized, has become an important item in underground supervision. He takes the place of a mine policeman. It is frequently contended that this only devolves on the Mines Department but it is clear that, since the enforcement of regulations involving issuing of orders, such a system would mean dual control which is impracticable. A miner will frequently admit rigging a machine under "drummy" hanging; when remonstrated with, he states that he is waiting for the timberman. The government mining engineer declares: "It is time a stop was put to the absurd and dangerous custom that a machine man does no timbering; any man, if he is worth employing, can put in props with the help of his boys and to enable him to do so, the management should see that proper provision is made for a handy supply of suitable timber and the few simple tools."

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The Platinum Output of the United States in 1913 was about 1034 oz., according to the U. S. Geological Survey. About 650 oz. was recovered from gold and copper bullion was made. The production of the country from imported sands was 39,154 ounces.

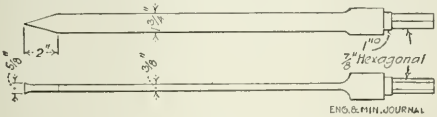
Details of Practical Mining

Cutting Mass Copper

By Arthur C. Vivian

In the Lake Superior district a great deal of mechanical cutting of copper is done underground in order to reduce the larger masses of native metal to smaller sizes that will readily go into the skips to be hoisted to the surface. The process as applied there does not differ essentially from that of cutting solid copper in any form, and as frozen masses of this metal are of frequent unwelcome occurrence in metallurgical works, a description of the method will perhaps be of interest.

As used at present, the method is essentially the same as that employed 70 years and more ago, the difference being that pneumatic hammers rather than hand sledges are used to strike the cutting tool. The general dimensions and the shape of the cutting tool are shown in the accompanying sketch; its length when new may be as much as four feet, and it is used until its length has been reduced by continued sharpening to a few inches. It is used in a pneumatic hammer of the size and style usually employed in riveting operations.



Tool for Cutting Mass Copper

The operation of cutting a large mass is as follows: After the mass has been freed from its resting place in the rock, and is lying loose on the foot wall, it is marked off by the shaft captain along the lines which will most advantageously divide it into smaller pieces. Grooves are then cut along these lines by taking out successive triangular chips; when cutting is being done by a skilled operator, each chip is continuous through the entire thickness of the mass. It is much easier to have the chips thin out to an edge on one side than it is to take out a flat strip, the tool being reversed at each cut. The width of the tool corresponds closely to that of the cutting edge of the chisel. The hammering action serves to compress the copper in the chip, so that the latter is about one-half the length of the groove from which it came and is correspondingly large in section. The chisels will cut copper for a considerable time without dulling, but they dull rapidly on pieces of included rock which are frequently encountered.

The process is slow and the work tells on the wrist and arms of the operator, as the tool must be held closely to the copper. It is usual for men to work in pairs, one resting while the other takes a cut through the mass. Two men working in this way under ordinary conditions will probably cut 1 sq.ft. of area per shift, making the labor cost approximately $6 per sq.ft., which is about one-half of the cost with the old method when one man held the chisel for two men striking alternately.

The opinion has popularly existed in the minds of many that copper may readily be cut by the oxyacetylene process. Various inquiries have led to the conclusion that this process is entirely inapplicable, at least in a way similar to that in which it is applied in cutting steel. It will be remembered that the latter is essentially an oxidizing process, steel oxidizing very rapidly in an atmosphere of oxygen when heated to the temperature of the oxyacetylene flame. Copper does not oxidize readily in this way, and its high heat conductivity is also a factor by preventing the localization of the heat. I do not know that the method has been tried out locally on mass copper, but it has been tried at refineries by men expert in its use and these attempts, as far as I know, have resulted in flat failures.

⁂

Burned Holes in Blasting

By E. Hibbert*

Often in the case of a burned hole, the explosive is completely burned and the hole shows no sign of an explosion's having taken place, but no detonator can be found and it is certain that the detonator was exploded either by the fuse or by the burning explosive. The question then arises: Why does the explosion of the detonator have no effect on the explosive in the hole?

This question kept me guessing for a long time, but recently in talking the matter over with J. J. Johns, mine captain at the Murray mine, Nickelton, Ont., he informed me that when in charge of the quarry at the Mother Lode mine in British Columbia, he could observe the shot-firing from a safe point, and sometimes saw sticks of powder come popping out of a hole and then the primer or detonator exploding outside. Following the matter up, it was found that these were invariably cases of burned holes. This observation supplies the direct answer to the question asked; the reason why the explosion of the detonator has no effect on the explosive in the hole is because the explosion of the detonator takes place outside the hole.

In such cases the gases given off by the burning explosive must generate sufficient pressure to throw out of the hole part of the charge containing the detonator, but the explosive which coats the hole continues to burn down and sets fire to the remainder of the charge. It may be that all the reports are heard, but on examination a burned, unexploded hole is found; the reason for this is that the explosion of a primer or even a detonator alone makes a loud report in a confined space.

In cases where the gases generated by the burning explosive do not throw the primer out of the hole, the explosion of the detonator will fire the unburned charge, and it frequently happens that on entering a place after blasting, the smell of burned powder is noticeable, although no burned hole can be found.

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*Superintendent of mines, British America Nickel Corporation, Ltd., Nickelton, via Sudbury, Ont.

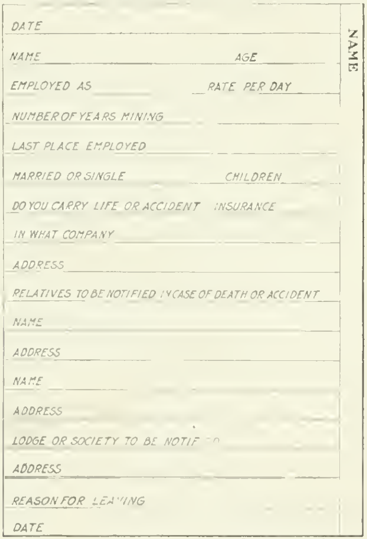
It follows from these considerations that the best method of charging a hole is the old one of placing the detonator in the top of the top cartridge and then using tamping. In charging, the paper wrapper is usually slit before the cartridges are placed in the hole and the sides of the hole become coated with explosive; the use of tamping will tend to prevent this coating of explosive from catching fire.

By placing the detonator deep in the charge, the liability to burned holes would seem to be increased, but in this case the burning of the explosive at the top of the charge would not prevent the detonator from exploding in the hole and detonating part of the charge, and so holes only partially burned would probably result.

⁂

Card Index of Employees

Mining companies operating in states having an industrial-insurance act in force, or where the companies carry liability insurance or insurance for their employees, should keep an accurate record of the employees. Even where not imperative, such a record is useful.


DATE
NAME AGE
EMPLOYED AS RATE PER DAY
NUMBER OF YEARS MINING
LAST PLACE EMPLOYED
MARRIED OR SINGLE CHILDREN
DO YOU CARRY LIFE OR ACCIDENT INSURANCE
IN WHAT COMPANY
ADDRESS
RELATIVES TO BE NOTIFIED IN CASE OF DEATH OR ACCIDENT
NAME
ADDRESS
NAME
ADDRESS
LODGE OR SOCIETY TO BE NOTIFIED
ADDRESS
REASON FOR LEAVING
DATE
NAME

ENG & MIN JOURNAL

A 4x6-In. Index Card for Employees

A simple form of index of employees is shown in the accompanying illustration. The form is printed on a 4x6-in. card, a convenient size for filing in a small cabinet, and while it does not contain the mass of data some companies require on their "death warrants," it includes all the information necessary to enable the timekeeper to fill out insurance forms, etc., in case of accident or death and to inform relatives or societies in case of death.

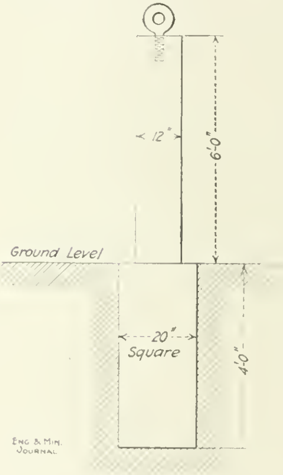
Two methods of filling out such cards are used. At one mine, the shift bosses hand the cards to new men the first shift, the men returning them the next or they are not allowed to go to work. Another mine requires newly hired men to appear at the office and give the data to the timekeeper. The latter system is preferable, for the cards are kept clean, no item is liable to be skipped and the data are placed on the proper lines. When a man leaves for any cause, the reason for leaving and the date are placed on the card, the card removed from its file and placed in a second file, which contains only the cards of employees who have left. Any notes regarding the man's work, habits, etc., may be written on the back of the card, if desired. In this way a complete record of all men who are working or have worked for the company is kept in a neat, simple and compact form.

⁂

Raising Guy Lines

By L. E. Ives*

Those who have had occasion to walk around the surface of mining properties at night, have probably once, at least, stumbled across a guy line leading from a smokestack or similar object. The height at which these generally cross path is just about that necessary to strike one in the neck. The accompanying sketch shows how this may be overcome, at the same time providing a perfectly strong anchor. A concrete post, reinforced with two 30-lb. rails, is made with a total length of 10 ft. The upper 6-ft. section of this post is circular in cross-section and 12 in. in diameter. The remainder is square, 20 in. on a side. The square section is placed in the ground, and the round portion extends above ground. An eye-bolt is embedded in the top, and the guy line is attached to this. In this way the line at its lowest point is 6 ft. above the ground, giving ample clearance.



Guy-Rope Support

⁂

War Deprives England of Mine Timber

The European war is materially affecting certain phases of the industrial-safety problem in Great Britain, says the *Travelers' Standard* for September. For example, the closing of the ports of the Baltic Sea and the shortage of labor in the neighborhood of Bordeaux have greatly reduced the supply of timber used for props in British mines, a considerable part of which has been obtained, heretofore, from Russia and southwestern France. Shipments from Norway and Sweden are not practicable at the present time. The situation has already become serious and mining engineers are giving it careful attention. One colliery uses props made from old steel pipes, filled with pieces of wood to strengthen them against collapse. It has been suggested, also, that old steel rails be used.

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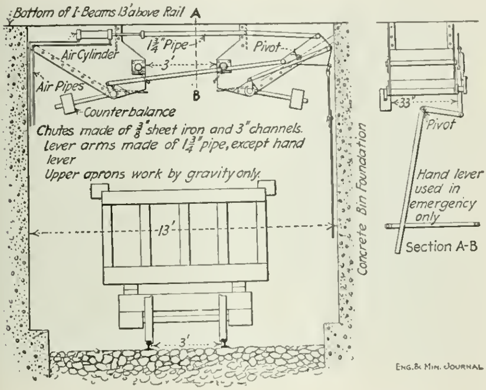
*Chicago Editor, "Engineering & Mining Journal."

Quincy Rockhouse Loading Chutes

By L. Hall Goodwin*

The Quincy method of loading stamp rock from the storage bins at the mine into cars for transportation to the mill is unique among those used at the Lake Superior mines in that the chute aprons are operated by compressed air. The accompanying sketch illustrates the chute mechanism. The air cylinder is direct connected to one corner of an irregularly shaped, four-cornered steel disk, the other three corners of which are connected by levers with the lower apron of each chute and a hand lever, respectively; the disk is pivoted so that the various levers have the right amount of play. The hand lever is, of course, thrown whenever the aprons are operated but it is of use only in emergency, when the air accidentally goes off; the aprons cannot be operated easily by hand, but are opened and closed quickly by the air cylinders. The air cocks are centrally placed in a niche left in the concrete bin foundation midway of the tunnel; this niche is just large enough to allow the operator room to work comfortably. There is one air cock for each cylinder, that is, for each pair of chutes, and they are arranged on the two sides of the operator's niche corresponding to the position of the chutes they control. The air cocks and pipes are arranged to admit air to either end of the cylinders.


Bottom of I-Beams 13' above Rail
A
$1\frac{1}{4}$" Pipe
Pivot
Air Cylinder
3'
Air Pipes
B
Counterbalance
Chutes made of $\frac{3}{8}$" sheet iron and 3" channels.
Lever arms made of $1\frac{1}{4}$" pipe, except hand lever
Upper aprons work by gravity only.
13'
Concrete Bin Foundation
3'
33"
Pivot
Hand lever used in emergency only
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Loading Chutes at Quincy's Steel Storage Bins

The operation of loading is as follows: The string of cars is pushed through the tunnel by the switching locomotive and left there, the grade of the track being such that the cars may be started easily when the brakes are released. Cars are loaded by two men, one of whom operates the chute aprons; the other rides the forward car and by use of the brake keeps the cars in slow but steady motion, the aim being not to allow them to come to a standstill because they might not start again of their own accord. As soon as an empty car comes under the end chutes the aprons of that pair of chutes are opened and remain open until the car is about to pass from under them; the filling of the car is completed as it passes along under the other chutes, and its load is finally topped off by a few splashes from the last pair of chutes. To accomplish this, several pairs of chutes must often be open at once, and the operator must be alert to avoid spilling rock on the track; his work is not difficult, however, as it consists of simply turning air cocks. Air is supplied from the main underground system; between shifts or at other times when the large air compressors are not working, a small Westinghouse air pump takes the load, it being adjusted to start and stop automatically whenever the pressure in the underground system falls below or exceeds a certain amount.

This method permits more rapid loading than does the usual one, with which it is necessary to stop each car for some time under the chutes. This is true not so much because of their operation by air, however, as because the chutes are located in pairs on opposite sides of the track and there are more of them than usual.

⁂

Motor Control On Gold Dredges*

The problem of control for the large motors used for digging service on gold dredges would be more simple if direct-current motors could be economically used. As their use is impracticable, the control for alternating-current motors that most nearly approaches direct-current control is desirable. The control must permit of reversing the direction of the motor in such a way as to allow the bucket line to be backed away from obstructions. For service during the repair of the bucket line, small variations of speed should be obtainable, particularly at partial loads. A control permitting continuous running at low-speed points is particularly necessary.

Dredges employing a digging motor of 100 hp. or less can use the ordinary drum-type controller. For larger installations, a combination of magnet switches controlled by a master controller has been used, but for the larger motors the ideal control seems to be the liquid rheostat.

Magnet-switch control has been used satisfactorily by the Natomas Consolidated on most of its dredges having digging motors of 300 hp. and larger. It has, however, several distinct disadvantages for that service, according to Girard B. Rosenblatt. The principal disadvantage is that a limited number of definite points only are available with this type of control unless the number of magnet switches in the secondary circuit is made very large, which, in turn, makes the controller inordinately expensive. Therefore, small variations in speed, particularly at light loads, are not available with this type of control, and in order to obtain slow movement of the bucket chain, it is customary to start the motor up and then plug it, with consequent strain on all mechanical parts, as well as wear on the control contacts. Further, this type of control does not allow the dredge operator to pick out any particular speed at which he desires to run. He can only pick a particular point on the controller and the corresponding motor speed will depend on the torque being exerted by the motor.

Another disadvantage of this type of control is the tremendous amount of resistance required for a large motor, as the resistance must be sufficient in amount to permit very low motor speeds at light loads, and large enough in capacity to permit continuous operation at duced speeds with heavy torques. This makes a very bulky resistance and unless the resistance is large enough, there is considerable danger from overheating of the grids starting a conflagration.

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*Mining engineer, 3 Barstow St., Allston Station, Boston, Mass.

*Excerpt from a paper read before the American Institute of Electrical Engineers, August, 1914.

The liquid rheostat for digging-motor control has, on the other hand, none of the disadvantages of the magnetic-switch control. There are no definite steps, and the speed of the motor may be varied by infinitesimal gradations. The operator simply moves the rheostat handle until he obtains the speed he desires. In other words, he does not work for any particular point on the rheostat, but works simply with the idea of getting the speed he wants. For large motors, the liquid rheostat and its accessories take up much less room than would a corresponding magnetic-switch control and its attendant resistance, and there is never any danger of the electrolyte (water and common washing soda) causing a conflagration.

However, the liquid rheostat for use on dredges must be modified from the forms commonly used for hoist service and the like on land. The first liquid rheostat installed on dredge service was on one of the Natomas dredges, with a 400-hp. motor, and while it was operative it was not entirely satisfactory, because certain essential details of design and application were overlooked. A similar liquid rheostat on which these details have been given due attention, is now being used on one of the dredges of the Conrey Placer Mining Co., and has been entirely satisfactory in operation with a 550-hp. digging motor, which I believe is the largest digging motor on any elevator-type gold dredge in operation today.

In order to keep down the size of the liquid rheostat for this work, it is practically necessary to provide some means of artificial cooling for the electrolyte. Usually this is accomplished by circulating cooling water through the coils in the rheostat tank. On the Natomas rheostat the mistake was made of pumping water from the dredge pond through these cooling coils. Due to the operation of the dredge, this pond water is usually muddy, and often carries a large percentage of solids in the shape of silt. At Natomas this silt coated the inside of the cooling pipes, thus reducing their effectiveness and eventually clogging them up, necessitating a shut-down while they were blown out with compressed air. Shut-downs on a dredge cost money, because to realize the greatest return on the investment, the dredge must be digging all the time. Therefore, this feature made the Natomas rheostat undesirable. At the Conrey Placer Mining Co.'s property, the cooling system consists of a series of pipe coils immersed in the pond, and the electrolyte is pumped from the rheostat tank through the coils and back again, instead of pumping pond water up to the tank and through coils installed therein. There has never been a shut-down on the Conrey dredge, due to the rheostat or its cooling system. The motion of the dredge in the pond is sufficient to keep silt from settling on the cooling coils.

Another trouble that was experienced at Natoma was stallation was the fact that dredges swing, and often rock considerably. This causes the electrolyte to splash out of the rheostat. Usually such loss by splashing was replaced by pouring in additional water, but this, of course, changed the density of the electrolyte and caused the operators some trouble. On the Conrey rheostat, baffleplates and inclosing covers were supplied, which effectually prevented any splash.

Another trouble that was experienced at Natomas was due to deficiencies in the cooling system mentioned above; the electrolyte often attained a high temperature during hard work, which caused excessive evaporation. Under certain conditions this evaporation was so great that the annoyance and expense of bringing fresh replacing water on the dredge and filling the rheostat was considerable. This trouble has been obviated at the Conrey installation by having an adequate cooling system.

All in all, it may be said that for large digging motors of, say 350 hp. and up, the liquid rheostat makes an ideal method of control, provided the rheostat is of adequate mechanical construction for the service and is provided with a proper and sufficient cooling system. Both liquid-rheostat and magnet-switch control may be arranged to give the same advantages as to protection against acceleration at too high a rate and against excessive overload due to sudden changes in speed.

⁂

Reversing a Cable Drum

We often want to pay out rope on a second-motion friction-clutch haulage system having nonreversing engines, says J. J. Piper in *Power*, Oct. 27, 1914. To put on reversing eccentrics and links would be quite expensive and as the engine has to run at a high rate of speed, they would be objectionable on that score also. We put on the device shown and can now pay out rope at will without reversing the engine.

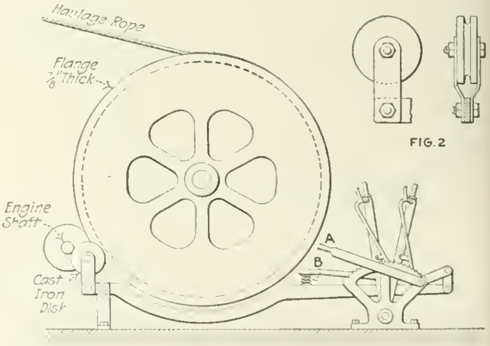


FIG.1

Friction Disk between Drum and Engine Shaft

Fig. 1 shows the drum, a cast-iron disk, and the control levers. Fig. 2 is the cast-iron disk.

By releasing the brake and clutch and pulling up on lever *A*, the disk is pressed against the engine shaft and the flange of the drum (in the groove shown in Fig. 2), and causes the drum to rotate in the unwinding direction. *B* is a coil spring which holds the lever up and keeps the disk from rubbing the engine shaft or flange when not in use.

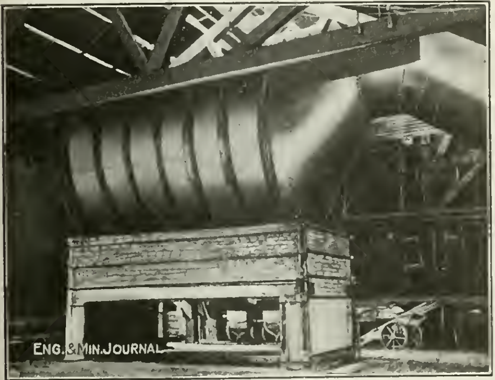
⁂

Mine Caves and Surface Support are to be the subject of a further investigation by the U. S. Bureau of Mines, in coöperation with the U. S. Geological Survey. The immediate work will comprise detailed studies of the extensive open-cut and underground mining operations in southwestern New Mexico. The field investigations will be conducted with special reference to earth pressures and surface subsidence in relation to the geological formation and mining conditions, and the equipment and efficiency of the large mechanical installations in operation there. Charles Enzian, a mining engineer of the anthracite region, represents the Bureau of Mines in this investigation.

Details of Milling and Smelting

Cylindrical Hood over Blast Furnace

In describing the Ladysmith smelting works of the Tyee Copper Co., Alfred W. G. Wilson[1] calls attention to the drum-shaped hood erected over the superstructure of the larger blast furnace at this works. The blast furnace is 48x160 in. at the tuyeres, and has jackets 9 ft. 9 in. high, sloping from the base to the top; the width of the furnace at the base of the jackets is 42 in., and at the top 62 in. The end jackets are vertical, and the distance from the bottom plate of the furnace to the feed floor is 11 ft. Blast is supplied to the furnace at 32-oz. pressure through 22 tuyeres, each having a diameter of 5.5 in. When this plant was in operation the furnace smelted about 300 tons per day.



Drum Hood over Blast Furnace at Ladysmith, B. C.

The accompanying photograph shows the cylindrical hood over the furnace. The drum is 12 ft. in diameter and is connected by a downcomer to the main flue. The function of the cylindrical hood was to return to the furnace as much as possible of the dust. The large cross-section permitted a momentary check in the velocity of the escaping furnace gases and, according to Mr. Wilson, caused nearly 40% of the dust carried in suspension to be returned directly to the furnace.

*

Effect of Steam on Magnesite Brick

According to R. H. Youngman, of the Harbison-Walker company, all calcined magnesite, and all magnesite brick, no matter how thoroughly burned, will hydrate in contact with steam (*Iron Trade Review*, Oct. 8, 1914). The effect of this hydration is to cause disintegration of the brick to an impalpable powder.

Difficulties of this nature have been experienced in laying openhearth furnace bottoms, from laying magnesite brick over a bed of water-soaked refractories. It also explains cases of disintegration of brick which had been in contact with steam leaking from coils over steam-heated floors. When the furnace receives its initial heating, steam is formed from this moisture, and trouble results.

*

Pine Oils for Flotation

In view of the increasing use of pine distillates in the flotation process, it is of interest to know something about the methods of manufacture and the characteristics of the various products.

The raw materials are the resinous woods of the South Atlantic and Gulf states—longleaf, loblolly and Cuban pines. For the purposes of manufacture, the dead and fallen timber generally known as "lightwood" is used. The bark and outer wood have usually rotted away before the timber is gathered. There are two general processes of manufacture:

(1) The steam-and-solvent process from which are obtained turpentine, pine oil, rosin, and "spent wood" which is suitable for paper pulp or may be burned under the boilers.

(2) Destructive-distillation process, the products of which are turpentine, pine oil, pine-tar oils, pine-creosote oils, pine tar, charcoal and uncondensed gases which may be utilized for heating the retorts.

In the steam-and-solvent process, the wood is reduced to fine chips by passing through chipping machines. It is then placed in retorts and superheated steam is driven through the mass until the volatile turpentine and pine oils have passed over to condensers. The pulp remaining in the retort is dried by evacuation, and a liquid hydrocarbon is sprayed over the top and allowed to percolate down through the wood. The rosin and any remaining pine oils are thus extracted and later the solution is separated into its component parts. It should be noted that all of the products of the steam-and-solvent process appear normally in the dead pine wood and are not products of decomposition.

The destructive-distillation process, however, changes the composition of some of the products. In this process, the wood, in the form of cordwood, is placed in a horizontal retort, sealed and heat applied externally, the temperature being raised slowly until the wood is thoroughly carbonized. The volatile constituents are passed to a condenser and later subjected to distillation, whereby the several liquid distillates are separated from one another.

The characteristics, yields and prices of the products made at one of the largest distillation plants in the South, as reported to us by the General Naval Stores Co., 175 Front St., New York, are given in the accompanying table. Up to date, the oil most used has been the steam-distilled yellow pine oil. The commercial pine-tar oil and the refined pine-tar (creosote) oil have also been used with satisfaction at some mills; as the yields of these oils per ton of wood are large, the cost is low, and experimentation may develop that for certain ores these oils will be as efficient as the more expensive steam-distilled oil.

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[1] "The Copper Smelting Industries of Canada," by Alfred W. G. Wilson, Mines Branch, Can. Dept. of Mines.

The use of the pine products in varying grades of purity, that is, before complete separations have been obtained, may considerably reduce the expense for oil in the application of the flotation process. We have also been told by one of the early investigators of flotation that rosin was a valuable ingredient of the mixture with which he experimented. In Australia, eucalyptus oil has been extensively used. In later developments of the flotation proces, preagitation of oil and water has been practiced by some. At one successful operation in the Southwest, the following emulsifying-and-frothing mixture is used: Cresol, five parts; Carolina tar oil, one; crude turpentine, five; "stove" oil, eight parts. The concentrates amount to 6.4% of the ore and the oil consumption is 1.227 lb. per ton of crude ore.

CHARACTERISTICS OF PINE PRODUCTS

Steam-and-Solvent Process

Product	Color	Specific Gravity @ 15° C.	Yield per Ton of Wood	Price in Bulk at Point of Manufacture
Turpentine	Water white	0.862-0.870	5-7 gal.	32@40c. per gal.
Pine oil	Light straw to red	0.920-0.950	1⅓-2 gal.	20@23c. per gal.
Rosin	Ruby red	1.08-1.09	250-300 lb.	1.4@2c. per lb.

Destructive-Distillation Process

Product	Color	Specific Gravity @ 15° C.	Yield per Ton of Wood	Price in Bulk at Point of Manufacture
Turpentine	Water white	0.858-0.865	5-8 gal.	25@30c. per gal.
Pine oil	Yellow to red	0.920-0.960	1½-2½ gal.	18@22c. per gal.
Commercial pine-tar oil*	Brown to black	1.02-1.07	35-45 gal.	10@14c. per gal.
Refined pine-tar (creosote) oil	Cherry red	0.940-0.990	8-10 gal.	13@17c. per gal.
Pine tar	Brown to black	1.07-1.10	25-30 gal.	9@12c. per gal.

* Commercial pine-tar oil is produced in lieu of refined pine-tar oil and pine tar, and yields shown above presume the two separate methods of refining. Great flexibility in characteristics of these products is possible by variance in method of refining.

⁂

Threading Pipe for Future Use

The elimination of small wastes goes a long way toward building up an ultimate profit. One opportunity for such a saving is suggested by J. F. Hobart in *American Machinist*, Oct. 20, 1914.

When ordinary pipe-fitting is being done, there are numerous pieces cut off and thrown aside for future use—or waste. A good plan is to make and enforce the rule that whenever a waste piece of pipe is cut off, that piece shall be threaded before it is placed in the stockpile. It takes but a short time to thread the piece when the pipe vise and the correct size of die is ready and in hand; much less time than will be required when the piece of pipe is wanted badly, usually in a hurry, and dies must be procured. The cutting of threads on all cut-off pieces of pipe is a fine habit to get into. It is one of those little things that look trivial but can be made to represent a saving well worth while.

⁂

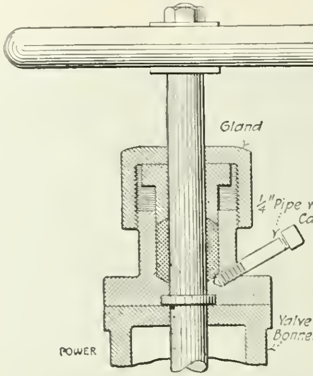
Calorized Iron

A new treatment for iron, copper, brass, etc., which is to be exposed to high temperatures under oxidizing conditions, is known as calorizing (*Gen. Elec. Rev.*, Oct., 1914, p. 917). This consists in tumbling the articles, if small, at an elevated temperature, in contact with a mixture containing finely divided aluminum. If the object is large, it can be packed in, or painted with the mixture. Apparently, when objects so treated are heated in contact with oxygen, the coating of aluminum formed on the surface is changed to a glaze of alumina, which stops further corrosion.

⁂

Valves Packed under Pressure

A method of packing valves under pressure is described by John C. White, in *Power*, Oct. 20, 1914. All modern valves should be capable of being repacked under pressure when wide open or shut, and most manufacturers make that claim for their product. In practice, however, it is found that even though they are tight when new, they soon develop slight leaks past the sealing joint or collar and it is then almost impossible to repack them without cutting out the line.



Packing Space Vented

To overcome this difficulty, they are drilled and tapped for a ¼-in. pipe and a short piece of pipe with a cap put in as shown. When repacking, the valve is opened wide, the gland and old packing removed, the pipe plug taken out and the hole in the stuffing-box cleared if necessary. The packing can then be put in, the gland brought down on it and the plug replaced without difficulty, any leakage during the operation escaping through the hole instead of blowing out the packing.

Thirty or forty valves have been so fitted and there has been no trouble in repacking them during the three or four years they have been in use.

⁂

Diaphragm for Electrolytic Tank

In much electrolytic work now carried on, the solution is fed into one electrode compartment, and drawn off at the other, a very porous diaphragm being a necessity. This diaphragm must often act as a filter. In a recent patent of N. V. Hybinette, residing at Kristiansand, Norway, the construction is advised of such a diaphragm from two perforated lead plates, with loose asbestos, or other filtering material between them. He says that the lead surfaces do not act as series electrodes, and that if the asbestos is acting as a filter, and becomes clogged, it is very easy to remove, wash, and replace it.

The Cost of Doing Things

Cost of Piping Arizona Copper Co.'s New Smeltery

According to numerous items of piping costs contained in "Unit Construction Costs from the New Smelter of the Arizona Copper Co.," by E. Horton Jones, published in *Bull. of A. I. M. E.*, No. 91, it appears that the total cost of piping for the smeltery that has been completed at Clifton, Ariz., was $122,389. There are probably a few small items of piping costs included in the installation of pumps, etc., that are not included in this summary which has been made up from the figures given in the original article. These costs include excavation, cost of material at Clifton and all labor in erecting. In addition to the cost as given for each item a proportionate charge for engineering expense and indirect expense has not been included. Anyone using these figures as a basis of estimate should add this charge, which amounts to 5.40% for engineering and superintendence and 7.53% for indirect expenses. A layout of the piping is reproduced herewith, (p. 832).

BLAST PIPE FROM FANS TO ROASTERS IN ROASTING PLANT

This pipe was made of No. 10 and No. 12 plate and varied in diameter from 18 in. to 36 in. The inlet pipe to each roaster was 18 in. diameter. Installation of this pipe included in the cost given herewith consisted of connecting up and riveting the pipe in place in the field only. This piping amounted to 240 ft. and cost of material, fabrication and installation was: Labor, $1569.62; material, $656.62; total $2,226.24

Cost per foot, $9.28.

PIPING IN REVERBERATORY PLANT

Miscellaneous piping, boilers and reverberatory building; the sizes were various and the amount of piping installed was not given. Costs were: Labor, $524.15: material, $1409.85; total $1,934.00

Feed piping from heating plant to feed pumps:

Excavating 1296 cu.yd. of trench from hot-water heating plant to boiler feed pumps through red clay filled with boulders, sand and gravel. The work was performed with picks and shovels and handled 300 ft. with wheelbarrows and slips. Much of the dirt had to be handled three times in removing it from the trench; 200 ft. of the trench was cribbed and lagged 20 ft. high. Cost: Labor, $1039.91; material, $51.51; total $1091.42

Cost per cu.yd., 84c.

In installing this pipe, ordinary vitrified 15-in. sewer pipe cut in half was used for conduit. The first half was laid in the trench and the joints cemented, followed by laying an 8-in. standard wrought-iron pipe. About this pipe an asbestos filler was packed, and after each section of conduit top was laid, the filler was stuffed in over the pipe to thoroughly cover it. The cost of labor was $386.25. Cost of supplies follow: 557 ft. of 15-in. J-M sectional conduit, $2273.47; 557 ft. of 8-in. wrought-iron pipe, $374.49; asbestos filler and miscellaneous, $109.83; total supplies, $2757.79. Total pipe work amounted to 557 ft. Total cost $3144.04

Cost per foot of pipe, $5.64

Total cost of feed piping from heating plant to feed pumps, including trenching 4,235.46

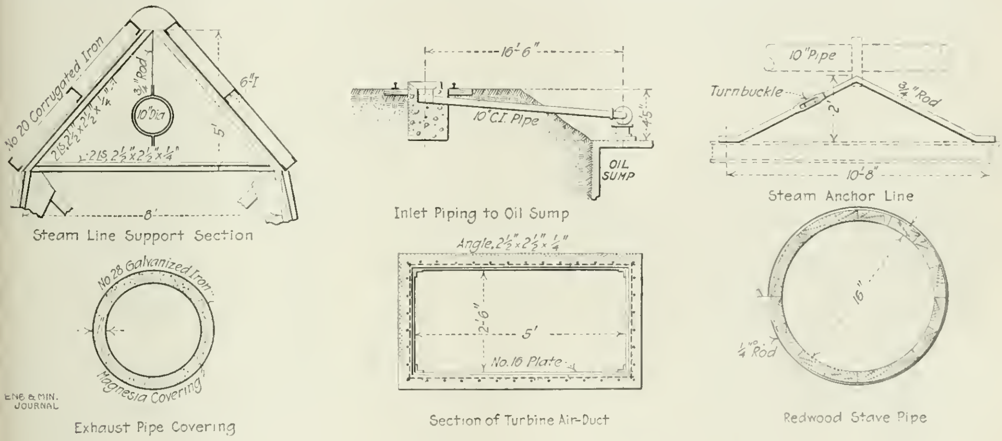
Total cost per foot, $7.60.

Feed piping from pumps to boilers:

This represents pipe fittings, pipe covering, paint and labor in erecting, covering some of the pipe with insulation and painting all the pipe. The piping was about one steam and two electric feed pumps at the boilers. It also covered a hot-water line the length of the boiler building and a cold-water line of the same length. Each is connected to the boilers. The two main lines are 6 in. Connections to the boilers are 3 in. The hot-water lines are covered throughout. Labor cost was $1060.53. Materials cost: Standard pipe, $416.39; extra heavy fittings, $2408.89; pipe covering, $137.26; hangers and miscellaneous, $78.46, total material cost, $3041. Total amount of piping, 1093 ft. Total cost 4,101.53

Cost per foot of pipe, $3.75.

Total cost of piping for reverberatory plant of 1200 tons capacity in 24 hr 10,270.99



Steam Line Support Section

Inlet Piping to Oil Sump

Steam Anchor Line

Exhaust Pipe Covering

Section of Turbine Air-Duct

Redwood Stave Pipe

DETAILS OF PIPING, ARIZONA COPPER CO., CLIFTON, ARIZ.

PIPING IN CONVERTER PLANT

Air pipe from power house:		
Excavating 331 cu.yd. of trench through sand, gravel and boulders with pick and shovel, and backfilling same..... Cost per cu.yd., 68c.	$224.06	
The pipe ran from the power house to connect with all the converters, and was built to carry air under 12 lb. pressure of No. 8 U. S. gage plate riveted, tested for 25-lb. pressure and painted with asphaltum paint. It was made in 30-ft. sections and fastened together with forge-steel flanges. Labor cost was $674.62. Material cost was: 400 ft. 24-in. pipe, 10-in. cast-iron nozzles, tees and ells, $1332.70; 22 ft. 10-in. pipe and two 10-in. flanges, $27.54; two 24-in. cast-iron gate valves, $138.55; miscellaneous, $127.85; total materials, $2041.89. Total cost.. Total piping, 422 ft., at $6.43.	2,716.51	
Total cost of air pipe from power house, including excavation .... Total cost per foot, $6.97.		2,940.57

SEWER SYSTEM

Excavating 2967 ft. of trench and tunnel. Trenches varied from 18 to 60 in. wide and 2 to 20 ft. deep through various kinds of soil. Costs were: Labor, $2122.84; material, $65.20; total .... Cost per linear foot, 74c.	$2,188.04	
Concrete work amounting to 53.8 ft. for manholes, etc., was performed. The mix was 7 of sand and gravel to 1 of cement. This work cost: Labor, $168.18; material, $184.08; total	352.26	
Laying and cost of pipe, which consisted of 2967 ft. of vitrified sewer pipe, ranging from 6 to 15 in. in diameter and laid at an average depth of 4 ft. below surface. Cost, $778.83 for labor and $1224.72 for supplies; total ...... Cost per foot of pipe, 68c.	2,003.55	
Total cost of sewer pipe, including excavation.... Total cost per foot, $1.53.		4,543.85

WATER PIPE LINE

Excavating 4253 ft. of trench through various kinds of ground from 8 to 15 ft. in depth. Labor .... Cost per foot, 20c.	$868.11	
Concrete work, 2.3 cu.yd., to anchor 6-in. line at foot of hill. Labor, $17.37; material, $17.86; total .... Cost per cu.yd., $15.32.	35.23	
Pipes and laying; all water lines about smelter consist of 2052 ft. of 6-in. pipe, 1058 ft. of 4-in. pipe, 200 ft. of $2\frac{1}{2}$-in. pipe, 268 ft. of 2-in. pipe, 115 ft. of $1\frac{1}{2}$-in. pipe and 50 ft. of 1-in. pipe; total, 4253 ft. of pipe, and all necessary fittings, valves and fire hydrants. Cost of labor, $2863.32; material, $2062.07; total .... Cost per foot of pipe, $1.16.	4,925.39	
A 6-in. pipe line from Clifton, distance 8988 ft.; cost, including excavation, laying, material, painting and backfilling, labor, $1474.71; material, $6914.95; total .... Cost per foot of pipe, 93c.	8,389.66	
Total cost of all water pipes .... Total cost per foot, $1.0		14,218.39

AIR LINE

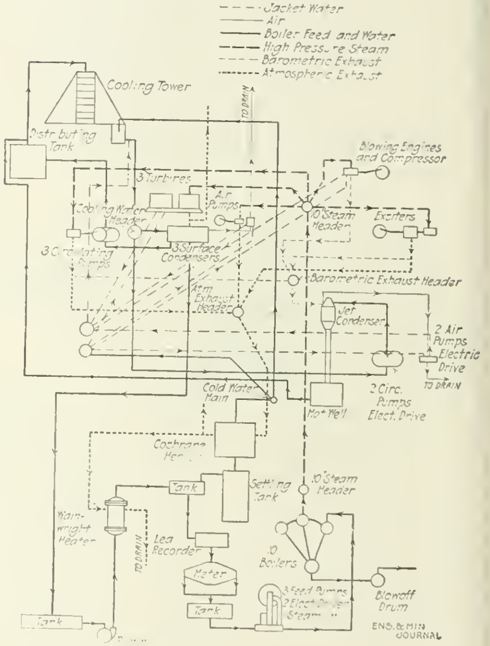
Excavating trenches amounting to 401 cu.yd. through various kinds of soil and ranging from 18 in. to 6 ft, in depth and 1 to 3 ft. in width. Cost, including backfilling; labor .... Cost per cu.yd., 67c.	$267.50	
The air lines together were 2316 ft. long and were made up of the following quantities of pipe: 526 ft. of 1-in. pipe, 36 ft. of $1\frac{1}{4}$-in., 80 ft. of $1\frac{1}{2}$-in., 656 ft. of 2-in., 838 ft. of 3-in. and 180 ft. of 4-in. pipe. Cost was as follows: Labor, $132.37; material, $623.08 total .... Cost per foot, 46c.	1,055.45	
Total cost of air line, including excavation. .... Cost per foot, 77c.		1,322.95

STEAM-HEATING SYSTEM

Excavating 227 cu.yd of shallow trench through red clay and backfilling. Labor cost .... Cost per cu.yd., 73c	$166.36	
This pipe was covered with double standard [illegible] covering, 260 ft. of 2-in. and 236 ft. of [illegible]-in steam pipe were laid in a 2-in. lumber box. Total pipe, 496 ft. Cost: Labor, $240.78; material, $305.37; total .... Cost per foot of pipe, $1.10.	546.15	
Total cost of steam-heating pipe system .... Cost per foot of pipe, $1.43.		712.51

POWER-HOUSE PIPING

Air pipes or ducts for turbines (see Fig. 57):	
This pipe was made in the shop of No. 16 steel, with $2\frac{1}{2}$x$2\frac{1}{2}$x$\frac{1}{4}$ angles. Total length, 103 ft. Cost of labor, $547.68; materials, $200.75; total .... Cost per foot, $7.27.	$748.43
In erecting this pipe, cloth insertion packing, rivets, hangers, anchors, etc., were used. Cost of labor, $232.57; material, $64.24; total........ Cost per foot, $2.88.	296.81
Total cost of air ducts for turbines Cost per foot, $10.15.	$1,045.24
Erecting compressor:	
All piping, except steam, used in erecting Ingersoll-Rand two-stage compressor. Cost of labor, $298.46; material, $160.65; total	459.11
Steam pipe for north and south mains:	
Excavating 279 cu.yd. for numerous piers done with pick and shovel and cast to one side. Labor cost....... Cost per cu.yd., 89c.	$249.65



PIPING LAYOUT, ARIZONA COPPER CO.'S SMELTERY

Foundations; these are concrete piers which support the long structural steam-pipe supports. Part of the concrete was mixed by machine and part by hand in proportions of 6 sand and gravel to 1 cement. There were 194.5 cu.yd. and about 50% of the vertical surface was formed. Cost of labor, $578.24; material, $945.97; total .... Cost per cu.yd., $7.84.	1,524.21
Steel support structure (see Fig. 60) for these mains consists of 11.8 tons of corrugated iron and 75.01 tons of structural steel. Cost, including labor .... Cost per ton, $88.64.	7,694.58
Hangers and anchors used for steam piping between boilers and the machines in the power house were made of $\frac{3}{4}$-in. rods and $\frac{1}{2}$x$2\frac{1}{2}$-in. iron (see Figs. 60 and 61). Cost of labor, $1030.68; materials, $337.26; total .... Total, 153 rods, at $8.94.	1,367.94

Cost and erection of pipe; the pipes run from the boilers to the power house in duplicate, making a complete loop about 1120 ft. around. The main lines are 10 in., branches from boilers 8 in. and all branches to engines of suitable sizes ranging from 4 to 8 in. The line is required to stand 180 lb. pressure with 100° F. superheat. All joints are Van Stone, all valves and fittings are of cast steel. Corrugated bronze gaskets were used. The 10-in. lines are fitted with six 10-in. Labor cost was $2286.31

The following gives some details of materials and cost:

Six 10-in. Harter expansion joints	$1,684.77	
One 6-in. cast-iron separator..	126.55	
Two 10-in. cast-steel vertical separators	843.47	
One 10-in. cast-steel horizontal separator	372.48	
Two 6-in. separators and receivers	591.77	
One 5-in. cast-steel separator and receiver	261.40	
Three 4-in. cast-steel separators and receivers	687.43	
Two 4-in. cast-steel separators and receivers	476.28	
Corrugated bronze gaskets....	251.93	
Ten 8-in. Lagonda valves......	1,315.52	
Twelve 10-in. gate valves.....	2,079.00	
Two 34-in. and one 33-in. Crane tilt traps	143.69	
Best Mfg. Co. pipe and fittings	8,738.89	
Extra pipe and fittings	526.18	
Miscellaneous	522.89	
Total cost of materials....	$18,622,25	
Total cost of labor and materials......		20,908.56

Total pipe work, 3401 ft., at $6.15 per ft.

The steam pipe lines and all fittings were covered with 85% magnesia blocks of double standard thickness, wrapped with 6-oz. duck. All the lines were then painted with two coats. Cost 6,079.94

Cost per foot, $1.79.

Total cost of steam lines, north and south mains $37,824.88

Cost per foot, $11.10.

Exhaust pipe:

Some of the piping used was cast iron, designed for a vacuum of 14 lb. per sq.in. The rest of the pipe used was lap-welded wrought steel and cast-iron fittings. The installation covers the three 20-in. atmospheic exhausts from the turbines, as well as the exhausts from the blowers, compressors, exciters, engines and circulating pump engines, to the jet condenser. It covers likewise the connections between the exhaust of the dry-vacuum pumps, exciters, engines, surface condenser, circulating pumps and heater house. The pipe ranges from 3 in. to 42 in. There were 1541 ft. of pipe. The labor cost for installation was $1745.71. The supply cost was $8715.66, made up as follows: Three 42x13 Wainwright turbine expansion joints, $656.70; three 20-in. atmospheric relief valves, $804.50; three 42-in. low-pressure flanged base elbows, $1428.61; three special 8-in. emergency-stop valves, $234.36; one 14-in. automatic atmospheric-exhaust relief valve, $123.27; pipe and fittings, $4585.74; miscellaneous, $882.48. Total cost of labor and material 10,461.37

Cost per foot, $6.79.

All exhaust pipe was given one coat of green silica graphite paint. Cost of labor, $85.05; material, $51.19; total.. 136.24

Cost per foot, 9c.

The exhaust pipe from the engines in the power house to the heater house were all covered with 85% magnesia single standard thickness, wrapped in 6-oz. duck. Where the magnesia is exposed to the weather, it is wrapped with No. 28 galvanized iron (see Fig. 62). Total pipe covered, 746 ft. Labor cost, $318.25; material, $830.56; total cost 1,148.81

Cost per foot, $1.54.

Other costs, including air pipe and erection, painting, exhaust-pipe foundations, supporting structure excavation Labor cost was $675.93; material, $733.56; total 1,409.49

Water pipe about power house:

Excavating a trench about 3 ft. deep through red clay and boulders for a 16-in. wood stave pipe, 2106 cu.yd. of earth removed. Cost, including backfilling: Labor, $1485.10; material, $0.24; total 1,485.34

Cost per cu.yd., 62c.

The following covers all the water pipe about the power house, the 30-in. cast-iron suction line from the cooling tower to the pumps; the 20-in. wooden lines from the pumps to the equalizing tank; the 16-in. wooden lines from the jet condenser to the cooling tower, and the 16-in. wooden lines from the equalizing tank to the cooling tower; the 12-in. cast-iron lines from the circulating pumps to the jet condenser. the 8-in. line from the condenser to the condensed water pump house; the 6-in. line from the condensed pump house to heater house, etc. Labor cost for erection was $3,747.79.

The following gives details of materials and their cost:

1998.7, 4-in. machine banded redwood pipes with collars (not used at new smelter)..	$397.74	
354.6 ft. 20-in. machine banded redwood pipe with collars..	365.24	
1104.2 ft. 16-in. machine banded redwood pipe with collars (see Fig. 63)	861.28	
22 flange couplings	590.00	
Freight on the above items ..	632.00	
Two 12-in. check valves	97.00	
Four 12-in. gate valves	172.00	
Three 20-in. gate valves	283.50	
Freight on above items	176.38	
Three 20-in. flanged, iron body, bronze-mounted double gate valves	403.49	
Five No. 20 gage copper plates	36.28	
Two cast-iron bell-and-flange fittings, 6 bell bends	81.11	
Freight and patterns on above	78.00	
220 lb. cloth insertion packing	91.50	
Best Mfg. Co. pipe	9,668.92	
Pipe, fittings, miscellaneous material	2,503.44	
Total cost of material		16,437.88
Total cost of labor and material....		$20,185.67

All this pipe above ground was painted at a cost of: Labor, $230.59; material, $25.54; total 256.13

Sewer pipe for feed water heating plant:

Excavating and backfilling a trench about 3 ft. deep through red clay and boulders, 266 cu.yd. Labor cost, at 59c. cu.yd.	$157.19	
Sewer pipe and laying, 100 ft. of 24-in. vitrified pipe. Cost of labor, $71.88; material, $203; total	274.88	
Cost per foot, $2.75.		
Total cost of sewer......	432.07	

$38.64; miscellaneous, $2.37; total............. 171.32

Total cost per foot, $4.32.

Total cost of power house-piping (except possibly a few small items connected with pumps, etc.) 74,844.35

OIL-SUPPLY SUMP AND PUMP HOUSE

Inlet piping, oil sump (see Fig. 38):

The following is for installing and cost of this pipe between the unloading tracks and oil sump: Labor, $44.77; six 10-in. wrought pipe 18 ft. long, $85.54; six 10-in. cast-iron cells, $38.64; miscellaneous, $2.37; total............. 171.32

108 ft. of piping at $1.59.

Oil piping:

Excavating trenches from 500,000-gal. oil tank to small 163-bbl. tanks. Trenches were 2 ft. wide and about 3 ft. deep. Total earth removed, 1150 cu.yd. Cost of labor, $990.73; material, $1.39; total 992.12

Cost per cu.yd., 86c.

Pipe and laying; there were 1888 ft. of pipe, consisting of 172 ft. of 12-in. wrought-iron pipe, 270 ft. of 16-in., 850 ft. of 8-in. and 596 ft. 2½-in. wrought-iron pipe. A 16-in. line runs from the oil sump to pump house, also from pump house to storage tanks. The 8-in line runs from the pump house to the 163-bbl. tanks. The 2½-in. line runs from the Wilgus oil pumps to each of the reverberatories. Cost of labor, $3156.14; material, $5654.50; total.... 8,810.64

Cost per foot of pipe, $4.67.

Heating installation for oil piping: a 2½-in. steam line is tapped off the steam line at power house and runs underground through a conduit and is packed in asbestos fiber. At the other end, the pipe connects with a cast-iron oil heater. Labor cost for installing was, $167.37 Materials cost $1068.04, and consisted of a cast-iron heater, $303.82; No. 33 Crane tilt trap, $35.91; 2½- 280 ft. 8-in. conduit, $547.49; asbestos, $29; in. pipe and fittings, $151.82 Total cost of labor and material 1,235.41

Total piping, 360 ft. at $3.43 per ft.

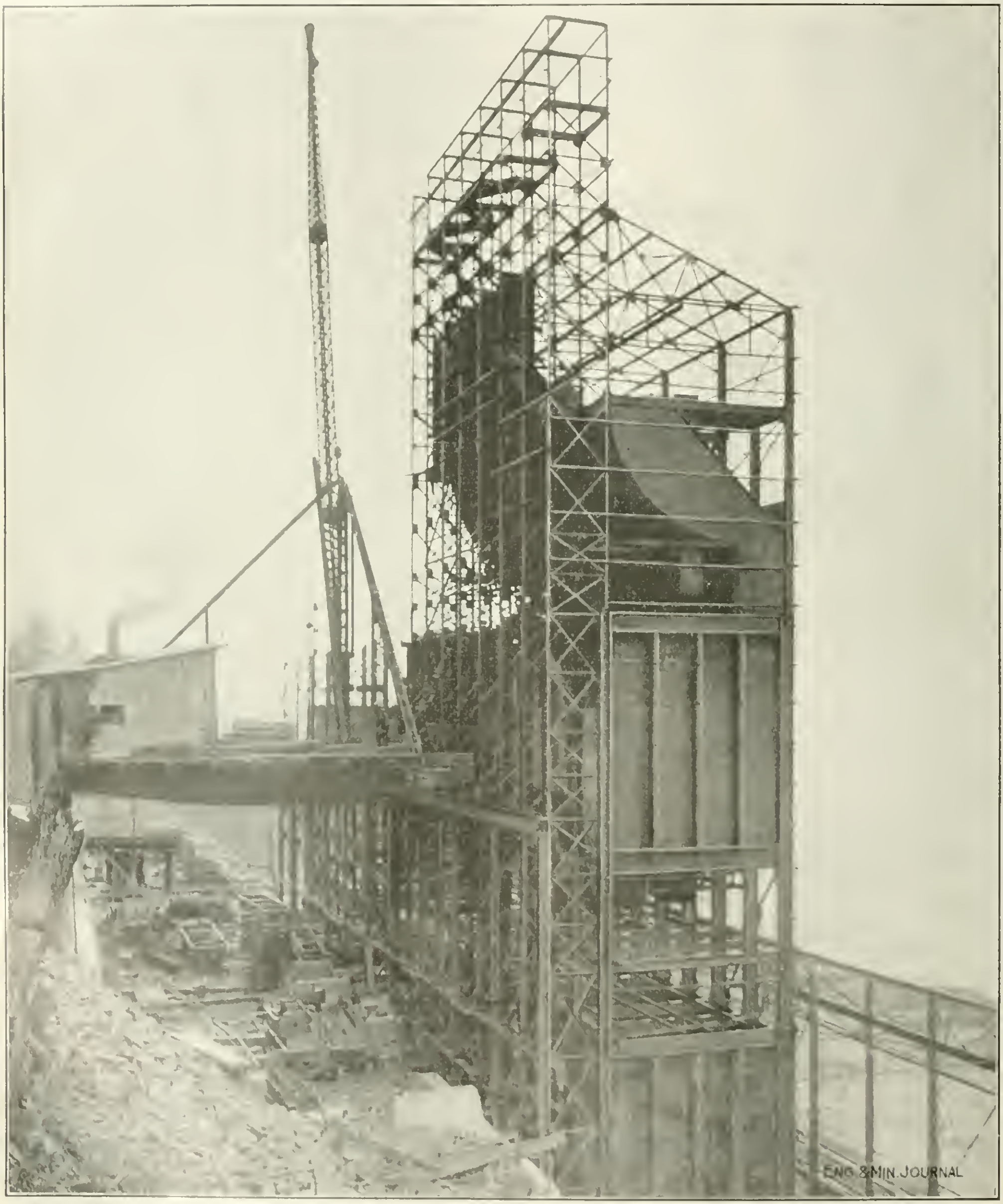
Total cost of piping at smelter, as given in details of cost..................... $11,389.34

⁂

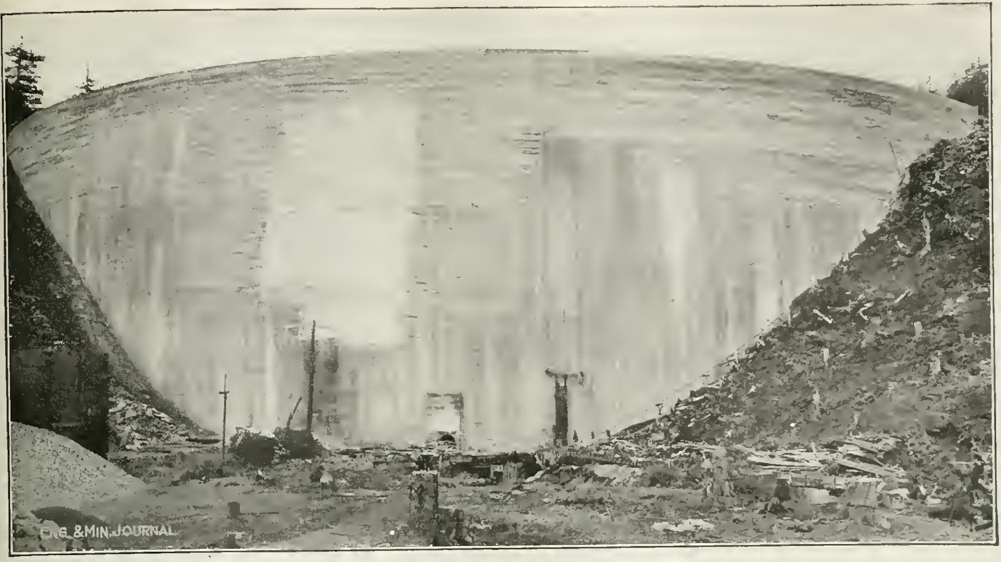
Operating Costs at the Dome

Report of the Dome Mines Co., South Porcupine, Ont., for the year ended Mar. 31, 1914, shows 145,305 tons milled. Costs were: Mining, 68c. per ton; hoisting, 7c.; crushing and conveying, 25c.; stamping, tube milling and amalgamating, 86c.; thickening, cyaniding and precipitating, 50c.; refining, 8c.; general, 61c., and total $3.05 per ton. Development cost amounted to $1.11 per ton. Average cost of mining, including hoisting and crushing, was $1.46 per ton milled.

Photographs from the Field



Construction of 6000-Ton Mill of Alaska Gold Mines Co., Juneau, Alaska



Up-Stream Face of Dam

Salmon Creek Dam of Alaska Gold Mines Co.
700 ft. long and 165 ft. high.

Character of the Employees in Lead Smelting in the United States

SYNOPSIS—A resumé of the findings of Dr. Hamilton on an investigation of the character of smelting-plant employes in the United States. These workers are of many nationalities, and colonize in different localities. Alcoholic excess exists principally among native-born Americans. They are essentially a shifting class, and employers have difficulty in retaining an experienced crew. Some of the villages are clean and well kept, but inattention and neglect is more common.

⁂

In her essay on lead poisoning in smelting and refining in the United States, published as a bulletin of the Bureau of Labor Statistics, to which we have previously referred in the JOURNAL, Dr. Alice Hamilton has some interesting pages on the character of the employees in this industry. She says:

The men employed in lead smelting and refining are for the most part foreign born of different nationalities, often newly arrived immigrants unable to speak English and unacquainted with the dangers of the work they undertake. This does not mean that they do not know the work is dangerous, for usually they have been warned by their fellow-countrymen, who have already worked in the plant, but they have no idea how to protect themselves against the dangers. On the Atlantic seaboard the men are chiefly Austrian Slavs, and the same nationalities are found in and around Chicago, with Magyars in addition. As we go farther west the mixture of nationalities increases. In the Federal plant near Alton there were in the spring of 1913 about 200 American-born whites and 25 negroes, the rest being Germans, Italians, Slavs and Greeks. The Italians were employed at the heaviest work, loading and unloading cars, the Greeks and Austrians in the yard and on blast furnaces, the negroes in the refinery, and the American whites on the ore hearths and in the powerhouse. In Collinsville the employees are negroes, American-born whites, Lithuanians, Italians, Syrians, Mexicans and Germans. The Hoyt Metal Co., in Granite City, employs Turks, Armenians, and Macedonians in addition to other nationalities. At Herculaneum the force consists of a much larger proportion of American-born whites, some of whom are regular smelters by trade, while some are farmers working at smelting only in winter. Some of these are descendants of the Washington County French. There are also Slavs, who form the more shifting part of the force. In Joplin alone the men are all Americans, many of whom come from Arkansas farms, work through the cold season, and return home in the spring. This alternation of employment is excellent for the men's health, and it is fairly general in the smelting industry. In Colorado the beet fields draw the men for the summer months, while the Slavs and Greeks of Chicago and southern Illinois go off on railroad-extension work.

Nationalities

Leadville, Salida and Denver have chiefly Austro-Hungarians and Greeks, with a few Italians and Russians. Pueblo has more Italians and has also Mexicans. Montenegrins are found in the Utah smelters, in addition to other southeastern Europeans. In 1911 a census of the Omaha Smelting & Refining Co. gave the following nationalities: Italians, 134; Austrians, 82; Hungarians, 85; Americans, 59; Bohemians, 53; Irish, 20; Poles, 18; Swedes, 12; Germans, 11. In 1913 the East Helena plant had 92 Austrians and 44 Americans, the remaining 56 men being scattered among no less than 17 different nationalities. In all these smelters there is always at least a small proportion of skilled American-born or northern European workmen holding the better-paid places.

The force is roughly divided into the yard gang, employed at day wages for a 9- or 10-hour day (eight hours in Colorado) and the inside men who work for eight hours, three shifts, in the western plants and in Perth Amboy, or for 12 hours, two shifts, in Grasselli, East Chicago, South Chicago and Newark. In one typical smelting plant the yard gang numbers 175 to 200, the inside men 90 to 100. In one large refinery the yard gang, including repair men, has 300; the converters and blast furnaces, 250; the refinery, 90.

Wages in the largest eastern plant were given as 20c. an hour for men in the yard gang, who work nine hours, and 25c. an hour for the inside men, who work eight hours. In East Chicago the day wage is $1.75; piecework averages $3 a day. In Collinsville and Federal the day wage is $1.65@1.80; the work on the ore hearths, in the dust-collecting system, and in unloading cars is piecework, and for this the men are paid from $2.25 to $3 per day. Farther west the wage for day labor rises, but that for more skilled work hardly changes at all. Thus, in Herculaneum and in Omaha, day laborers are paid $1.65 per day, in Denver $1.75, in Leadville and in Salt Lake City $2, in Tooele and in East Helena $2.25 or $2.35, while in all these plants $2.35 to $3 was given as the wage for skilled work. Mechanics, repairers, plumbers, blacksmiths, etc., are not included here.

Many vague charges of alcoholic excess are brought against the men employed in lead smelting, but not often by the people who know them best—their own foremen and employers. That Slavic, Magyar, Italian, and German workmen drink beer, wine and even whisky is readily admitted, but they are not regarded as an intemperate class of men on the whole, nor are the negroes. It is really in the plants where many American workmen are employed that one hears most complaint of alcoholism, perhaps because American workmen cannot stand alcohol so well as Europeans.

A Shifting Lot of Men

The workers are a very shifting lot of men and even the cash bonus offered by one large company to men who remain as long as a year in its employ is not inducement enough to make them stay. This refinery had succeeded in keeping less than 30% of the force as long as one year at the time it was visited. Naturally such a state of things results in far more lead poisoning among the men than is found in a plant where the workmen remain for years, acquire a fair amount of skill, and learn the risks to which they are exposed.

Although almost all of the managers of American plants complain of the shifting character of their labor, the condition is worse on the Atlantic seaboard and in the neighborhood of Chicago and St. Louis than in western Missouri, Colorado, and Omaha: The following are some of the statements made by superintendents as to the shifting character of the men employed by them:

"From 25 to 30% new men must be employed every month."

"We cannot get steady workmen; we are always losing our men, though we pay more than the usual rate of wages."

"Not 30% have been here as long as one year, and those who do stay average only 20 days' work a month."

"In one month 25 out of 92 men quit work."

"Not many of the men stay more than two months. We always prepare for the semimonthly pay day by sending to the employment agencies in St. Louis and Chicago."

"Six hundred and thirty are employed all the time, but there were 800 on the books last month."

"The monthly pay roll is 350, but 100 new men were employed during August, 25 on the blast furnace alone."

In only two plants could accurate information be obtained as to the length of employment of the men then at work. In one, out of 238 men, 52 had been there less than one month, 91 less than six months, 106 less than one year, while exactly one-half the force, 119 men, had been employed less than two years. On the other hand, 75 had been employed over five years and 13 over 20 years.

The second plant gave a more detailed report, as follows: Employed less than one year, 298; one to two years, 75; two to three years, 48; three to four years, 35; four to six years, 39; six to eight years, 22; eight to 10 years, 14; 10 to 15 years, 15; 15 to 20 years, 16; over 20 and under 30 years 53, over 30 years, 15. In spite of the large number of casual workers, this is an unusually good showing, with 68 men employed over 20 years.

It is evident from the records that while none of the managers can boast of anything like a steady force of workmen, yet some of them suffer far more than others from the continual shifting. The plants which are near the big centers of industry naturally have more difficulty in holding their men than do those which are situated where there is not so much demand for labor. It is also true, however, that some of these plants enjoy fair reputations, while others are so notoriously dangerous that the newly arrived Greek or Slav or Italian is warned by his fellow countrymen that two months is the longest time he may safely work there, after which he must look for work in the open air to get rid of the poison.

In talking with the men employed in two neighboring plants it was learned that while one plant was receiving many applications for work from old employees returning from a summer on the farms the other was actually crippled for lack of men. It was easy to see why there should be this difference between the two plants, for one was unusually clean and under the management of an intelligent and careful man, while the other was one of the two most dangerous plants to be found in the country.

Housing

In almost every lead smelter there is a large number of foreign-born workmen, who have no families with them, who have taken up the employment as a temporary thing, and who are eager to save as much as possible from their wages so that they may send home for their families or return to them. This part of the force usually lives close around the smeltery, and groups of men of the same nationality rent a few rooms which they use to the utmost limit permitted by the three-shift system. These rooms are sometimes surprisingly clean and well kept; more often they are as neglected and dirty as would be expected. Most smelting villages are very unattractive, dreary and squalid, and the dreary effect is added to by the sulphurous fumes which escape from the smokestacks of the works, sometimes only at intervals, sometimes almost continuously. Yet there are some pleasant, prosperous looking smelting villages of permanent homes, such as the one the Herculaneum, the one at East Helena, and the Slavic village at Pueblo. It is partly a question of permanence as against excessive shifting, for a migratory population will take little interest in a place of temporary sojourn only, but it is partly also a question of nationality, as can be seen in the contrast between the Italian-Mexican village in Pueblo, with its utter neglect of ordinary cleanliness in the surroundings of the houses, and the clean attractive Slavic village across the river. As a rule the smelting companies do not rent houses to their workmen, but in the three instances where this is done these houses compare very favorably with workingmen's houses in the neighboring towns, and the rent is moderate.

The Copper Seizures

Four American companies which sell copper, viz., the American Smelting & Refining Co., the American Metal Co., Ltd., the United Metals Selling Co., and the Consolidated Metals Co., sent the following telegram, dated Oct. 28, to William J. Bryan, Secretary of State:

The undersigned, representing nearly 90% of the copper export trade of this country, have the honor to lay before you the following facts: We learned yesterday by cable that the Italian steamers "San Giovanni" and "Regina d'Italia" have been seized by British authorities at Gibraltar because part of cargoes consist of copper shipped from this country. The "San Giovanni" has 450 tons belonging to the American Smelting & Refining Co. and consigned in conformity with universal practice in the trade to order of that company at Genoa. The "Regina d'Italia" has 1160 tons, of which 150 belong to the American Smelting & Refining Co., 200 to the American Metal Co., 410 to the Consolidated Metals Co. and 400 to the United Metals Selling Co., practically all being consigned in the usual course in the same way.

We are further advised this morning by shipping agents that the American Line SS. "Kroonland," flying the American flag, and having on board 800 tons of copper belonging to the American Smelting & Refining Co. and 500 to the United Metals Selling Co., has also been seized and is detained at Gibraltar, the copper being consigned in usual course as in the other cases. Moreover, we have just been notified by the New York agents of the Sicilian American Line that, for reasons which cannot be explained, it absolutely declines to ship any copper by its SS. "San Giorgio," and this morning the Lloyd Sabaudo Line has given notice of its refusal of a shipment of copper and cancellation of contract unless the name of an Italian consignee shall be given, together with a guarantee that the copper shall not be reëxported from Italy, which guarantee it is manifestly impossible for the American exporter to give.

These measures of interference with our commerce threaten to stop altogether the exportation of copper from the United States to Europe, and this means practically the stoppage of the entire export business in that metal, except to England and France, since there is no demand for the American product outside of Europe. The stopping of the export trade would affect disastrously the copper-mining industry throughout the West. We beg leave respectively to ask consideration of the

> facts above set forth, and such representations and action by our government as it may deem appropriate for the relief of the critical situation in which the industry we represent is now placed, and we shall be very grateful to be acquainted of the action taken by the department to that end.

*

Acme Property in the Porcupine District

SPECIAL CORRESPONDENCE

The Acme Gold Mines, Ltd., is incorporated under the laws of Ontario, with a capital of $3,000,000. Its claims adjoin the Hollinger on the northeast and cover the continuation of the Hollinger vein system. The company has four shafts in operation, is carrying on development work on the 100-, 200-, 300-, 425- and 550-ft. levels, and is sinking to reach the 800-ft. The company is owned entirely by the Canadian Mining & Finance Co., Ltd., which is a close corporation. It is not the intention of the owners to market any stock, as they believe that their best interests will be served by working the property.

The Canadian Mining & Finance Co. also owns the Millerton Gold Mines, Ltd., the property of which adjoins the Hollinger ground on the southwest and contains the extensions of the Hollinger veins in that direction.

If the Hollinger, Acme and Millerton were all one company, great economies in operations could be made, but it is practically impossible to amalgamate the properties on a basis satisfactory to all parties concerned, since the public owns approximately one-half of the Hollinger stock. Plans have been worked out, however, by means of which all three properties will be operated under one administration, and the mechanical details are being so arranged as to achieve most of the economies, which would result from an amalgamation of the properties. The Hollinger is extending its mill sufficiently to accommodate ore from the Acme and later will take ore from the Millerton. This will enable the milling costs to be reduced to the minimum. Sampling will not be relied upon to determine the respective values. The ore and solutions will be kept entirely separate throughout the milling operations. Separate precipitation systems are being provided and the necessary duplication of refinery apparatus will also be made. This means a slightly increased capital cost, but it does away with any question as to the values obtained by sampling. To offset this expenditure by the Hollinger, the Canadian Mining & Finance Co. is now completing a compressed-air generating station with a capacity of 15,000 ft. per min., sufficient for present requirements of all three properties. The building is of reinforced concrete and space has been provided for extensions of the compressing plant.

The Canadian Mining & Finance Co. is also sinking a central shaft. This will have levels at the 425-, 800-, 1250-ft. points and, it is hoped, at others still deeper. Electric locomotives will collect ore from the different properties and deliver it to a rough-crushing plant at the central shaft. The crushed ore will be hoisted to a crusher station at the surface for further reduction, and will be delivered from the crusher to the respective bins of the several companies in the mill. By this means it will be necessary to operate but one crusher station and one hoisting plant, which can be of the most advanced type; it is expected that each company will have to bear the cost of operating this plant during only eight hours per day. This will result in the maximum economy in tramming, hoisting, crushing and conveying to the mill bins. It is expected that 18 months will be required for getting this central shaft into operation. The shaft will have six compartments, and will serve for carrying on development work on the lower levels of all three properties, as well as for handling men and materials and hoisting ore and waste.

From an engineering standpoint, the opportunities for economy are excellent, and by combining operations as outlined above, it will be possible to work all three properties under approximately the same conditions as would exist if they were combined into one corporation. There will be some duplication of underground superintendents, however, which would not be necessary if the companies were consolidated.

*

Cessation of Tin Mining in Bolivia

The inability of Bolivia to market its tin in Europe was commented upon in the JOURNAL last week, in connection with the movement to have these ores smelted in the United States. The local conditions with respect to the tin industry are reviewed by the La Paz correspondent of the *West Coast Leader,* under date of Sept. 22, as follows:

> In spite of the efforts made by the government and the banks to tide the mining industry of Bolivia through the present crisis, the problem, resting as it does purely on the economic basis of supply and demand in markets which have been closed indefinitely, has shown itself to be not wholly amenable to the diction of emergency measures. It has therefore been possible to make only partially effective the undertaking, on the part of the government and the banks, to advance to the miners 29 bolivianos per quintal of tin barrilla on a basis of 60% tin, with the difference of B/ 0.80 for each per cent. of tin higher or lower that the ore may contain. Advances so far range from B/8 to B 10 per quintal, considerably below the cost of production. The banks also insist upon the miners giving them in guarantee the titles to their mines, and in every way make it so difficult that even if the miners were able to produce at this price, it would be impossible for them to comply with the terms of the banks. Therefore, almost all the tin mines in Bolivia have been shut down.

*

New Chemical Laboratory at University of Illinois

The University of Illinois, at Champaign, Ill., on Oct. 9 laid the cornerstone for its new chemical laboratory, which will be a five-story, fireproof structure. Combined with the present laboratory, of which it will be a part, it will be 231 ft. long, 202 ft. deep, of nearly four acres floor room. With the completion of this new addition, it is the intention of the faculty to provide a suitable training for chemists and chemical engineers.

Speaking of the need for these men, Dr. E. J. James, president of the University, said: "We cannot expect to rival Germany in a day or a week or a month in a field which she has cultivated with such patience and wisdom for more than a century, but we can take up the competition with her by adopting similar methods. Germany's success in this whole industrial field rests upon the foundation of discoveries made in the laboratories of her universities and upon the work of men trained in methods of independent research in those universities. Such men look upon chemistry as a profession and not merely as a trade by which they may gain a livelihood."

The Mining Index

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26,853—POWER—Hydro-Electric Power Installations in Northern Georgia. Claud Hafer. (Min. and Eng. Wld., Oct. 3, 1914; 5 pp., illus.) 20c.

26,854—RAILWAY—The Electrical Operation of the Butte, Anaconda & Pacific Ry. J. B. Cox. (Gen. Elec. Rev., Nov., 1914; 19 pp., illus.)

26,855—RECORDING DATA—Graphic Methods of Presenting Data. Willard C. Brinton. (Eng. Mag., Sept. and Oct., 1914.) Continuation of article previously indexed.

26,856—WEIGHTS AND MEASURES—Definitions and Tables of Equivalents of Weights and Measures. Roy Cross (Kansas City Testing Laboratory, Bull. 7, 1914; 15 pp.)

Editorials

Cyanide Supply and Gold Production

Some alarm is still displayed respecting the effect of shortage in cyanide supply upon the gold production of the world. If there should be any restriction of gold production at this time the results would be serious indeed. However, we are now more than ever of the opinion that the excitement about this last August was only an ephemeral "scare."

The Roessler & Hasslacher Chemical Co., the only producer of cyanide in the United States, has assured us privately, and also has stated publicly, that it will be able to supply the cyanide requirements of this country. We have had no specific information from the British manufacturers, but we are aware of a general feeling in the industry that they will be able to supply the requirements of South Africa and the other British colonies.

The chief uncertainty has existed with respect to Mexico, but it has been appreciated that shortage of supplies in that country would affect silver production more adversely than gold production. However, we are just in receipt of news that arrangements for the renewed exportation of cyanide from Germany have been effected, and that the "Sun" is already on the way with 1000 tons for this country. There is an understanding that further shipments from Germany will follow, and it is understood, moreover, that this cyanide may be reëxported from this country. The renewal of exportation from Germany was preceded by negotiations in Washington, which resulted in the removal of cyanide from the contraband lists.

Several independent projects for the manufacture of cyanide in this country have been under consideration. With respect to their present status, there is scarcely any information current. In any event, it would naturally be a matter of a good many months before new manufacturers would be in a position to enter the market. Summarizing, we do not think that difficulties in obtaining cyanide supplies are going to be so serious as to result in any material restriction of gold production.

The Copper Seizures

The detention of several ships carrying American copper to Italy and Scandinavia, which was reported last week, is an extremely serious matter, more so with respect to its effect upon our copper-mining industry than upon our international relations. It is difficult to conceive of serious friction arising between the United States and Great Britain, but it is easy to foresee events which may be very adverse to our copper-mining industry. Indeed, it is probable that such events have already happened.

Germany is manifestly in great need of copper. Her willingness to pay 20c. per lb. shows that. The fact that copper realizes 20c. per lb. there, and only about 11c. per lb. here shows that outside countries have as yet been able to deliver but little copper to Germany.

The copper seized last week was shipped by the principal American selling agencies to their own order in Italy. On the face of things, there seems to be no justice in interfering with the shipments by citizens in one neutral country to their own order in another neutral country. Great Britain is apparently convinced, however, that this copper is ultimately going to find its way to Germany, which is something not to be permitted. If Italy herself has put an embargo on copper, as has been reported, there will be a new phase of the situation.

The critical thing is that if the United States is limited to exporting copper to England and France alone, the outlet for our production, even at the present greatly curtailed rate, will be insufficient. Industry in France appears to be almost stagnant, while the British market is already flooded with copper that has been shipped thither on consignment. Let it be remembered that England is getting copper not only from the United States, but also from Australia, Africa, Chile, Spain, and elsewhere, in some of which countries, e.g., in Australia, there has not been so extensive a curtailment as there has been here.

Prisoners of War

The war in Europe has brought out the latest developments of scientific fighting, while at the same time there has been an exhibition of the primitive. Zeppelins, aëroplanes, submarines, automobiles and 16-in. howitzers have been playing a great part, but so has cold steel in hand-to-hand fighting. The savagery of the fighting, the wholesale devastation of cities and the destruction of precious cathedrals have been fearful. Compared with the present war the campaigns of Napoleon were but jaunts of pleasure. To find the compeers of the present captains we have to turn to the mercenaries of the Thirty Years' War, and to Tamerlane, Ghengis Khan and Attila. In other respects also do we see a reversion to ancient customs, viz., in the treatment of prisoners of war, who are immediately put to work. The Russians put the German captives to road-building, canal digging and other things for the improvement of the country. The Germans put their prisoners to harvesting in the fields. What the British do with theirs we have not heard. Perhaps they have not yet any plan. If that be the case, C. Vey Holman, formerly state geologist of Maine and now operator of gold mines in Nova Scotia, is at hand with one.

We learn from *The Evening News*, of New Glasgow, Nova Scotia, that Mr. Holman has written to Lord Kitchener, asking him for prisoners of war to work in the Nova Scotia gold mines. So far as the mines operated under his own control are concerned, he offers to donate to Great Britain "all gold taken by the labor of such prisoners during the continuance of this war, above the actual cost of production." Mr. Holman argues that these prisoners must be made to earn their subsistence in order not to be a burden upon the Empire and how better could they be put to work than in being made to produce gold, which the Empire needs, and which, rather than steel, copper or lead, is ultimately going to settle things? Mr. Holman goes more into details, which need not be repeated. His argument sounds good. In effect, Britain's prisoners may be used to win the war for her. This is almost like the all-profit and no-cost of the cat and rat farm. The only thing that we feel doubtful about is the Nova Scotia gold field.

However, there is perfect historic precedent for the use of prisoners that Mr. Holman proposes. Indeed, the Greeks and Romans were wont to make war in order to seize men to work their mines. The mines of Laurium were full of barbarians torn from Macedonia and Thrace, and to man the Rio Tinto mines the Romans raided Gaul. The revival of the idea is interesting. We wonder what the labor unions will say about it?

*

Construction Work Resumed

In August and September there was a general cessation in mining and metallurgical construction, which afforded some relaxation to certain overworked engineering staffs, but it did not last long, nearly everything now being prosecuted about as previously. Some pictures in the JOURNAL this week give an idea of the huge construction work that the Alaska-Gastineau company is doing. Other pictures show something of Calumet & Hecla activities, also on a big scale. The construction of the Anaconda's sulphuric-acid and leaching plants, temporarily interrupted, has been resumed. The remodeling of the Washoe reverberatories is also in hand. The plans for the reconstruction of the Great Falls refinery have been delayed, however. The Inspiration company is moving slowly, there being no need to hurry things with the copper market as it is now. Putting new copper on the market would be robbing the stockholders. Construction at Chuquicamata is going steadily along, but inability to obtain necessary things from Germany is troublesome. In the iron region of Michigan and Minnesota, several concentrating mills are projected. We prophesy that there is going to be a lot of such work in that region in the not very distant future.

In smelting constructions 1914 has not been a very active year, anyway; certainly nothing like 1913, when many large plants were in course of construction. Most of these were completed before the end of that year, or early in 1914. The Rose Lake and Langeloth zinc smelteries begun in 1913 are now about finished. The largest copper-smelting works now under construction is the Miami plant of the Anaconda company.

*

Sheet Zinc

Through the recent ups and downs of the spelter market, the manufacturers of sheet zinc have been enjoying an uninterrupted prosperity that is very welcome, following a long period of dull business, as it does. Whether we export spelter as slabs or sheets, the statistical result is, of course, the same, but the country benefits the more from the more highly manufactured form.

The use of sheet zinc in the United States has not extended as much as we have hoped it would. The use of it for roofing, which is so important in Europe, has never been important here. A new and interesting use has lately developed in the construction of the cottages at Langeloth, Penn., a sheeting of very thin zinc being put over the studs, which externally are covered with expanded metal and plaster. The zinc sheeting, which adds about $30 to the cost of a cottage, makes it wind- and weather-proof.

We think that there are possibilities in the sheet-zinc business in the United States which have failed to be appreciated. We need some new outlets for our steadily increasing production of spelter.

*

Conditions in Silver

The price of silver continued to decline during all the month of October, and at the opening of this month it reached the lowest point recorded since December, 1908, being 22⅝d. in London and 48½c. in New York. Both quotations were for cash silver, no futures being offered or bid for. The price has not been strong at any time during the present year, though supplies have hardly been as large as usual, by reason of the troubles in Mexico. The receipts in London, where most of the metal is handled, were approximately 72,600,000 oz. up to the end of September, against 89,600,000 oz. in the corresponding period last year, and 98,300,000 oz. in 1912. The smaller receipts, however, have been more than sufficient for the demand.

As we have often shown, the main support of the silver market has been the demand from the Far East, which has for years absorbed about two-thirds of the silver production of the world. The European demand is mainly for subsidiary coinage and for use in the arts. The coinage requirements were about normal up to July, while those for manufacture were lighter than for two or three years past, owing to the general depression in business. As to the Eastern demand, China has not been a buyer at any time this year, owing to the disturbed financial condition of the country, and to the consequent postponement of the adjustment of the new coinage system, which has not yet been settled. In the early part of this year, India was a smaller buyer than usual. That country has been fairly prosperous, but the tendency to buy gold instead of silver in which to invest its savings has increased to a degree that was perceptibly felt in the silver market.

The breaking out of war, of course, put a temporary stop to all dealings in the silver market. The break lasted only a short time, and dealings in cash silver were resumed. The general financial dislocation which followed the beginning of the war almost stopped the demand from India, and for a time the only demand was for coinage. Now that business with India has begun to resume more normal conditions, a new trouble has arisen from the operations of a German cruiser in the Indian Ocean, which have made the transit of the metal decidedly unsafe.

The last named condition will doubtless be soon removed. The future of the market, however, does not seem specially promising. Coinage and commercial demand must continue limited. The shipments from Mexico are likely to increase. Unless there is a revival in the demand from the East—which is not now expected—the prospect is for continual low prices for a time.

*

The Supreme Court, on Nov. 2, granted the application of Minerals Separation, Ltd., for a writ of *a certiorari*. This means that the decision of the Circuit Court of Appeals was found to be questionable on points of law and that the Supreme Court itself will review the case, which is something unusual in patent litigation as now conducted. Patent litigants seldom get so far as this, even in major cases.

BY THE WAY

Berton Braley, in the *Illustrated Sunday Magazine*, thus characterizes the miner:

———He must work in gas and see in the dark,
The music he hears is the air-drill's bark,
It isn't no picnic in the park,
 It isn't no cinch he's stole!
He's carpenter, plumber, machinist, yes,
A sort of surveyor, too, I guess,
A little of everything more or less,
 The miner who digs the hole!

⁂

In a certain new metallurgical works now under construction, a pattern shop was added to the carpentry. In getting up the new apparatus for which castings were required, the patterns were made under direct supervision and were sent to the foundry instead of sending drawings. This made it possible to see in advance just how the castings were going to look. As everyone knows they are apt to look quite different from the idea that is derived from a drawing.

⁂

We read a lot of curious things on technical subjects in the newspapers, and seldom expect accuracy in them, but we wonder what sort of mental aberration led a British Columbia journalist to write: "According to information from the East, our zinc ores may find a new market on account of the war. Hitherto Germany has been supplying half of the world's entire demand for sodium cyanide. That chemical is produced from zinc, and it is not at all unlikely that the United States, which is eagerly taking up the manufacture of products formerly carried on by Germany, will be soon producing sodium cyanide as a byproduct of its zinc, all of which may have a good effect on the market for local zinc ores." Let the much maligned zinc metallurgists ponder upon this suggestion.

⁂

"The attached clipping from a Los Angeles paper, showing a report from the U. S. Census Bureau, shows where the engineers have gone, in answer to some of the past questions in the JOURNAL," says a subscriber. "There is room for many more here providing they do not have to depend on the profession for a living." This list is for the city of Los Angeles only:

> In professional service are 7717 men and 5094 women. Included are 237 actors, 210 actresses, 252 architects, 550 artists, sculptors and teachers of art, 424 authors and editors, 194 chemists and assayers, **907 civil and mining engineers**, 422 designers and draftsmen, 1015 lawyers and judges, 1160 musicians and teachers of music, 2281 teachers, 820 trained nurses and 54 veterinarians.

⁂

Woman's suffrage rarely interferes with mining operations or a miner's sleep, but in Hawthorne, Nev., recently, it did both. An ardent woman supporter of the cause was delayed in reaching the Lucky Boy mine; the day shift was in bed and the night shift at work. These were small obstacles. The fire bell was rung, arousing the day shift, and a lively meeting was held, the side of a dump serving as an auditorium. The delegate then went into the mine through a 6000-ft. tunnel and the night shift listened to a midnight suffrage speech. Needless to state, every miner at the Lucky Boy will vote for woman's suffrage.

⁂

The following "Waltmason" illustrates how readily even the semi-educated Mexicans appreciate the advantages of modern scientific achievement, being at times more progressive than is consistent with the degree of progress in their country: "The foreman at the Cobre mine showed up one day at half past nine; so when Don Carlos went to town to buy supplies, he wore a frown, and at the Tienda Aleman de Mercerias he began to price *relojes despertadores*, to wake up lazy Manuel Flores. The suave, polite young German clerk displayed all kinds and made them work; and, praising one, said, 'This is nice, just *cinco pesos*, special price; the luminous paint lights every mark so you can tell time in the dark.' A test in darkened room was made. Don Carlos then four *pesos* paid and asked a price per hundredweight on luminous paint, with shipment date. Said he, 'Those thieving miners steal so many candles that I feel like painting all inside my mine with this new stuff to make it shine. One coat would make a light intense and then I'd have no more expense.' "

⁂

The possible shortage of gasoline in Germany has been the subject of much discussion. The United States, which is the largest producer, has at present a large surplus production that it is anxious to market The seizure of certain oil-carrying steamers by the British has been with the object of preventing this petroleum from finding its way into Germany, where the petroleum resources are small. In view of the importance of motor spirit in the enormous transport problems of the European war, it is of interest to examine the data of the world's production of petroleum in 1913. The *Financial Times* publishes the following estimate: United States, 32,315,410 tons; Russia, 9,246,942; Roumania, 1,885,286; Galicia, 1,087,286. Mexico, 3,000,000; Dutch Indies, 1,534,223; British India, 1,000,000; Japan, 250,000; Germany, 130,000; other countries, 350,000; total world's production, 50,-797,175 tons. It will be seen that the United States is far and away the largest producer of petroleum, its output amounting to 63% of the world's production. Germany's output, on the other hand, is only one-quarter of 1% of the world's total. Hence, the British interest in restricting, to normal domestic consumption, the imports of petroleum into neutral countries, such as Holland, Denmark, and even Italy, which at this writing has not taken sides in the European struggle. The normal production of petroleum in Germany is about a million barrels a year. Lately Germany has been obtaining petroleum from Roumania, via Predeal and Budapest, especially from the Société Steaua Romana, which is controlled by the Deutsche Bank; probably this source of supply will be cut off, as it is stated that the Roumanian government is exercising a close supervision of all shipments. It is likely that work in the Galician fields is at a standstill, the oil zone being in the line of the Russian advance. The restriction of petroleum imports may hamper Germany in the movement of its armies, but when the supply of petrol becomes scarce, other fuel will doubtless be substituted, such as paraffin, alcohol, distillates from coal, and other [illegible] spirits, for the production of which no country is better prepared than Germany.

The Alaska Railroad

Two members of the Alaska railroad engineering commission, W. C. Edes and Thomas R. Riggs, who returned to Seattle from Alaska on Oct. 25, were interviewed by a representative of the Journal. They state that in their report to Washington they will urge the construction of a Government trunk line from tidewater to Fairbanks.

Mr. Riggs, who had charge of the surveys from Broad Pass down the Nenana River to Fairbanks, said that the road will have the effect of prolonging the prospecting and development season a month or so in the fall and will enable summer work to begin a month earlier. It will operate to reduce the cost of living by reducing haulage charges from the coast and by doing away with the necessity of the merchants carrying stocks over long periods. Even this single trunk line will help the development of all interior Alaska by putting the railroad terminus and the base of supplies at approximately the center of the territory.

The commission surveyed 1200 miles of railroad line all told, definitely located part of this and made paper locations of from 400 to 500 miles. This work included relocation of the Alaska Northern line from Seward to the Susitna River and thence to Fairbanks, location of a route from Portage Bay to the Alaska Northern line, from the Alaska Northern to the Matanuska coal field and from the Alaska Northern to the Kuskokwim, together with routes from the trunk-line route to the Nenana coal field. The commission also had the benefit of surveys already run from Chitina to Fairbanks, from Valdez to the Copper River & Northwestern line and from the Bering River coal field to Cordova.

Lieut. Frederick Mears William C. Edes Thomas Riggs, Jr.

The last part of the time of the commission was taken up with investigating and surveying port terminals at Cordova, Nelson, Valdez, Seward and Portage Bay. It seems most probable that the first unit of the Government system will be a trunk line from Portage Bay to Mile 63 of the Alaska Northern, thence to Knik, thence to the Susitna River and along the Susitna, Chulitna, Nenana and Tanana Rivers to Fairbanks. It is along this route that the Government has recently withdrawn so many townsites; along the other surveyed routes, townsites have not been withdrawn. This route would, of course, include a branch from Knik up the Matanuska River to the coal fields. Eventually, the system would be expanded and connection made with the Copper River & Northwestern.

Maps, profiles and estimates are being prepared in Seattle and will be forwarded to Washington as soon as completed, along with the report of Lieut. Frederick Mears, who is still in the North making surveys in the Sheep Creek district. He was to return about the first of November.

Mr. Edes left Seattle for San Francisco to confer with Secretary Lane. He reported great enthusiasm throughout Alaska in expectation of the coming of the railroad.

Mining Dividends for October

Twenty-eight United States mining companies reported dividends aggregating $3,551,460 for October, 1914, as against $8,159,716 paid by 39 companies in 1913. American metallurgical and holding companies paid $2,179,629, as against $3,393,607 in 1913, while 11 Canadian, Mexican and Central American companies paid $1,078,241, against $2,163,393 in 1913.

United States Mining Companies	Situation	Per Share	Total
Anaconda, c.	Mont.	$0.25	1,165,625
Brunswick Con, g.	Calif.	0.06	23,717
Bunker Hill & Sullivan, l.s.	Ida.	0.25	81,750
Bunker Hill Con, g.	Calif.	0.01	5,000
Caledonia, l.s.	Ida.	0.01	26,000
Daly-Judge, s.l.	Utah	0.15	45,000
Eagle & Blue Bell, g.s.l.	Utah	0.05	44,658
Fremont, g.	Calif.	0.02	4,000
Golden Cycle, g.	Colo.	0.05	75,000
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.65	163,254
Iron Blossom, l.s.g.	Utah	0.10	100,000
May Day, g.s.l.	Utah	0.03	24,000
Old Dominion M. & S., c.	Ariz.	2.25	364,500
Portland, g.	Colo.	0.02	60,000
Stewart, l.s.	Ida.	0.10	123,826
Skidoo, g.	Calif.	0.01	10,000
Silver King Con., l.s.	Utah	0.75	62,000
Tennessee, c.	Tenn.	0.75	150,000
Tom Reed, g.	Ariz.	0.06	54,473
Tonopah-Belmont Dev., g.s.	Nev.	0.25	375,000
Tonopah Extension, g.s.	Nev.	0.07½	70,757
Tonopah Mining, g.s.	Nev.	0.25	250,000
United Globe, c.	Ariz.	3.50	80,500
Vindicator, g.	Colo.	0.03	45,000
Wasp No. 2, g.	S. D.	0.01	5,000
Wolverine, c.	Mich.	2.00	120,000
Yosemite, g.	Calif.	0.10	2,400
Iron, Industrial and Holding Companies	**Situation**	**Per Share**	**Total**
Am. Sm. Sec. pfd A.	U. S. Mex.	$1.50	$255,000
Am. Sm. Sec. pfd B.		1.25	375,000
Bethlehem Steel	Penn	1.25	186,350
Cambria Iron	Penn.	2.00	169,360
Guggenheim Expl	U. S., Mex.	0.87½	727,768
Old Dominion of Maine, c.	Maine	0.25	73,338
Penn. Salt.	Penn.	3.00	150,000
Sloss-Sheffield	Ala.	1.75	117,250
U. S. Sm. Ref. & Min.	U. S., Mex.	0.87½	425,563
Canadian, Mexican and Central American Companies	**Situation**	**Per Share**	**Total**
Con. Min. & Sm., c.l.s.g.	B. C.	$2.00	$116,088
Crown Reserve, s.	Ont.	0.02	35,376
Hollinger, g.	Ont.	0.15	90,000
La Rose, s.	Ont.	0.25	187,328
Lucky Tiger, g.s.	Mex.	0.09	64,380
McKinley-Darragh-Savage, s.	Ont.	0.03	67,431
New York & Honduras-Rosario, g.	C. A.	0.30	60,000
Nipissing, s.	Ont.	0.25	300,000
Porcupine Crown, s.	Ont.	0.03	60,000
Seneca-Superior, s.	Ont.	0.10	47,638
Standard, l.s.	B. C.	0.02½	50,000

The month's record is largely that of disappointments. Anaconda, Old Dominion of Maine, Seneca-Superior and United Globe reduced their dividends; Mary McKinney, Shattuck-Arizona, and U. S. Smelting common, omitted them altogether. It is a pleasure to note, on the other side, the dividends paid by Caledonia, Skidoo and Wolverine, after long silences on this subject, as well as the increase by Golden Cycle.

Total for the first nine months of the year are: United States mining companies, $49,242,100 in 1914, against $62,175,610 in 1913; smelting and holding companies $70,127,102 in 1914, against $71,996,631 in 1913; Canadian, Mexican and Central American mining companies, $13,680,365 in 1914, against $18,817,816 in 1913.

PERSONALS

John McGee has been making examinations in the Greenhorn district of Oregon.

Robert H. Richards will spend the month of November in Virginia on professional work.

Edward Carter has taken charge of the work of the Precious Metals Exploration Co. at Mogollon, New Mexico.

Morton Webber has been engaged in examination work in the Flat River lead belt, Missouri, on behalf of Boston interests.

A. M. Swartley, of the Oregon State Mining Bureau is in Granite camp completing some of the details of the field work recently done.

P. Argall, consulting engineer of the Ozark Smelting and Mining Co., at Magdalena, N. M., has returned to Denver after a visit to the mines.

Fred Jones, until recently engineer for the Portland Gold Mining Co., Victor, Colo., is now superintendent. Frank Smale is general manager.

Frederick H. Morley has retired from the practice of his profession of mining engineering, and is going into horticultural work in the vicinity of Santa Barbara, Calif.

Captain Thomas Walters, for many years in direct charge of the Jones & Laughlin mines on the Lake Superior ranges, has resigned. E. F. Bradt has been appointed as his successor.

John Mocine, general manager of the National Copper Mining Co., Mullan, Idaho, has become superintendent of surface plants of the Goldfield Consolidated Mines Co., Goldfield, Nevada.

F. W. Schumacher, of Columbus, Ohio, owner of the Schumacher mine, was recently at Porcupine, Ont., looking over the property in connection with the proposed installation of a new mill.

F. H. Hitchcock, president of the Ernestine Mining Co., at Mogollon, N. M., has been visiting the property. E. A. Wayne, general manager of the company, is in the hospital at Silver City, N. M., recovering from an operation.

Messrs. Laney, Spencer, McDonald and Hunter, of the U. S. Geological Survey, are in Santa Rita, N. M., and vicinity, covering the geology of the country included in the Santa Rita special map of the Survey of three years ago.

Oscar B. Warren, of Hibbing, Minn., has lately returned from a trip to the Pacific Coast. Mr. Warren is now managing two new operations, one being the Isabella mine of the Cascade Mining Co., this mine being situated on the Cascade branch of the Marquette range, Marquette County, Mich.; the other being the Bennett mine, operated by the Keewatin Mining Co., on the Mesabi Range, west of Hibbing.

George E. Roberts has resigned his position as director of the United States Mint. He has accepted the position of assistant to the president of the National City Bank of New York, which office was recently created, and he expects to take up his new duties in a few weeks. Director Roberts served as head of the Mint Bureau during four presidential terms. In 1907 he resigned to take the presidency of the Commercial National Bank, of Chicago. President Taft reappointed him, and although a Republican, he was continued in the present administration. His term would not have expired until December, 1915. Mr. Roberts is one of the country's foremost authorities on financial subjects and author of a number of important papers on international finance.

OBITUARY

Mark Hanna, mine captain of the Porcupine Pet at Porcupine, Ont., and an Italian laborer named Carino, engaged in repair work at the mine, fell into the intake from Simpson Lake on Oct. 27 and were suffocated in the mud. Two others were rescued with difficulty.

Anton J. ("Tony") Jacobson, a well known mine operator of Salt Lake City, Utah, died Oct. 28 after several months' illness. Mr. Jacobson was president of the Alta Consolidated Mining Co., and was instrumental in bringing the former Columbus Consolidated mine at Alta to a productive state.

Frederick E. Calverley, of Whitby, Ont., died Oct. 28, from a severe attack of pneumonia in his 34th year. He was engaged in mining at Cobalt during the early days of the camp and held extensive mining interests, but for the last few years had retired from active business owing to ill-health.

Albert Teats, a well known mining man in the Leadville district, Colo., committed suicide, Oct. 25, at the office of the Siwatch Tunnel where he has been acting as manager for a pool of lessees. He was born at Mt. Clemens, Mich., in 1853; went to Colorado in 1864, settling at Central City; moved to Leadville in 1879. He has held important positions in the past with the Maid of Erin and Penrose mines. Ill health is ascribed as the only excuse for his act.

John Cowling, a pioneer of the Michigan iron country, died at Ely, Minn., Oct. 20, aged 68 years. He was born in Cornwall and came to this country when 19 years old. After working a short time in Pennsylvania and in the copper country, he became mine captain of the old Quinnesec mine on the Menominee range. In 1884 he went to Minnesota and was employed at several mines on the Vermilion range, including the Pioneer A and the Chandler, as mining captain. Two years ago the Oliver Iron Mining Co retired him on a pension.

James Green, chairman of the board of directors of the Laclede-Christy Clay Products Co., St. Louis, died Oct. 19, aged 85 years. He was one of the wealthiest men of St. Louis, and was the first to manufacture firebrick and similar products in the West. He was a director of the Mechanics-American National Bank and the Guardian Trust Co. He was a native of England, being born in Staffordshire, but came to America in 1852, first working in rolling mills and was in charge of the old Laclede Rolling Mills, St. Louis, until 1874. He leaves a widow and two sons.

James Hasbrouck Le Fevre, vice-president and general manager of the Electric Steel & Metals Co., Ltd., Welland, Ont., died Oct. 23, from burns caused by an explosion which occurred at the turning on of the electric power at the new plant. He was in his 45th year. After his graduation from Rutgers College, Mr. Le Fevre entered the employ of the Pennsylvania Steel Co., at Steelton, Penn. Later he held important positions with other steel concerns of the United States and Canada. He was widely known for his ability as a metallurgist, and manufactured the first steel made in Canada, at the plant of the Dominion Iron & Steel Co., Sydney, N. S. He was one of the promoters of the Electric Steel & Metals Co., whose plant is being made ready to manufacture shells for the British Government. He was also vice-president of the Standard Tube & Fence Co., Woodstock, Ont. He leaves a widow and two sons

David John Kelly died at Salt Lake City, Utah, Oct. 10, at the age of 37 years. A great loss has been sustained, not only by his personal friends and associates, but also in those fields of endeavor where his inventive genius has assisted to solve many metallurgical and mechanical problems. He was a native of Utah, was educated in the Salt Lake schools, and later took his M. E. degree at the University of Utah. In 1898-9 he was working under George Moore, as assayer, for the Salt Lake branch of the Consolidated Kansas City Smelting & Refining Co. In 1901 he was again with George Moore at Sunshine, Utah, where the Moore filter was born, and at that time he first conceived the idea of the Kelly filter press. It was not until 1905, however, that he built his first working model and demonstrated his theory. With unbounded faith, courage and perseverance, through financial vicissitudes, mechanical difficulties, disloyalty of a principal associate, he struggled on, never wavering, until the Kelly filter press, through his creative genius and untiring efforts became a recognized factor, not only in metallurgical plants but in sugar factories and chemical works all over this country and in many foreign countries. To those who have known "Dave" Kelly through the years of his struggles to the dawning of his success his death, at this time, seems hard to understand, and we have yet hardly realized that this genial, whole-souled friend has left us. With a joke and a smile he met all difficulties, grappled with and downed them. To his sorrowing widow and two little sons heartfelt sympathy is extended; those who are now carrying on his work realize the trust imposed on them and hope to be able to bring to full fruition the work so well begun.

SOCIETIES

American Institute of Mining Engineers—The [illegible] for 1915 are: President, W. L. Saunders; vice-presidents, Sidney J. Jennings and Philip N. Moore; directors, Samuel A. Taylor, Robert W. Hunt, Hennen Jennings, George C. Stone and W. H. Aldridge.

Editorial Correspondence

SAN FRANCISCO—Oct. 28

Operation of Compensation Insurance in California as conducted by the state industrial accident commission is reported by the commission as so successful that on Jan. 1, 1915, the state compensation insurance fund will be prepared to allow a return of premiums to its policy holders in an amount equal to 15% of earned premiums and distributed in percentages ranging from 5% to 25% of premiums of employers and various hazards, depending upon the loss in the several groups. Whatever success has attended compensation insurance in California, however, it has in no way benefited the mining industry, as the mines are precluded from state insurance by the inadequacy of the fund appropriated by the legislature.

DENVER—Oct. 29

A Marked Activity in Digging has followed the failure of Congress to pass upon the bill that aimed to relieve prospectors and claim owners of the necessity of performing their annual assessment work for 1914. It is probable, however, that many locations will be open to restaking on Jan. 1, 1915, since the prevailing low market for metals is having a discouraging effect on prospectors. Congressman Edward T. Taylor reports that Secretary Lane found the majority of miners in the country opposed to the bill.

Smelting in Colorado—The Colorado plants of the American Smelting & Refining Co. are handling about the same tonnage of ore as at the mid-year, approximately 55,000 tons per month. The same number of furnaces is running in each plant as before, viz., five in the Arkansas Valley plant, one at Durango, and three each at the Globe and Pueblo plants. The only plant where there is any special change in conditions is the Arkansas Valley, which is busy and is receiving a plentiful supply of ore. The recent sharp decline in the price for silver is creating a poor prospect for ore supplies from some districts, but the ore receipts from Cripple Creek remain about normal, i.e., 3000 tons per month.

BUTTE—Oct. 29

Political Activities have forced all other interests into the background. In the existing political turmoil the affairs of the military would have received scant attention had it not been for the repeated disgraceful disturbances in the county jail, which the authorities seemed unable either to prevent or to suppress. Eight prisoners have escaped, others have attempted several times to set the place on fire, have demolished furniture and fixtures, are insulting and forcibly resisting the attendants and are getting more unruly every day. Due to these disturbances and the hold-ups and other lawless acts in various parts of the city, the confidence of Butte citizens in the military régime, which at first furnished relief from the incompetence of certain civil authorities, has been materially shaken and speculation has beeen aroused as to the reasons for this return to lawlessness.

Perhaps the utterance of Jesse B. Roote, judge advocate-general, in an appeal made Oct. 27 to the supreme court for a rehearing in the case of Dan Gillis, throws some light on the situation. He says: "The military force in Silver Bow county, by the decree of this court in this case, has been rendered almost powerless to restore order and civil authority. It will be remembered that this decision was that the military courts were illegal. Obviously, somebody made a blunder that is highly deplorable, inasmuch as it puts a doubt on the legality of the whole military régime and begets a general contempt for the laws of the state, which those in power and appointed to enforce them have—presumably through their ignorance—been permitted to violate without incurring any [illegible] consequences to themselves. Such conditions cannot but encourage prisoners to resist the authorities, who, they claim, are lawbreakers themselves and had no right to imprison them or, at any rate, have no longer the power to punish them. Inviting as such conditions are to the lawbreaker and to the professional agitator, they are discouraging in the highest degree to those commanded to maintain order, but given only partial authority to do so.

Those opposed from the beginning to military authority in any shape are losing neither time nor opportunity to point out the ridiculousness of it all and to make invidious comparisons between the blunder committed by so called authorities and the deeds pronounced lawless because committed by less favored individuals. These critics certainly have a large degree of justice on their side, and their arguments are troublesome to answer, however much one may distrust their disinterestedness.

At the present writing it is far from clear how the vexing problems confronting the County of Silver Bow and the City of Butte are to be solved or whether they will ever be solved if the vacillating tactics experimented with in the immediate past are continued.

SALT LAKE CITY—Oct. 29

A Model of the Utah Copper Mine will be constructed for exhibition at the Panama-Pacific Exposition in San Francisco. The model will be 36 ft. long by 27 ft. high, and will be exhibited in the Utah building. A model of a Utah coal mine will also be made, showing the position of the coal beds, method of working, etc. Contracts for the work have been given to E. L. Mulkey. A large relief map of Utah, 16x20 ft., is also being prepared by the Agricultural College at Logan, for the exposition. It will be made in clay, in nine sections, from which plaster of paris casts will be taken.

SEATTLE—Oct. 28.

The Valdez Creek Placer Mines, operating on Valdez Creek, has made a record achievement in installation. This summer the company purchased a hydraulic-mining outfit weighing 260 tons, including a mile of heavy pipe-line, three giants and all the necessary tools and machinery for riveting the pipe and installing the plant. This outfit arrived on Valdez Creek on May 7 and installation immediately began. The layout included a mile and one-quarter of ditch, 8 ft. wide on the bottom, 15 ft. wide on top and 3 ft. deep, capable of carrying 3500 miner's inches of water; a penstock; flume; electric-lighting plant; steam sawmill; an electrically driven air compressor and drilling outfit. Fifty-four men were employed during the greater part of the season. The penstock, flume, one mile of pipe line and the entire water system were completed and the water turned through for the first time on Aug. 27. On Sept. 20, the men started to clean bedrock in the pit made by the hydraulicking, but freezing weather setting in at once, forced them to suspend work. They did, however, clean the boxes, which yielded $4200; the bedrock should yield a much larger sum.

The Kenai Peninsula stands a good chance of becoming a formidable competitor of Nome as a gold-dredging region. A number of mining men are figuring on the construction of dredges for installation there next summer, while this season there were many cleanups of gold ranging up to as much as $30,000. The biggest was made on Crowe Creek by Dick Lawson and associates, who, it is reported, took out about $40,000. N. B. Solner, of the Union Savings & Trust Co., Seattle, brought down over 700 oz. from the property. The peninsula during the summer was visited by many Nome dredging men and engineers, among them being J. H. Hutchinson, former governor of Idaho, who opened up the tin deposits in the Nome region several years ago. Hutchinson optioned a number of claims at Hope for $25,000. They lie on Resurrection Creek, where Gus Sieffert, formerly of Nome, has just installed a big hydraulic plant for the St. Louis Hydraulic Mining Co. Maj. L. H. French and C. E. Herron, also formerly of Nome, operated a drill on Six Mile Creek, near Sunrise City, and are planning to install a dredge for next summer. The drilling showed a content in excess of $1 per cu.yd.; it was conducted by Arthur Jett, former manager of the Miocene Ditch Co., of Nome. The creek was opened in 1896 and about $300,000 was taken out by rocking along the rims. The stream itself was never worked on account of the heavy flow of water. Two years later, the discoverers deserted the camp for Dawson

Frank Young will install a dredge on the Kenai River. Prof. Herschel Parker, of Mount McKinley fame, is developing a large tract of ground in that region; and Paddy Cummings, of Nome, will install a hydraulic plant. The Gilpatrick quartz property, situated on the peninsula, 14 miles from Seward, recently was bonded to E. G. Wilson, of Washington, D. C., who has shipped in 800 tons of freight and supplies for development work this winter. With all this development, Northerners are anticipating a much larger gold production from the section next summer.

The Granite Gold Mining Co. operating in the Port Wells district, has issued a report of progress signed by Pres. B. F. Millard. The property consists of three lode claims. To Tatom and Irving, original owners, $28,500 has been paid and the balance of the purchase price, $21,500, is due in March, 1915. Development work was done first by the Millards under partnership agreement with J. E. Chilberg and Jafet Lindeberg. The Granite company was organized in the fall of 1913. Under the partnership arrangement, a 156-ft. crosscut was run to the vein, the latter drifted on for 222 ft. and a 156-ft. raise put through to the surface. After the company organization, a hoist station was cut, the tunnel extended, a raise put up to Tatom and Irving's original shaft, a working shaft put down in the vein and the vein opened up by another drift for 360 ft. The shaft was further continued 85 ft. at the same angle of 45°, leaving the vein which flattened to 35°, and a crosscut run to the vein again. Good ore was found here as on the second level. Surface equipment includes a mess-house, tents with board floors and metal roofs, power house, blacksmith shop, carpenter shop, 4500 ft. of corduroy road to the beach, storehouse and mill. At the mine power house there is a one-drill compressor, a 25-hp. gas engine and a 6-hp. gas engine for lighting. In the mine there is a 15-hp. gas-engine hoist, two sinkers and a 12-hp. gas station-pump. The mill contains a crusher, a set of rolls, a 7-ft. Lane mill, two concentrating tables, a clean-up barrel and a gold-melting furnace. A 20-hp. West Coast engine drives the mill and a 26-hp. oil engine drives the crusher and rolls. Since Mar. 18, 1914, about 3000 tons has been milled, yielding about $85,000. The tailings have been impounded for future cyanide treatment. A larger power plant and a tunnel at a much lower level are contemplatd.

SILVER CITY—Oct. 29

The Experimental Mill of the Burro Mountain Copper Co. will operate all winter for the purpose of ascertaining the most effective method of treating the company's ores. The original equipment included a Minerals Separation flotation unit, but the quality of the concentrates produced was not good enough for economical operation. It is believed the fault lay in the agitation. The company discarded the unit and installed a Towne separator using air agitation. This is embodied in the mill and is doing satisfactory work, although readjustments of the agitation and of the oil mixtures is constantly being made in order to obtain a cleaner separation. The management believes the flotation process will be incorporated in the final large mill and not used merely as an auxiliary method, but since flotation is still largely in the experimental stage, a large amount of testing work will be necessary before large units can be installed. The flow sheet of the experimental mill in its present form includes crushing, screening and rolling to get a ½-in. product, which is tabled and classified, reground to 80-mesh and delivered to the Towne unit.

Recent Acquisition of Property by the Empire Zinc Co. at Hanover, has brought forth the announcement of a power plant and a concentrator to be erected at Hanover and another concentrator at Pinos Altos, for the reduction of the company's sulphide ore. It is expected to have one concentrator operating in a year. The Copper Queen mine on the Santa Rita-Hanover divide, formerly owned by the General Electric Co., was recently purchased from Messrs. McCarty and Bell for its mine-water supply. When operated, 50 gal. per min. was pumped from between the 80- and 200-ft. levels. The Copper Queen is believed to be on the same underground flow with the Booth mine water of the Chino Copper Co., at Santa Rita. A one-mile pipe line would carry water from the Queen to the proposed power-plant site. However, drilling will be done in Hanover Gulch before constructing a pipe line. A tramway is under erection from the Santa Fe to the Thunderbolt group of blende claims east of Hanover and adjoining the Chino Copper Co. These orebodies will be extensively worked when the ore reduction plant is finished. The company is now shipping only carbonate zinc ore from the Nason tunnel. At Pinos Altos the Empire Zinc has done a good deal of road work and has reduced the distance to Silver City by two miles.

WICKENBURG, ARIZ.—Oct. 29

In the Constellation Camp, 12 miles east of Wickenburg, the only property now actively developing is the Monte Cristo. Here an inclined shaft has been sunk to 950 ft. on the vein and extensive drifting has been done above the 800 level. The ore carries silver and gold. The former is generally distributed in the vein matter and in places is found as slabs of native metal while the gold is irregularly distributed. The grade of the ore below the 800 is reported to be better than above and therefore it is proposed to continue development to the 1000 and then completely open the mine by drifting, before building a mill. The ore occurs in a fault plane in schist cut by pegmatite dikes and dipping to the south at about 50°. The ore is brecciated above the 800 and the orebody varies greatly in width; in some places it is 50 ft. wide. Three parallel veins have been disclosed. Plans for treatment have not yet been made but it is likely that it will be decided to transport the ore to the railroad at Wickenburg, as the water supply at the mine is limited. The development of the property so far has been financed by Ezra W. Thayer, of Phœnix, and some local associates. The Duluth-Arizona, adjoining the Monte Cristo, is idle. This was developed in a limited way by a Duluth and Superior syndicate a few years ago and a mill with cyanide plant was installed. The development is mainly on a gold-bearing quartz vein. J. A. Merrill, of Superior, Wis., is now in control of the property. It has been recently examined. Work on the Uneeda mine, west of the Monte Cristo about two miles, is suspended pending the adjustment of an estate. It was operated for a time by the Golden State Mining Co. The Copper Belt Mining Co., controlled by the Delthy interests at 25 Broad St., New York, is doing a small amount of development. An extremely small mill has been erected. The Keystone and Interior mines, controlled in Pittsburgh, have closed temporarily. A large amount of development has been done on both of these. A number of smaller operations in the district are under way awaiting the realization of the large expectations which everybody seems to have for the Monte Cristo mine. The district is reached by a daily automobile stage from Wickenburg.

LUNING, NEV.—Oct. 29

The Luning District is Active—The Vemilla is starting to ship, a good road having been built to the property, which lies seven miles southeast of Luning, about 1½ miles northeast of the old Garfield mine, a record breaker in the '80s. The property consists of nine claims with a 140-ft. tunnel driven on the ore.

New York Cañon is still enjoying active development. Leases have been let on the Mayflower, owned by T. L. Patrick of Goldfield, and on the West End, controlled by H. B. Ling, also of Goldfield. This section of the district has a large developed tonnage of low-grade copper ore and is anxiously awaiting the opening of the leaching plant to custom ore.

The Red Butte Mining Co., of Spokane, has financed the development of its property and will start active operations immediately, Capt. Chris Smith having just returned from headquarters with the necessary money. This mine is about 12 miles northwest of Luning. The ore is a high-grade lead and silver, and from present indications the property will become a shipper soon. The Esmeralda Copper Co. is about to resume operations, and Manager Jacobs is now on his way from the East. There has been much development work done on the property.

The Wagner-Azurite has closed down its leaching plant temporarily. It is possible that it will be found necessary to roast the ores on account of the excess of lime in the rock, but this will not greatly increase the expense of making metal. The development of the mine is satisfactory and the company has sufficient ore blocked out for many years' run. The leaching test so far carried out on ores from the Alameda and Shipper properties has proved that these properties can be worked by this process in a manner that will insure the early erection of a plant on their ground.

An Important Sale was made recently when Sacramento and Nebraska mining men, represented by M. T. Rowland, formerly a Tonopah mining operator, secured the property of the Luning Gold Mines Co. under a lease and sale agreement. This property consists of thirteen claims about four miles north of Luning, adjoining the Luning-Idaho. These people will immediately commence operations and have ample resources for carrying on the work. They propose to treat the ore themselves and thus save the expense of shipping and smelting. The price secured for the property is not definitely known, but is said to be $100,000 or over.

Work on the Luning-Idaho has been progressing continuously in the tunnel, which has just struck the casing of the vein on which the shaft was sunk. Another body of ore should be cut soon at a depth of over 150 ft. and near the hanging wall of the mineralized zone. This vein is about 7 ft. beyond the 18-ft. vein encountered a month or so ago and if it improves in width and content as did the first vein it will place the mine in condition for a large production. It is reported that an offer has been made to take an interest in the mine for the erection of a large leaching plant to handle these ores.

CHICAGO—Oct. 31

The Smelting Plants at Mineral Point, Wis., according to press dispatch from Milwaukee, Oct. 28, are running at full capacity for the first time in a year, necessitating the appointment of a deputy collector of customs. It is said that conditions in Mexico have been responsible for this resumption.

Increased Interest in the Treatment of Low-Grade Iron Ores is being manifested throughout the Minnesota and Michigan iron districts. This interest is taking practical form in the insertion of certain clauses in some leases, under which the lessee is required, within a specified time, to construct a plant to treat such ores. This is the popular conception, at least, of a recent development on the Mesabi range. Butler Bros., stripping contractors and railroad builders, not long ago leased the Harrison property from the Great Northern interests, and this is now being operated jointly with the Quinn mine. One of the conditions of the lease is supposed to have provided that Butler Bros. build a concentrating plant having an annual capacity of at least 100,000 tons. It is known that Butler Bros. was recently in the market for such a plant, the estimates on the machinery having been furnished by a large Milwaukee concern. While this concentrator will eventually be installed, it is held up until next spring, probably because of the unsettled business conditions, and particularly the low state of the iron market. In general, the design of this plant and the method of treatment are said not to vary greatly from that at the Nashwauk and Coleraine washeries, which have been in operation for some time and are giving good results. In addition, it is understood that one other concentrator is being planned for the Mesabi range, the name most frequently mentioned in this connection being that of the M. A. Hanna Co. It is not known, however, what property this plant is for or whether it is a Hanna property.

DULUTH—Oct. 31

In the Hibbing-Chisholm District the Leonard pit continues to be the range's leading producer, and will head the 1914 shippers; 250 to 300 cars are being loaded daily, a considerable reduction from mid-season shipments. The daily shipments from several mines in the district are about as follows: Albany, 60; Utica, 65; Agnew, 55; Hill, 30; Mahoning, 130 to 150.

The Great Northern is handling about 1500 cars per day out of its Kelley Lake yards. A decided slump is looked for immediately following the end of October, as many operations are planning to wind up the season with this month.

New Mines Are Being Opened on the Mesabi, notwithstanding the depressed state of the iron-ore market. Tod-Stambaugh is making ready to take over the Dean mine near Buhl, lately leased from the Great Northern interests. Butler Bros. has nearly completed the stripping of the property. Mining will be under the management of John S. Lutes. Tod-Stambaugh has also started to open a Great Northern property adjoining the Morton mine. B. A. Middlemiss is in charge of this development. It is generally believed on the range that the Great Northern will work the Leonard mine next year to capacity, probably 500,000 tons. It is stated also, that the Great Northern will mine and ship 2,500,000 tons in 1915—if it it can sell it. Prospects for the independent producer are not bright. If the Great Northern is forced into the independent market by reciprocal agreements, it is certain to crowd somebody outside. Independent producers are hoping, therefore, that the Great Northern tonnage will be sold to the Steel Corporation.

Labor Is By No Means Scarce in the iron districts, even though the European war did reduce the supply somewhat. Those returning to fight were largely those with property [illegible] in their home country. While no uniform reduction in [illegible] has been made, some operators have, during the past few weeks, made 10 and 15% cuts. At Hibbing, a considerable amount of city work is kept going for the purpose of [illegible] the unemployed, and a plan has been evolved whereby an entire new crew is put on every second week, in an [illegible] to assist as many as possible. Married men are given preference, as are taxpayers of the village. The local [illegible] of the Mesabi range, almost without exception, have [illegible] various public works for the purpose of keeping the unemployed occupied. The situation will find some relief with the approach of winter, when the lumber camps will take care of a large number—if these are willing to accept a [illegible] from the pay of former years. The lumber market is [illegible], but the large operators are taking advantage of the low labor costs, and expect to do much logging. The common laborer in the woods this season will get $16 to $18 per month and board, while in former years he has received $35 to [illegible] for the same service. Hence, in the spring, the "lumberjack" will not have the usual fat roll when he returns to the mines.

ISHPEMING—Oct. 31

Illustrative of Depressed Conditions, there are employed in the Crystal Falls district fewer than 600 men, whereas in normal times 2000 names are on the payrolls. The Wickwire interests have cut the working force at the Homer mine at Iron River to 130 men. Shipments from stockpiles on the Menominee range have been suspended by the Steel Corporation; most of the ore now being hoisted is, however, going to the Escanaba docks.

The Steel Corporation is Preparing a Novel Exhibit for display at the Panama-Pacific Exposition. It will show how ore is mined in the Lake Superior region and transported therefrom. It will contain miniature reproductions of mines and of ore docks and a replica of the Pittsburgh Steamship Co.'s "Wm. J. Olcott" taking on a cargo. A relief map showing the various iron districts will be another feature, as will an exhibition of safety devices. Walter Croze, geologist, is in charge of the work.

Measures of Retrenchment similar to the recent 10% payroll cut of the Cleveland Cliffs have been taken by Pickands-Mather, Corrigan-McKinney, Oglebay-Norton, and the Buffalo Iron Mining Co. In most of the districts affected, including the Crystal Falls and the Iron River, the wage cut was 10%; elsewhere, as at the Cary mine on the Gogebic, it is 25c. a day. Hereafter the woodchoppers cutting material for the charcoal kilns of the Pioneer Iron Co. will be paid 80c. a cord, as against 90c. prior to Oct. 20.

Engaged to Sink a Shaft at Lyon Mountain, N. Y., a score of skilled miners recently left Negaunee and Ishpeming to enter the service of the Chateaugay Ore & Iron Co. Most of the men are Cornish; more than 100 applications for membership in the party were made within a few hours. The shaft is now down to the 300-ft. level and will be carried to the 1200 ft. It is probable that more experienced men will be procured from the Lake Superior iron region early in 1915. Harry Whear, formerly of Negaunee, is the superintendent.

HOUGHTON—Oct. 31

The Isle Royale is producing 2100 tons daily, 300 more than before the strike, and this is secured with practically the same working force. The apparent increase in efficiency is accounted for by the fact that all extraordinary work was shut off with the decline in the price of copper. No construction work is under way and no advance openings are made underground, except those absolutely necessary. No men, however, directly employed in getting out rock have been let out, and only a few miners have been dropped from the rolls. So Isle Royale today is making a fairly good showing, considering that it never before was able to contend successfully with 11c. copper. How long operations can continue on the present basis is cause for speculation, but all friends of the property hope for the best. The present rock output comes from four shafts, the largest quantity from Nos. 4 and 6, much less from Nos. 2 and 5. No. 6, the farthest south, in territory practically new, continues to show good general rock, better than the average of No. 2 in fact.

TORONTO—Oct. 31

The Manufacture of Shrapnel in Canada, for which the British War Office has placed large orders, will materially benefit the silver-lead industry of the Kootenay district of British Columbia. The shrapnel bullets are to be made of lead from the smelting plants at Trail, B. C.

The Prevention of Nickel Exportation has been strongly agitated since the outbreak of the war, inasmuch as Canada is the only source from which Germany can draw her supplies of that metal for armor plating. The first step in that direction has been taken by the Canadian government, which has issued an order-in-council prohibiting the export of a number of articles classed as contraband of war "to all foreign ports in Europe and on the Mediterranean and Black Seas, save France, Russia (except Baltic ports), Spain and Portugal." The list includes nickel and nickel ores, gold and silver bullion, unwrought copper, lead sheet or pipe, iron ore and coal, in addition to foodstuffs and many manufactured articles. The order will hardly prove effective as regards the main object, namely, that of preventing Germany from procuring supplies of nickel, as the export of nickel ore to the United States is not prohibited, and all nickel shipped from the Sudbury mines across the line is in the form of matte. It is pointed out that the refined metal can be reshipped from the American refineries to Holland, Denmark or Italy and thence to Germany or Austria. It is probable that more drastic legislation will be enacted at the next session of Parliament. A report issued by the Canadian conservation commission some time ago stated that Canada had it practically in her power to prevent the continued construction of battleships by her monopoly of nickel.

The Mining News

ALASKA

HAMILTON & IRVING PROPERTY near head of Pigot Bay in Port Wells country bonded to B. F. Millard who will start development on quartz lode.

HONEY BOY GROUP, south of Ptarmigan Drop roadhouse near Valdez, bonded by B. F. Millard from Frank Frase, Charles Koppus and Fred T. Elkins. Claims cover gold bearing quartz lode.

GOLDEN EAGLE MINING CO. (Port Wells)—Latest shipment concentrates ran $111 per ton. Company owned by Cordova men.

JUALIN (Jualin)—Operations started with 10-stamp mill. Work in charge of H. G. Young, consulting engineer of Aigunican Development Co., the holding company furnishing capital.

EBNER (Juneau)—Reported U. S. company has done a good deal of development work during summer; 400 ft. of tunnel driven, together with crosscuts and raises; five-stamp mill installed for testing.

MOTHER LODE COPPER MINES CO. (Shushanna Junction)—Intention to work 40 men through winter and get out 1000 tons for shipment; sledding it to railroad. Reported by Superintendent Parks that Pittsburgh crosscut intersected main vein, giving 380 ft. of backs on Mother Lode fissure.

TREADWELL GROUP (Treadwell)—In September Alaska Treadwell crushed 78,015 tons; estimated value free gold, $93,196; of concentrates, $88,444. Corresponding figures for Mexican: 19,173 tons, $18,504 and $22,137; for United: 38,157 tons, $41,235 and $57,079.

WATSON PROPERTY (Fairbanks)—Charles Watson, on Chatanika flats, has cosmopolitan force: Three Bulgarians, four Swedes, four Russians, three Austrians, two Norwegians, one German, one Scotchman, one Native Son of Golden West. Watson feared European war might be epitomized in his mine. Not so! Men were all Alaskans, worked together like brothers. To show hearts were in right places, put forth extra efforts and broke hoisting record: 582 buckets from 147-ft. shaft in one shift, beating best previous record by 31 buckets.

ARIZONA

Cochise County

TRANQUILITY (Tombstone)—New track to loading platform completed and shipping begun. Several carloads of timber and building material received recently and company has put on 20 men. Private telephone line put in to connect main office and various departments.

Mohave County

TOM REED (Oatman)—Company purchased of Henry Lovin mineral in Fraction claim. Lovin retains surface rights and buildings thereon.

Pinal County

KELVIN-SULTANA (Kelvin)—Coarse-crushing department of new concentrator in operation Oct. 20. Concentrator itself in operation Oct. 26. Capacity 125 tons, designed and built by O. N. Brown. Three shifts at work in mine. Stoping in progress on No. 2 vein at 300-ft. level. No. 1 drift on 500-ft. level advanced 82 ft. Auxiliary hoist being set to handle material from big stockpile. Raise to be made on No. 1 vein from 500 to 400 level.

CALIFORNIA—Amador County

ORIGINAL AMADOR (Amador)—Reported order placed for two 8x3-ft. Hardinge mills. Expected to increase recovery and handle larger tonnage.

Humboldt County

COMPLETION OF EUREKA-SAN FRANCISCO branch of Northwestern Pacific announced. This fills gap of about 100 miles north of Sherwood, Mendocino County, and provides direct line between Eureka and San Francisco. Humboldt County heretofore dependent on water transportation, which, though sufficient for handling of great lumber business, retarded mine development.

Nevada County

EMPIRE (Grass Valley)—Installation of additional 20 stamps in 40-stamp mill progressing. New hoist designed to operate to inclined depth of 7500 ft. Mill running steadily on good ore; monthly cleanup reported at about $50,000; definite figures not obtainable.

Placer County

MAGNESITE DEPOSIT, said to be much larger than that near Towle, reported near Alta, situated between Boardman ditch and Bear River. Stated deposit will be developed by D. J. Sullivan.

Shasta County

CALCIUM NITRATE plant reported by newspapers as contemplated for vicinity of Heroult. Charles G. Carter said to represent Boston capital has taken option on limestone deposit. Three units to be built, first with annual capacity of 100,000 tons.

Sierra County

SOVEREIGN (Downieville)—This quartz property in Ladies Cañon leased to George Bigelow and Horace A. Morse, who will mill ore now stored in bins and will cyanide tailings.

OXFORD-GOLD BLUFF (Downieville)—Recent prospecting disclosed that vein recently found on surface had been cut by tunnel run 30 years ago. Vein at this point 10 ft. wide, running over $3 per ton. Additional equipment being installed by Grant Snyder.

COLORADO

Boulder County

CONGER MINE (Lakewood)—Primos Chemical Co. demonstrating continuity in depth of this tungsten deposit. Main shaft down over 800 ft. on dip of vein, 700 ft. vertically; with fine orebody developed in bottom level. Deepest tungsten mining yet done in region. Primos company recently took option on large group of claims in Daley district about eight miles west of Empire in Clear Creek County, is working party of miners in development of molybdenite deposit.

Chaffee County

EUREKA MINING & REDUCTION (Garfield)—Application for injunction by minority stockholders to prevent majority interests from selling property under execution; assert it is freezeout. Complainants are John L. Farrell and Esther R. Abbott. Property stated to have value of $300,000.

Clear Creek County

ONEIDA (Idaho Springs)—New mill now completed and turned over by contractors. Plant constructed by Hendrie & Bolthoff, of Denver, for $35,000. Uses continuous decantation system. Capacity, 50 tons. Mine contains large supply of developed ore, running from $8 to $12 a ton.

BIG FIVE TUNNEL (Idaho Springs)—Lessees Mosher & Co. are developing Lake vein, about 9000 ft. from portal and 1800 ft. from surface. Vein 3 to 4 ft. wide, contains 8-in. streak of smelting ore that assays $70. Milling ore averages about $16. Product shipped to Newton mill for treatment. Lessees Klein & Wilson are blocking out ore east of junction of Bellman and Lake veins, with average value of about $30. Lessees on west Lake vein drifting on vein of $8 ore. Drifting on East Bellman toward Dove's Nest indicates improvement in vein. Vitagraf Leasing Co. is sinking on promising vein below tunnel level.

Gilpin County

COLORADO PINE CONE (Central City)—Milling plant, including grizzly, Samson crusher, two automatic feeders, ten 850-lb. stamps, plates, one bumping table and one Wilfley concentrator completed. Electricity to be used for power.

Lake County

DORIS (Leadville)—Verhofstad, et al., reopening this old property in Iowa Gulch, expect to unwater in order to attack known oreshoots.

BENGAL TIGER GORDON (Twin Lakes)—G. W. Boyce, backed by Midwest capitalists, has undertaken operations. Will send large samples of ore to Denver for metallurgical tests. Litigation arose during sale, 17 years ago, after first payment of $50,000 had been made toward total price of $225,000; mine never resumed until now.

Ouray County

AMERICAN NETTIE (Ouray)—Development done by Wanakah company on neighboring property demonstrated advisability of working this famous old mine on lower or second "contact"; is now proposed to drive new adit about 2000 ft. to open this ground.

Teller County

DEEP EXPLORATION FASHIONABLE AND PROFITABLE in district. Portland working between levels 5 and 17 and finding best ore at lowest level; further sinking to begin Nov. 1. Vindicator sinking almost to 200-ft. mark, said to find best ore in lowest levels. Granite and Golden Cycle preparing to go down.

BLUE FLAG MINING & MILLING (Cripple Creek)—Sinking of main shaft 300 ft., from 8th level to 11th, completed; property will now be explored by north and south drifts. Machine drills will be installed for new work. J. F. Erisman manager.

ABE LINCOLN (Cripple Creek)—Holmewald Leasing Co. has opened orebody on 300-ft. level of May Queen vein which may be of great importance, is 20 ft. wide and 70 ft. long, said to assay $18 per ton. Development on company account on third level has opened 4-ft. vein of $70 ore for 400 ft. Crosscut being driven north from third level to intersect vein system in Womack Hill, now 1200 ft. long. Heading approaching Lucky Bill vein which showed rich ore on surface. West heading on sulphide vein advanced 300 ft., now in payable ore. Crosscut on 700-ft. level advanced 300 ft., must continue 75 ft. further to cut Sulphide vein. North and south headings on 800-ft. level now in payable ore. Frank Vetter manager.

Summit County

FRENCH GULCH (Breckenridge)—Hermann J. Relling states he is digging bank 10 ft. deep, 410 ft. wide, and [illegible] daily profit of $1[illegible]. Does not propose to work boat during severe winter months, for, while feasible and carried on several years, found increased cost amounts to nearly 1[illegible] per cu.yd.

IDAHO

IN OLD PIERCE MINING DISTRICT 30 miles west of Orofino, W. J. Harris expects to start dredging [illegible] Quartz Creek next year. Will build $75,000 dredge and have it operating by Aug. 1, 1915.

SILVER CABLE (Mullan)—Good showing of ore developed, lead and zinc; company has let contract for seven months of tunnel work this winter.

NATIONAL COPPER (Mullan)—Mine operations suspended until 14c. copper returns. After mill closed mine work continued for some time with 30 men.

CALEDONIA (Wallace)—Second dividend recently declared and surplus held in treasury. Property fully developed, operated through Kellogg tunnel of Bunker Hill & Sullivan, has large reserves. Charles McKinnis manager.

IDORA HILL (Wallace)—Constitutionality of law providing that discharged employee, when not paid immediately on discharge, can collect wages for each day after his dismissal for 30 days, attacked by Idora company in the suit brought against it by Harry Olsen et al. Company was unable to meet obligations last spring owing to financial difficulties. Does not deny amount of wages due employees at time of discharge, but does deny liability for penalty provided by law.

MICHIGAN

Iron

ROGERS-BROWN has suspended operations at Chicagon and Rogers mines, Iron River.

CORRIGAN-McKINNEY has closed Colby and Ironton mines at Bessemer, retaining in service only superintendents and captains. Has closed Tully at Iron River and scaled down force in Great Western at Crystal Falls.

PICKANDS-MATHER has only Caspian mine at Iron River working in Menominee region, has given up all exploratory work, including that on Warner property at Amasa and Calumet tract in Felch Mountain district.

NEWPORT (Norwood)—Men at Newport, Anvil and Palms shafts put on half-time.

COPPS (Marenisco) —Whiteside-La Rue interests suspended work. Exploration and development had proceeded for more than two years.

CLEVELAND-CLIFFS (Ishpeming)—Dividend passed, first time in many years, result of depression. Believed other companies in district will follow suit.

MINNESOTA

Cuyuna Range

THOMPSON (Crosby)—Pit will be largest Cuyuna producer this season, shipping well over 200,000 tons. Two shovels working in ore continuously.

AMERICAN MANGANESE MFG. CO. (Ironton)—Company now shipping 25,000-ton stockpile at Ironton shaft and 20,000-ton stockpile at Cuyuna-Mille Lacs shaft to its furnaces at Dunbar, Penn.

DULUTH-BRAINERD (Ironton) — At recent stockholders' meeting control passed to new hands. Formerly controlled by Locker-Donahue interests, along with Cuyuna-Mille Lacs and Cuyuna-Duluth. New directorate represents Duluth capital only. Otto J. Wendlandt, president, 314 Palladio Bldg., Duluth.

Mesabi Range

MINING AGENTS from Colorado and other western mining districts are on Mesabi range securing laborers from openpits now suspending for winter. One party of 150 left recently for coal mines at Walsenburg, Colo., and smaller parties going west almost daily.

ANNUAL REPORT OF ITASCA COUNTY INSPECTOR for year ended June 30, 1914, just issued. Shows 13 of county's 21 mines shipped during that period, the Canisteo, Hill, Holman, Judd, Mississippi, Crosby, Hawkins, Pearson, La Rue, Bray, Bennett, John Jr. and Quinn-Harrison. Number of men employed, 2527; 2010 in openpits and 517 underground. Average wage, $2.81. Total injuries, 272; eight fatal. [Death rate about 3.15 per 1000. Apparently based on payroll, not on number at work. Season short; rate would be increased if reduced to 300-day, or 300,000 man-shift, basis. Extremely high for district where openpit work predominates.—Editor.]

QUINN-HARRISON (Nashwauk) — Concrete work beginning on new washing plant, one mile south of Nashwauk, on Swan Lake road. Planned to begin operations early next spring.

ELBA AND CORSICA (Elba) — These Pickands-Mather properties being put in shape for constant operation through winter. New boiler houses being constructed at both properties, new boilers and engines installed, and 150-ft. concrete stacks will be erected.

DUNWOODY (Chisholm) — Stripping operations being rushed on this Great Northern property by Winston-Dear, contractors. Property, formerly known as St. Louis, held under lease, with 30 years to run, which will necessitate removal of about 1,000,000 tons annually if deposit is to be mined out during life of lease.

LEONARD (Chisholm)—Beginning Nov. 1, 500 additional men will be employed. Day shift increased and night shift added. Additional motors and equipment recently installed permit enlargement of force; management announces production will be kept at highest figure throughout winter. Property, both openpit and underground mine, one of Great Northern leases canceled by Steel Corporation. Great Northern interests obliged to work it to limit, since their lease from Clark Mining Co., fee owners, has but four years to run.

Vermilion Range

SOUDAN (Tower) — Accident in shafthouse caused suspension of all underground operations at mine for number of days.

MONTANA

Jefferson County

ALTA (Corbin)—Cave-in Oct. 27 caused death of Roy Barnes and serious injury of James Belch. Barnes in trying to save Belch who had been caught in fall of rock, lost his own life by crushing under larger fall

Silver Bow County

HOMERUN (Butte)—Leasers of this mine, north of famous old Alice mine in Walkerville, report strike of rich silver vein in shaft, at depth of 85 ft. from surface. Vein from 18 to 24 in. wide and ore assays extremely high. Mine surrounded by other claims, formerly large producers of silver.

BULLWHACKER (Butte)—At stockholders' meeting, Oct 26, in Phoenix, Ariz., plans for reorganizing, reported in recent issue of "Journal," approved. New company will be known as Butte-Bullwhacker Mining Co., with headquarters in Butte Stockholders in old company may acquire stock in new by paying 15c. a share. It is believed that before end of six months company's property will be in active operation again.

NEVADA

Clark County

REVIVAL OF PROSPECTING IN GOODSPRINGS DISTRICT reported. Many old prospects relocated and being worked with satisfactory results.

Elko County

BUNKER HILL TUNNEL (Bullion)—Tunnel now in 2200 ft.; last round opened mineral-bearing formation.

KEY LEASE (Bullion)—Mine retimbered throughout, 25 tons good-grade silver-lead-copper ore shipped daily. Two auto-trucks as well as teams used for ore haulage in Bullion district.

Esmeralda County

HASBROUCK (Gold Mountain)—Contract made with West End company, of Tonopah, to mill ore being extracted in development work.

ATLANTA MINES CO. (Goldfield)—Development work will be resumed on 1750-ft. level as soon as new pumping plant is installed in Merger shaft, through which Atlanta works at this depth. Stated, at time of shut down on account of water, southwest crosscut had opened wide oreshoot of commercial grade.

JUMBO EXTENSION (Goldfield)—Estimated $50,000 value of ore extracted from 60-ft. raise between 1017-ft. level and intermediate below 921-ft. One 50-ton car ore assayed $302 per ton. Final payment of $30,000 for Velvet claim made to Goldfield Merger six months before due.

GOLDFIELD MERGER (Goldfield)—New pumping plant received, will be installed at once. When workings, flooded several months ago, are drained, development work will be resumed. Believed oreshoot recently discovered at depth in Jumbo Extension will be found in Sunflower claim of Merger. Main development work to be done on 1750-ft. level; deepest working in southern Nevada.

Humboldt County

LEASING COMPANIES IN NATIONAL are Wheeler, working on White Rock through White Rock tunnel; Hatch, on National Mining Co. ground; and Baldwin-McCloud, on West Virginia National Mining Co land.

CROWN POINT EXTENSION (Rochester)—Lease taken on this block adjoining Big Four lease. Thought east vein of Big Four crosses ground. Work will start at once.

ROCHESTER MINES CO. (Rochester)—Concrete work of new mill completed, water pipe received, and expected superstructure will be finished in few weeks, when machinery will be shipped.

SEVEN TROUGHS COALITION (Seven Troughs)—Mill produced $37,000 in bullion from 18 days' run in September, according to manager's statement. Station cut on 1300-ft. level and oreshoot appears to extend to greater depth.

BUCKSKIN NATIONAL (National)—Raise being lifted from 250-ft. level to No. 2 tunnel level; will be timbered, station cut on No 2 tunnel level, hoist installed and raise used as working shaft for deeper work. Development work on No. 2 level continues to open large tonnage of milling-grade ore and some high-grade ore.

Lyon County

NEVADA-DOUGLAS (Ludwig)—Foundation for leaching plant finished. Reported plant will be in operation soon after first of 1915

Nye County

ROUND MOUNTAIN SPHINX MINING CO. (Round Mountain)—Suit for $11,267 filed against company by former manager for salary due and money advanced.

WEST END CONSOLIDATED (Tonopah)—Recent attachment by Jim Butler dissolved to permit plaintiff to file application for amended restraining order. Stated will be no interference with operations of company.

NEW MEXICO

Grant County

MANHATTAN (Pinos Altos)—Body of pyrite with good gold content penetrated. Shipments being made.

CHINO COPPER CO. (Santo Rita)—Property near Hanover with galena outcroppings under lease. Development work being prosecuted.

HARDSCRABBLE (Pinos Altos)—Vein of good copper-silver ore encountered from 1 to 2 ft. wide. Is in soft ground, and extensive timbering will be done before shipments are made. J .T. Janes is in charge.

PRECIOUS METALS EXPLORATION CO. (Mogollon)—Sinking and raising in No. 3 tunnel on Gold-Dust vein under way. Shipments of good milling ore being made to Deadwood mill. Extensive new work to be prosecuted.

GREEN KING (Lordsburg)—Water struck at 40 ft. in sinking shaft. Four-foot vein of good gold ore found. Shipments made weekly. Other operators in new camp are Higgins & Scarborough, Hayden & Weldon, Hickman & Weldon Strikes attracting much attention.

Taos County

CARIBEL MINE (Red River)—Reported 50-ton treatment plant will be erected in spring. Six properties in camp have commercially valuable ore. Road improvement under way making all grades below 6.5%. Greatly needed, will add much to future of camp.

OREGON

Baker County

GOLDEN GATE (Greenhorn)—Ten-stamp mill being constructed, large quantity of hay and mine supplies being hauled from Greenwood station.

MORNING MINE (Greenhorn)—Reported sold, new owners having taken it over from lessees who worked it for some time. Has over 3000 ft. drifts and tunnels, producing for number of years from oxidized orebody; large seams sulphide ore practically untouched for lack of proper treatment process.

NORTH POLE (Cracker District)—Drift from E. & E. mine into this property to be continued, opening vein more than 200 ft. below the present lowest working level of North Pole. Development continued in upper levels of North Pole after mill was closed in early summer, disclosing pay ore at different points. Mine being operated under bond and lease by John C. Lewis, of Portland, belongs to Baring Bros., of London. E. & E. is property of Jonathan Bourne and associates; called valuable, but idle for many years.

SOUTH DAKOTA

ORO HONDO (Lead)—Use of pumps for handling water discontinued, skips being employed instead.

RATTLESNAKE JACK (Galena)—Completion of mill postponed. Mine being developed by shaft and drifts.

BLACK HILLS TUNGSTEN (Hill City)—Mill leased to local men; to be put in shape for concentrating tin.

HOME LODE (Silver City)—Machinery for new mill arrived, being moved to site. Oil flotation will be used in treatment of complex ore.

TROJAN (Trojan)—New town being built by company will be ready for occupancy before Jan. 1. New hotel will be modern in every respect.

WASP NO. 2 (Flatiron)—New locomotive and self-dumping cars reduce cost of handling product from steam shovel. New porpnyry orebody opened up shows increase in content.

HOMESTAKE (Lead)—Annual gift of $200 to each church in Lead, Central and Terraville being distributed. Thirteen in all receive gift. Superstructure for new hoist nearing completion. Good progress being made at installation of machinery.

GOLDEN REWARD (Deadwood)—Tube mill, installed for sliming of roasted "blue ores" in continuous operation, handling about 30 tons daily. Good extraction obtained. Trent replacer nearly ready for use. Installations being made will greatly increase capacity of plant.

UTAH

Beaver County

BEAVER GOLD MINES (Beaver City)—Company making tests on Sheep Rock ores at five-stamp mill, with view to increasing capacity of mill.

HORN SILVER (Frisco)—At annual meeting held in October instead of December as heretofore, directors elected as follows: E. F. Emmet, C. Brenneman, A B. Simmonds, H. R. Britton, H. S. Young, E. B. Critchlow, W. J. Barrette, and J. Neadle. Reports will be sent to stockholders after first of year. Mine has paid $5,662,000 in dividends, last payment made in September, 1907. Thirty men employed. B. B. Lawrence consulting engineer.

Juab County

MAMMOTH (Mammoth)—About 50 tons of ore carrying gold, silver, and copper being mined from new orebody on 600 level, daily. There is streak of bismuth ore, from which assays of 35% bismuth have been obtained. Some leasing being done.

LEONORA (Milford)—Zinc ore opened on tunnel level. Widened from 8-in. streak to about 3 ft. at breast. Lead ore running well in silver opened for 75 ft. on strike along contact of white and blue limestones. Material taken out in development sacked. Property is in Star district, near Red Warrior and Moscow.

MONITOR (Milford)—Property in Star district short distance southeast of Moscow has shipped 16th car of ore for present year thus far. Ore being mined from 125-ft. level, where there is good showing. Winze being sunk in ore from this level, with two shifts working. Ore carries lead, silver and some gold; averages from $12 to $15. E. H. Althon manager.

Summit County

THOMPSON-QUINCY (Park City)—Work resumed Sept. 23, when five mine-cars of first-class ore were obtained from material which had caved while property was idle

SILVER KING CONSOLIDATED (Park City)—New compressor and other machinery being installed, interrupting ore shipments for week ended Oct. 23. Roads soft from recent snow.

DALY WEST (Park City)—Expected both mine and mill will be in operation early in November Good milling ore, over 3000 tons, accumulated, and in addition there has been developed first-class ore, which will be mined as soon as work begins.

SNAKE CREEK TUNNEL (Park City)—Face in hard marbleized limestone near contact with diorite, good progress, 13-ft. daily, being made with two shifts, although normal rate is about 15 ft. Some mineralization, with copper staining. New compressor will be installed, within next 30 days, which will facilitate work. Tunnel in about 9600 ft.; there is a flow of 11,000 gal. of water per minute.

WASHINGTON

RATHFON REDUCTION WORKS (Republic)—Fine body of ore encountered. Shipments being made to Trail.

PALMER MOUNTAIN (Loomis)—Reported this property and Summit property will be worked by a Dr. Barton, of Los Angeles, who has obtained option. Stated he will install electric smelting plant.

CANADA

British Columbia

CARMI—Operations by Burke & Collins being resumed in mine and mill of this property, on west fork of Kettle River.

GUEDETTA—Vancouver men have secured a working bond on this group of 14 claims in Franklin camp, on North Fork of the Kettle River, from John Morrell; development work will begin soon.

CONSOLIDATED MINING & SMELTING (Trail)—Company notifies customers it will receive ore for treatment; preliminary payment for silver 40c. per oz.; lead settled for on New York quotations instead of London. Final settlement for silver as company disposes of product. Each month's receipts will be pooled, that from company's mines being included and handled on exactly same basis as that of customers; distributions of returns made when sales amount to month's output. Lead paid for at 90% on New York price for third month after receipt of order. Company will charge existing smelter rates for treatment, plus 4% of net value of ore.

Ontario

NIPISSING (Cobalt)—Mine has discontinued shipments to Europe until conditions improve, is storing output.

CROWN RESERVE (Cobalt)—Company seriously affected by war, having contract for its high-grade with Kingdom of Saxony. Payment for two cars still owing and of course uncollectible until close of war.

McINTYRE (Schumacher)—Mill production for October will be between $70,000 and $75,000; daily tonnage 175, averaging about $9.75. Underground No. 4 shaft being sunk from 500- to the 600-ft. level, and No. 5 from the 300 to 600, at which depth they will be connected by crosscut. Also contemplated to connect the McIntyre workings with main shaft of Pearl Lake.

Yukon Territory

CANADIAN-KLONDYKE MINING CO. (Dawson)—Dredge No. 2 sank in October, not likely to be in commission again during present season.

ASSESSMENTS

Company	Delinq.	Sale	Amt
Annie Laurie, Utah (old stock)	Nov. 9	Nov. 28	$0.004
Annie Laurie, Utah (new stock)	Nov. 9	Nov 28	0.001
Austrian, Calif.	Sept. 29	Nov. 28	0.02
Black Bear, Ida. (post)	Oct 30	Nov. 28	0.01
Blaine & Emmett, Ida.	Oct. 26	Nov. 14	0.005
Bullion, Ida. (post.)	Nov. 4	Dec. 7	0.005
Busy Bee, Utah.	....	.....	0.0025
Carney Copper, Ida. (post.)	Sept. 21	Nov. 21	0.00225
Challenge Con., Nev.	Oct 27	Nov 17	0.05
Coeur d'Alene Investment, Ida.	Oct. 10	Nov. 14	0.002
Comet, Ida.	Oct 20	Nov. 20	0.0005
Confidence, Nev.	Nov 11	Dec 2	0.10
Con. Virginia, Nev.	Nov. 27	Dec. 18	0.10
Copper Chief, Ida	Nov 4	Dec. 7	0.005
Copper Crown, Ida	Oct 10	Nov. 14	0.002
Copper King, Ida. (post.)	Oct 1	Dec. 1	0.01
Copper Plate, Ida	Aug 29	Nov 29	0.002
Custer Peak, S.D		....	0.02
Davis-Daly, Mont	Oct 15	.	0.25
Diamondfield Black Butte, Nev (post)	Oct 15	Nov. 21	0.01
East Hercules, Ida (post)	Nov 1	Dec. 1	0.001
Eastern Star, Ida	Oct 20	Nov. 20	0.002
Echo, Ida.	Nov. 20	Dec. 15	0.0015
Ely Con, Nev	Oct 15	Dec. 2	0.03
Emerald, Utah, (three installments)		June 9, '15	0.01
Excelsior Iron, Utah	Oct 25	Nov 15	0.115
Federal Ely, Nev.	Oct 21	Nov 24	0.115
Gold Mountain Champion, Utah	Nov 14	Dec. 2	0.0025
Greenhorn, Utah	Oct 26	Nov 30	0.005
Hilarity, Ida	Oct 12	Nov 23	0.003
Hypotheek, Ida	Oct 26	Nov 16	0.01
Idaho-Montana, Ida	Nov 2	Nov. 21	0.001
Idaho-Nevada, Ida.	Nov 7	Dec. 1	0.001
Imlay, Nev.	Nov 15	Nov. 26	0.01
Lead King, Ida	Nov 1	Nov. 16	0.0005
Lewis & Clark, Ida	Sept 15	Nov 13	0.001
Little North Fork, Ida	Oct 12	Nov 12	0.001
Lucky Deposit, Utah	Oct 12	Nov. 15	0.005
Lucky Swede, Ida (post)	Oct 19	Nov 19	0.001
Mammoth Gold, Nev	Nov 23	Jan 4, '15	0.02
M & P Gold, Utah	Nov 10	Dec. 1	0.0025
North Scranton, Utah	Nov 3	Dec 3	0.002
Ophir, Nev	Nov 19	Dec 11	0.10
Peerless, Utah	Oct 30	Nov. 16	0.001
Phoenix, Ida	Oct 26	Nov. 20	0.005
Rainbow, Ida	Nov 30	Dec 31	0.002
Rarus, Utah	Nov 13	Nov 30	0.001
Reindeer-Queen, Ida (post)	Sept 21	Nov. 28	0.002
Revelator, Utah	Nov 9	Dec. 8	0.005
Santaquin Utah	Oct 7	Nov 21	0.005
Silver Dipper, Utah	Oct 27	Nov. 16	0.001
Spider, Utah	Oct 28	Nov 17	0.0025
Sunset, Ida	Nov 7	Nov 30	0.003
Tarbox, Ida (post)	Oct 26	Nov 27	0.0025
Triumph, Utah	Nov 2	Nov 23	0.01
Tuscumbia, Ida	Oct 20	Nov [illegible]	[illegible]
United Tintic, Utah	Nov 7	Nov 23	[illegible]
Valentine, Ida (post)	Oct 12	Nov 12	[illegible]
Wasatch-Utah, Utah	Oct 26	[illegible]	[illegible]
Wisconsin, Ida	Nov 16	Dec 21	0.003
Yellow Jacket, Nev	Nov 5	[illegible]	0.05
Zella, Utah	Oct 25	[illegible]	0.0025

The Market Report

METAL MARKETS

NEW YORK—Nov. 4

The copper market has been shrouded in gloom, but there has been no pronounced weakness in price. Spelter has been dull, a little below where it closed last week. Lead has been distinctly firmer. Tin has exhibited much strength Silver declined further.

Copper, Tin, Lead and Zinc

Copper—There were other seizures in addition to those we reported last week, but this week there is news of the release of two of the detained ships: the "San Giovanni" and the "Regina de Italia." Diplomatic negotiations are now going on in Washington. Although the situation is viewed with profound pessimism by the copper producers, there is an undercurrent of feeling that conditions are already as bad as they can be, and that any change must be for the better; yet it is certain that there must be further curtailment of producion if exportation is to be limited to England and France. The shock experienced last week did not seriously affect the market, business having been done this week at 11.10c. cash, New York, and at 11¼c. regular terms, equivalent to 11.10c. cash, New York, which is only a little under the level of prices in the previous week.

The Secretary of the Treasury has issued instructions to collectors of customs that returns of exports of metals shall not be made public until after 30 days from the date of clearance of the vessel. Heretofore these returns have been available each day.

Base price of copper sheets is now 16½c. per lb. for hot rolled and 17½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire si quoted at 12@12½c. per lb. for carload lots at mill.

The copper mines of Japan are producing at about 70 to 80% of their rate in 1913. Such curtailment as there has been is due to the low level of price which has made some mines unprofitable.

Brass Prices, Base, are announced by the American Brass Co. as follows, to date from Nov. 2: Sheets, high brass, 13½c. net per lb.; low brass, 14⅞c. Wire, high brass, 13¼c.; low brass, 14⅞c. Rods, high brass, 13¼c.; low brass, 15⅝c. Tubes, brazed and open seam, 17¼c. Brass angles and channels, 17¼c. Scrap allowances are 8c. net per lb. for high brass; 8⅞c. for low brass.

DAILY PRICES OF METALS

NEW YORK

			Copper	Tin	Lead		Zinc	
Oct.	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
29	[illegible]	48[illegible]	*	30¾	3.50	3.37½ @3.40	5.00 @5.10	4.85 @4.90
30	[illegible]	48[illegible]	*	30½	3.50	3.37½ @3.40	5.00 @5.05	4.85 @4.90
31	4.[illegible]	48[illegible]	*	30[illegible]	3.50	3.37½ @3.40	5.00 @5.05	4.85 @4.90
2	4.9000	48[illegible]	11.05 @11.17	31[illegible]	3.50	3.37½ @3.40	5.00 @5.05	4.85 @4.90
3								
4	4.9000	49[illegible]	11.1[illegible] @11.[illegible]	32	3.50	3.37½ @3.40	5.00 @5.05	4.85 @4.90

*No quotations.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts, and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St Louis is given as the basing point St Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb. are: St Louis-New York, 15½c.; St Louis-Chicago, 6c.; St Louis-Pittsburgh, 12½c. Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

Visible Stocks of Copper in Europe on Oct. 31 are reported at 21,457 long tons in Great Britain and 1150 tons in Rotterdam; a total of 22,607 tons. In addition 450 tons are reported afloat from Chile and 4000 tons from Australia, bringing the total up to 27,057 tons.

Tin—This market developed great strength for near-by shipments, due to the fear of an interruption of shipments from the Far East, because of the entrance into the war of Turkey and the threatened blockade of the Suez Canal.

The New York Metal Exchange will open on Nov. 9 for trading in tin.

Tin production of Federated Malay States seven months ended July 31 was 29,484 long tons in 1913, and 28,009 in 1914; a decrease of 1475 tons this year.

Lead—Right through the week a large business has been done, including at least one 1000-ton transaction. Some of the independent sellers appear to have sold all they want to at the present level, having let competitive business go to the largest interest. The St. Louis market has risen a little further above the ordinary differential.

The S.S. "Suruga" took 750 tons of lead and 360 tons of antimony last week from New York for Archangel, Russia.

Spelter—A business of a few hundred tons daily, including both domestic and foreign orders, was reported, but the volume was not large enough to characterize the market as otherwise than dull. Sales were made at 4.85c., 4.87½c. and 4.90c., this range prevailing from day to day.

Other Metals

Aluminum—Business is quiet and unchanged. Sales are moderate. The current quotation is slightly easier at 18@18.50c. per lb. for No. 1 ingots.

Antimony—The export demand has apparently stopped, but is expected to start up again. Meantime, the market is firm. Ordinary brands—Chinese, Hungarian, etc.—are quoted at 15½@16½c. per lb. Cookson's is 18@19c., with 17@18c. asked for other special brands.

Quicksilver—Asking price is rather higher here, chiefly owing to a reported advance in London to £11 per flask. New York price is $50@55 per flask of 75 lb. About 1500 flasks were imported from Italy a short time ago, but the results were not encouraging, and no more is expected to come.

Nickel—Shot, blocks or plaquettes are 40@45c. per lb. Electrolytic is 5c. per lb. higher.

Minor Metals—Quotations for **Bismuth** are $2.85@3 per lb. **Magnesium**, $1.50 per lb., New York. **Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, $5 per lb. for small quantities.

Mineral Exports of Spain half-year ended June 30 are reported by the "Rivista Minera" as below, in metric tons:

	Metals		Ores	
	1913	1914	1913	1914
Iron	6,887	6,969	4,891,841	3,745,509
Copper	11,871	11,009	86,621	66,011
Copper precipitate	2,829	5,747	. . . . .	. . .
Lead	107,685	86,414	1,124	1,310
Zinc	507	985	62,714	53,448
Quicksilver	1,472	1,273		. . . .
Manganese			11,265	6,45
Pyrites			1,523,481	1,637,10

Exports of salt were 326,976 tons in 1913, and 347,430 in 1914; an increase of 20,454 tons.

Gold, Silver and Platinum

Gold—Exports of gold to Ottawa, Canada, on account of the Exchange or Bankers' pool, have stopped for the present.

Silver—The market has gradually been going down for the reasons so often mentioned, namely, the inability of India to trade her exports for bullion, as result of war conditions. Supplies have fallen off and this has had a tendency to check the fall.

The London official quotations for the week were: Oct. 29, 22⅝d.; Oct. 30, 22⅜d.; Oct. 31, 22[illegible]d.; Nov. 2, 22[illegible]d.; Nov. 3, 22½d.; Nov. 4, 22 11/16d., per oz. standard silver.

Exports of silver from London to the East, Jan. 1 to Oct. 22, as reported by Messrs. Pixley & Abell, in value:

	1913	1914	Changes
India	£8,156,500	£4,649,500	D. £3,507,000
China	702,000	42,000	D. 660,000
Total	£8,858,500	£4,691,500	D. £4,167,000

Platinum—Business is rather slow and most transactions of any size are based on special negotiation. The demand for the jewelry trade is small for the season. Quotations are rather nominal at $48@50 per oz. for refined platinum and $53@57 per oz. for hard metal, according to iridium content.

Zinc and Lead Ore Markets

JOPLIN, MO.—Oct. 31

Blende high price is $49; assay base, 60% zinc, $43@46; metal base suspended; Calamine, base, 40% zinc, $22@23. Average, all grades zinc, $39.60 per ton. Lead, high price, $42; base, $40 per ton of 80% metal content; average, all grades of lead, $40.16 per ton.

Verification of the closing down of the big zinc mine at Butte, and the declining production of this district is materially strengthening offerings for all grades of blende. Producers are hoping for further advances, based on the Montana restriction of 2500 tons weekly and a curtailing of 1000 tons weekly in this district.

SHIPMENTS WEEK ENDED OCT 31

	Blende	Calamine	Lead	Value
Totals this week	8,012,470	1,098,090	1,455,710	$209,650
Ten months	435,698,920	32,689,390	75,449,070	$10,797,520

Blende value, the week, $167,340; 10 months, $8,649,530.

Calamine value, the week, $13,160; 10 months, $381,950.

Lead value, the week, $29,210; 10 months, $1,766,040.

PLATTEVILLE, WIS.—Oct. 31

The base price paid this week for 60% zinc ore was $42@44 per ton. No sales of lead ore were reported.

SHIPMENTS WEEK ENDED OCT. 31

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	5,027,790	......	905,420
Year	134,865,910	4,230,700	28,850,630

Shipped during week to separating plants, 3,838,440 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Nov. 4

The iron and steel trades have become somewhat more stagnant in the past week. In many branches of the trade there is practically no new business at all, not enough to show definitely where market prices stand. Steel-mill operations are still trending downward, and are now probably under rather than over 45% of the capacity. As bookings are still less, on an average, further decreases in production and shipments are to be expected.

Despite the almost uniformly unfavorable showing made by concrete developments in the iron and steel trade itself, there has begun to appear a more hopeful feeling, based upon influences outside the trade—large crops with an excellent market, increased export demand for many manufactured goods, a large drop in the price of exchange on London, further improvement in the financial situation, the prospective release of loanable funds through the reduction in required bank reserves Nov. 16, the adjournment of Congress, the ending of the election campaign and the prospect that the war scare as an incubus on all thought and action will soon pass.

Several of the smaller iron and steel interests have lately made reductions in wages. The large independents had the matter under advisement in the spring, but deferred action, and perhaps chiefly because the Steel Corporation was then opposed to any reduction. Conditions have now changed. The corporation has cut its common dividend, and may later pass it entirely, while the war promises a large export trade and a reduction in manufacturing costs would help to make such trade enlargement permanent. It is therefore accepted in most quarters that by Jan. 1, there will be a general reduction in both wages and salaries throughout the iron and steel industry.

A curious point in the market is the sale of some considerable quantities of ferromanganese for export. The inquiries came from Sweden and Italy, nominally, though it is suggested that Germany was the ultimate destination.

United States Foreign Trade in Iron and Steel, including machinery, eight months ended Aug. 31, is valued as follows by the Bureau of Statistics of the Department of Commerce:

	1913	1914	Changes
Exports	$203,650,904	$140,245,692	D. $63,405,212
Imports	23,287,536	20,718,089	D. 2,569,447
Excess, exports	$180,363,368	$119,527,603	D. $60,835,765

This shows decreases this year of 31.1% in the exports, and of 11% in the imports.

PITTSBURGH—Nov. 3

Steel prices are not closely quotable, as not enough business is offered to test the market. Nominal quotations are 1.10c. on plates, 1.15c. on bars and shapes, 1.90c. on black sheets, 2.90c. on black sheets and $1.60 on wire nails. The cutting in steel pipe that has been going on for some time is recognized by the National Tube Co. in the issuance of new discounts dated Nov. 2. The net reduction in the quoted price averages about $1.15 a ton.

Pig Iron—Prices have been softening in the local market, basic being quoted down to $12.50, Valley, or 50c. under the quotation that obtained for six months, until quite recently, while bessemer has dropped to $13.75, Valley, 25c. under the quotation of that obtained for six months. The market stands quotable as follows: Bessemer, $13.75; basic, $12.50; No. 2 foundry and malleable, $12.75@13; gray forge, $12.50@12.75; at Valley furnaces, 90c. higher delivered Pittsburgh. Since Oct. 1 the rate from the Shenango Valley has been 95c. to Pittsburgh, the rate from the Mahoning Valley remaining at 90c., but the Shenango furnaces would equalize with the others. W. P. Snyder & Co. announce average prices in October, based on the actual transactions, at $13.9375 for bessemer and $12.85 for basic.

Steel—The market is absolutely stagnant again and nominally, at least, prices have not declined. We quote f.o.b. maker's mill, Youngstown, billets at $19 and sheet bars at $19.50, and at maker's mill, Pittsburgh, billets at $19.50 and sheet bars at $20. These prices are for prompt specification, and for a contract running to the end of the year the mills would endeavor to obtain somewhat more. Rods are nominal at $26, Pittsburgh.

FOREIGN IRON

Steel Production in Germany half-year ended June 30, in metric tons:

	Basic	Acid	Total
Converter	5,341,406	50,922	5,392,328
Openhearth	3,527,455	185,930	3,713,385
Direct castings	122,080	54,426	176,506
Crucible	.....	45,432	45,432
Electric	.	53,216	53,216
Total	8,990,941	389,926	9,380,867

No comparisons can be made as the German Iron & Steel Union has not reported steel production monthly until this year.

Pig Iron Production in Great Britain for the half-year ended June 30, in comparison with preceding years, was, in long tons:

	1911	1912	1913	1914
First half-year	5,110,823	3,606,147	5,410,627	1,507,984
Second half-year	4,607,815	5,282,777	5,071,290	
Year	9,718,638	8,888,924	10,481,917	

Production of the first half this year was 902,643 tons less than 1913, and was the smallest reported for a half-year in 10 years, with the exception of 1912, which was the year of the great coal strike.

Pig Iron Production in Germany in August was 625,927 metric tons, against 1,564,345 in July. For the eight months ended Aug. 31 the total make of pig iron was 12,865,037 tons in 1913, and 11,478,468 in 1914; a decrease of 1,386,569 tons, or 10.8% this year.

IRON ORE

The Lake Superior shipping season will be a short one this year, as most of the large steel companies are planning to close down their mines early in November.

The Carnegie Steel Co. has lost about 5000 tons of Indian manganese ore on two vessels captured by the German cruiser "Emden."

Dunbar furnace of the American Manganese Manufacturing Co., at Dunbar, Penn., is now running on 40% ferromanganese. The ore is from the Cuyuna range in Minnesota.

Imports at Baltimore for the week included [illegible] tons ferromanganese from Great Britain; also 16,400 tons iron ore from Cuba.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 229,519 tons; shipments, 214,132 tons. Production of Greensburg and Upper Connellsville districts, 30,352 tons.

Fuel Exports of Great Britain nine months ended Sept. 30, long tons:

	1913	1914	Changes
Coal	54,517,788	48,116,349	D. 6,401,439
Coke	838,055	824,325	D. 13,730
Briquettes	1,542,365	1,431,938	D. 110,427
Steamer coal	15,545,617	14,581,962	D. 963,655
Total	72,443,825	64,954,574	D. 7,489,251

The decrease this year has been wholly in August and Septemher, when shipments were very light.

Coal Production in Germany in August showed a heavy decrease, as was to be expected. For the eight months ended Aug. 31, the total production was, in metric tons:

	1913	1914	Changes
Coal	127,318,665	119,187,604	D 8,131,061
Brown coal	56,658,980	56,401,120	D 257,860
Coke	21,418,997	20,127,970	D 291,027
Briquettes	17,995,383	18,548,987	I 553,604

Of the briquettes reported this year, 14,529,040 tons were made from brown coal or lignite.

SAULT STE. MARIE CANALS

Total tonnage of freight passing through Sault Ste. Marie Canal between Lakes Huron and Superior, in September, was 8,417,716 net tons. For the season to Oct. 1, the total freight was: Easthound, 30,668,547; westbound, 12,365,128; total, 43,033,675 short tons, a decrease of 17,039,619 tons from last year. The number of vessel passages was 14,556, showing an average cargo of 2956 tons. The mineral freights included in the totals were, in short tons, except salt, which is given in barrels:

	1913	1914	Changes
Coal	14,721,491	11,303,724	D. 3,417,767
Iron ore	38,018,387	25,923,002	D. 12,095,385
Pig and m'f'd iron	281,160	191,326	D. 89,834
Copper	72,466	47,237	D. 25,229
Building stone	6,181		D. 6,181
Salt, bbl	504,659	565,736	I. 61,077

Iron ore was 60.2% and coal 26.3% of the total freight this year.

The new canal at the Sault, with the third lock on the American side, went into commission Oct. 21, a number of vessel owners being present at the opening.

The new lock is the largest one at the Sault, being 1350 ft. long, 80 ft. wide and 24 ft. 5 in. deep over miter sill. Two of the largest Lake vessels can be locked through in tandem. This lock is 350 ft. longer than the locks of the Panama Canal.

CHEMICALS

NEW YORK—Nov. 4

The week has brought no material changes in the general market, which remains quiet.

Arsenic—There has been no change and quotations remain at about $3.75 per 100 lb., in a quiet market.

Copper Sulphate—The market continues steady, with about the usual demand. Current quotations are $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is slightly more active, so far as inquiry is concerned. There is no change, prices holding about 1.87½c. per lb. for November and December; 1.90@1.92½c. per lb. for deliveries in January and later.

Magnesite—The American Refractories Co. has received at Philadelphia a cargo of 6000 tons magnesite, brought by an Italian steamship from its works in Austria.

Imports and Exports of Fertilizers in the United States, eight months ended Aug. 31, in long tons:

	Imports		Exports	
	1913	1914	1913	1914
Kainit	247,832	317,205	140	....
Manure salts	118,592	150,973		.....
Other potash salts	149,709	182,091	2,569	2,746
Nitrate of soda	463,689	371,952	3,727	6,114
Sulphate of ammonia	33,135	51,483		..
Phosphates	..		933,992	899,100

Exports include reëxports of imported material. Some phosphates are imported, but are not given separately in the returns.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56 260	62 938	57 572	25 887	28 983	26 553
February	59 043	61 642	57 506	27 190	28 357	26 573
March	58 375	57 870	58 067	26 875	26 669	26 788
April	59 207	59 490	58 519	28 284	27 416	26.958
May	60 880	60.361	58 175	28 038	27 825	26 704
June	61 290	58 990	56.471	28 215	27 199	25.948
July	60 651	58 721	54 678	27 919	27 074	25.219
August	61 606	59 293	54 344	28 375	27 335	25.979
September	63 078	60.640	53.290	29 088	27 986	24 260
October	63 471	60.793	50.654	29 299	28 083	23 199
November	62 792	58 995		29 012	27 263	...
December	63 365	57 760		29 320	26 720	
Year	60 835	59 791		28 042	27 576	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0 925 fine

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50 298	37 779	238 273	171.905
February	48 766	39 830	220 140	181 556
March	46 832	38 038	213 615	173 619
April	49 115	36 154	224 159	163.963
May	49 038	33 360	224 143	150 702
June	44 820	30 577	207 208	138 321
July	40 260	31 707	183 511	142 517
August	41 582	*	188 731	‡
September	42 410	32 675	193 074	‡
October	40 462	30 284	184 837	‡
November	39 810		180 869	...
December	37 635	.	171 786	..
Av. year	44.252	.	206 279	...

New York in cents per pound; London in pounds sterling per long ton. ‡Not reported

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5 262	6 854	5 112	26 114	21 533
February	6.239	5 377	6 089	5 228	25.338	21 413
March	6.078	5 250	5.926	5 100	24.605	21 460
April	5.641	5.113	5 491	4 963	25 313	21 569
May	5.406	5 074	5.256	4.924	24 583	21.393
June	5.124	5.000	4 974	4 850	22 143	21 345
July	5.278	4.920	5.128	4 770	20.592	21 568
August	5.658	5.568	5.508	5 418	20 706	‡
September	5.694	5.380	5.544	5 230	21 148	‡
October	5.340	4 909	5.188	4 750	20 614	‡
November	5.229	.	5.083		20 581	
December	5 156		5 004		21 214	.
Year	5.648	...	5 504		22 746	...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16 488	14.223	71 741	64 304	77 750	69 488
February	14 971	14.491	65 519	65.259	71 575	70 188
March	14 713	14.131	65 329	64 276	70.658	69.170
April	[illegible]	14.211	68 111	64 717	74 273	69.313
May	[illegible]	[illegible]	68 807	63 182	74 771	67 786
June	14 672	[illegible]	67 140	61 336	70 821	66 274
July	14 190	[illegible]	[illegible]	[illegible]	69 446	64 955
August	15 400	*	[illegible]	[illegible]	71 313	‡
September	16 328	*	[illegible]	‡	78 614	‡
October	16 337	[illegible]	[illegible]	‡	79 250	‡
November	15 182		[illegible]		73 825	
December	14 224		[illegible]		69 583	
Year	15 269		[illegible]		73.740	.

New York, cents per pound, London, pounds sterling per long ton. ‡Not reported

* No quotations made ‡ London Exchange closed

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4 171	4 011	17 114	19 665
February	4.325	4 048	4 175	3 937	16.550	19 606
March	4.327	3.970	4 177	3 850	15 977	19.651
April	4 381	3 810	4 242	3 688	17 597	18 225
May	4.342	3 900	4 226	3 808	18 923	18.503
June	4 325	3.900	4 190	3 810	20.226	19.411
July	4.353	3 891	4 223	3 738	20.038	19 051
August	4.621	3.875	4 550	3 715	20.406	‡
September	4 698	3.828	4 579	3 658	20 648	‡
October	4 402	3 528	4.253	3 384	20 302	‡
November	4 293		4 146		19 334	
December	4 047		3.929		17 798	.
Year	4 370		4 238		18 743	.

New York and St Louis cents per pound London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14 94	$17.35	$13.23	$18 59	$13 99
February	18 15	15.06	17.22	14.12	18.13	14 08
March	18.15	15 07	16.96	13 94	17.53	14 10
April	17.90	14.90	16 71	13 90	16.40	14 13
May	17 68	14 90	15.80	13 90	15.40	14 27
June	17.14	14.90	15 40	13 90	15.10	13 96
July	16 31	14 90	15.13	13 90	14 74	13 90
August	16 63	14 90	15 00	13.90	14 88	14 90
September	16.65	14 90	15 04	13 90	14 93	14 03
October	16 60	14 84	14 61	13 75	14 80	13 97
November	16 03		13 91		14 40	
December	15 71		13 71		14 28	.
Year	$17 09		$15 57		$15 77	

The Engineering and Mining Journal

VOLUME 98 NOVEMBER 14, 1914 NUMBER 20

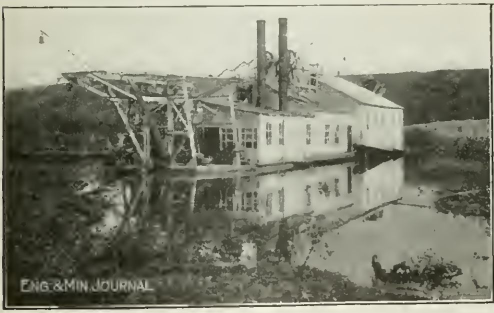
Dredging in the Russian Empire

By John Power Hutchins*

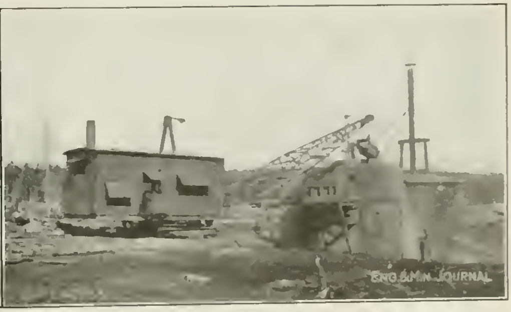
SYNOPSIS—Dredging in the Russian Empire is handicapped by poor design of the individual dredges and lack of team work between those controlled by the same company. Moreover, centuries of cheap labor have exhausted all the easily worked ground.

⁂

The first dredges in the Russian Empire were installed in Central Siberia in 1901 by the Dredging Co., a Russian company, which is still operating, and a year later the Neviansk Co. commenced installing dredges in the Ural Mountains. The first dredge in East Siberia was installed by the New Oodeel Co., in 1907, and in 1911, the first American dredge was installed in the Russian Empire. There are now about 70 dredges at work and eight new ones were installed in 1913. Three of these are being completed on the watershed of the Lena River, and one is being installed on the head waters of the Yenesei, where dredging has not yet been done. It is apparent, therefore, that the dredging horizon is being slowly extended.



Amgoon Dredge



Drag-Line Excavator and Floating Washing Plant

Economic Aspects

In general, gold dredging in Russia has not been successful. However, there are notable exceptions in dredging for platinum, some of these operations having been wonderfully successful. In Central Siberia, where the first dredges were installed, there have been no successes and the companies now operating there are either in the hands of receivers, or are having a most precarious existence. The causes are not hard to find. In the Ural Mountains, where deposits of rich gold-bearing gravel formerly existed, and where labor is only 25c. to 35c. per day, nearly all the gold-bearing placers have been exhausted, although there are still some platiniferous areas that will be profitable for dredging, with the enhanced value of this metal.

No foreign company has ever been successful in dredging for gold in Russia and this should serve as a warning when plausible promoters talk about having thousands of acres of rich ground. There is not one gold-dredging company, Russian or foreign, now paying well in Russia.

The first and most important point is a low-tenor gravel, which can only be worked profitably when handled cheaply on a large scale. Most of what would have been rich ground for dredging had been worked by hand with opencuts. In Russia and Siberia it is only necessary to wash the gravel on and near bedrock to recover more than 90 per cent. of the gold. Since hand stripping and shoveling into horse carts can be done in many regions for about 6c. per cu.yd., it is not costly to strip overburden. Only the gravel left after stripping needed to be mined, transported, washed and wasted. Thus, with labor at 35c. to 50c. per day, it has been possible to mine large volumes of gravel averaging less than 20c. per cu.yd. from grass roots to bedrock, when only the lowermost gravel had to be washed. Chinese and Koreans working in Siberia will opencut ground even poorer than this, so it is not probable that great volumes of richer ground will be found where mining has been carried on for any length of time.

Until 1911 there had never been a good dredge in the Russian Empire. The installation of small dredges of poor design and weak construction has resulted in lost time, heavy repair expense and failure, where success would probably have been attained with large, powerful, well designed machines. One of the most potent factors in a generally poor design has been the ignoring of the necessity for securing as long a working season as possible. All the Russian dredging fields are situated where the winters are long and cold. Until the first American dredge was installed in Siberia, in 1911, with a design evolved from the practice in the Klondike, there were no Russian dredges possessing special modifications to permit working in cold weather. As a result, about 25% of the possible dredging time has been wasted each year. This has had an important influence, for successful dredging, like other large operations on low-grade material, must be carried on nearly continuously.

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A third season for failure has been the lack of predetermining dredging conditions and content of bedrock gravel. Many dredges have been installed without one drill hole or pit having been put down to bedrock. Sufficient allowance for surface concentration has not been made, and the mistake of assuming rich bedrock content because rich material was found on the surface of stream gravels is still being made.

Payment of Excessive Royalties

Another reason has been the application to dredging of a leasing arrangement suitable only for one-man undertakings. Several dredges are now working on leased ground and pay a royalty based on the gross weight of the gold saved. This is called poodage and is expressed in roubles per pood, or, in other words, in money per unit of weight. It leads to complications.

It is a hardship for a company working low-grade material, where the difference between product and expenses is small, to pay royalty based on gross output; it is also difficult when this royalty is based on money per unit of weight, for the fineness of gold varies greatly. A pood (36.11 lb.) of pure gold is worth about $10,886.58, or Rs. 21,160.20. A poodage of Rs. 1000 means, therefore, at least 5% of the content, for dredging gold in Russia is never worth Rs. 20,000 per pood, but more frequently about Rs. 15,000 per pood. Some dredges are paying a poodage of Rs. 1500, or about 10% of the worth of the gross output. The object of the dredgemen working on poodage, of course, is to save the gold in as pure condition as possible. This is one reason for not using mercury and necessarily results in the loss of fine gold from the tables.

Yenesei River Region

The Yenesei River, rising in Central Asia and flowing north into the Arctic Ocean, is one of the several largest Siberian rivers. Its tributaries, from its source almost to its mouth, are auriferous. Only one dredge is working on the upper or southern watershed of the Yenesei. This has 5-cu.ft., close-connected buckets of Russian build and American type. The ground is shallow, contains about 25c. per cu.yd., and the working cost is about 10c. per cu. yd. Only a small area has been prospected ahead of this dredge and its success is therefore problematic.

On the lower Yenesei, north of the Trans-Siberian R.R., about 35 dredges are operating with poor results. Most of these dredges have small buckets, are of faulty design and weak construction. The ground contains about 10 to 15c. per cu.yd. and with working costs of 8 to 14c. per cu.yd., there is little or no profit. Dredging conditions, except for the short working season, are generally favorable. The gravel is of medium depth, rests on generally soft bedrock, has a few large boulders, little clay and no cemented material. It is possible that success may yet be attained in the Yenesei, but it can only result from reorganizing the tottering companies, scrapping all the old dredges and beginning on a new and large scale with powerful dredges, central-power stations, control and repair shops.

One of the greatest drawbacks to progress in Russia is the inability of the people to do "team work" on a large scale. For instance, when a dredging company desires to operate on a large plan, it secures many small dredges of different size, each having an independent organization and management. Each has its steam-power plant, with all the consequent expense and lost time. Centralized electric-power generation has not been attempted. Dredges of the same size and with interchangeable parts reduce greatly the capital tied up in spare parts especially where the dredging fields are so remote from sources of supplies.

In the Lena River region dredging is just beginning and three dredges are being installed on the watershed. These are poorly designed and built, and are doomed to failure. As an example of poor design, 8 cu.-ft. buckets have 2½-in. pins and they must dig in rocky gravel that will be frozen in the early spring and late fall, conditions demanding the strongest construction. One of the handicaps of this region is its inaccessibility and it has cost nearly $100 per ton to transport the dredges from England to the dredging ground. Two of the dredges are being installed on ground unprospected except for a few

Platinum Dredge on Iss River, Ural Mountains

Demidoff Dredge
Note short stacker.

superficial pannings. From these so called tests rich gravel on hundreds of miles of rivers has been assumed to exist and to contain about 60c. per cu.yd. It is owing to this kind of work that so many dredges have failed in Siberia.

AMUR RIVER REGION

The upper Amur waters have produced much placer gold but there have been no successful dredges. One machine working in the bed of a tributary of the Zea River is having a difficult career. Almost all the gravel, except that in the beds of the rivers, is frozen perpetually and is too low-grade to permit steam thawing. The Nerchinsk cabinet lands of the Emperor of Russia, situated on the upper Amur, have produced over $100.000.000 worth of gold, but all from material that could not be dredged, and no dredging ground is left there. The lower Amur has three dredges at work. One, the Oodeel dredge, built in Finland from home-made plans, is a failure. It is working in ground that is rich but difficult because of clay. The rich area is small and a short existence is certain.

BOW GANTRY, DEMIDOFF DREDGE

Two inferior dredges are operating on the watershed of the Amgoon River, a tributary to the Amur. These dredges are working the bed and banks of the Gongren River, on a pay channel about 240 ft. wide in loose, clean gravel about 20 ft. deep, which resting on a soft slate bedrock and contains about 50c. per cu.yd. The larger dredge has 7½-cu.ft. buckets, weighing about 800 lb. each, and having 2¼-in. bucket pins. The rest of the dredge is on a par. As a result, it works only 1200 to 1400 cu.yd. per 24 hr. The channel being worked has probably been enriched locally and the dredges will probably soon get into unprofitable ground.

KOLCHAN DREDGES

These are, perhaps, the most interesting of the dredges recently installed in Russia. One was the first American gold dredge built with a steel hull and also the first American-built dredge erected in Siberia. It has 7½-cu. ft., close-connected buckets, that dig about 25 ft. below water level. It was installed on an old mine that had been worked partially by opencutting, with a cost of about 50c. per cu.yd., by hand. The gravel, because of clay content, had not been washed thoroughly and some gold had been left in the tailings, although the washing plants had trommels to disintegrate the clayey materials. About 40,000 cu.yd. of oversize from a trommel were worked with a drag-line excavator, dumping into a plain sluice set on a 5% grade, and using longitudinal poles and steel rails for riffles. About 50c. per cu.yd. were recovered. This shows the poor work done by the trommels.

Most of the ground worked so far had already been mined by opencutting and conditions for dredging were difficult. The dredge was operated among irregular piles of tailings and old workings, containing heavy timbers, old railroad iron, machine parts and other scrap. A working cost of less than 10c. per cu.yd. has been obtained, using electric power generated at a steam plant about 10 miles from the dredge. The total cost, including administration, winter expenses, London office expenses, etc., was about 28c. per cu.yd. These figures show well the difficulty of operating one dredge in a foreign country with imported labor and a short working season. It demonstrates emphatically that a successful one-dredge business must have unusually rich gravel.

It is interesting to compare the work of the 7½-cu. ft. bucket dredge, of New Zealand type, operating in the Amagoon region, under similar climatic conditions. This dredge, with the same size buckets, though excavating easy gravel, worked only one-half as much as the American dredge. Thus, the American dredge, though working under difficult conditions, dug twice the amount that the New Zealand type did under ideal conditions. With positions reversed it is probable that the American dredge would have handled from 3500 to 5000 cu.yd. per day and that the New Zealand dredge would have broken down completely.

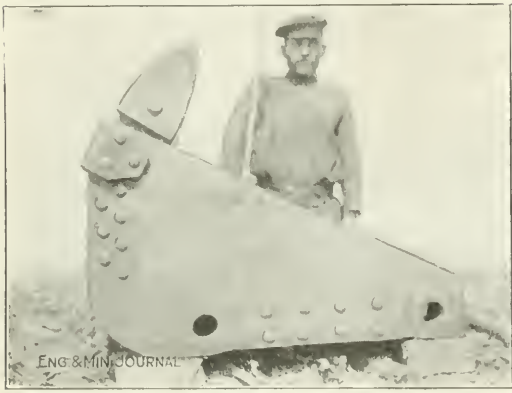
MINING DEVELOPMENT SLOW

Little pioneer work in the engineering and mechanics of mining has been done in the Russian Empire. One learns rather how not to do things by studying Russian mining methods and machines. For instance, it is useless to study drift-gravel in Siberia where, with labor at less than $1 per day and supplies in proportion, it costs about $8 to $9 per cu.yd. to work unfrozen gravel that needs no blasting. The cost is said to be $6 per cu.yd. but it is actually one-third to one-half more, due to working actually from one-quarter to one-third less than claimed. In other words, it costs more per unit of volume with more than 7000 men picking ground, than to work many vein mines where rock must be drilled, blasted and milled. Further, in Russia the work costs about three times as much as mining perpetually frozen ground in Alaska, where the cost of labor and supplies is six times that in Siberia. With proper management of well designed and constructed dredges the working costs, in parts of Siberia, would be at least one-half these at present.

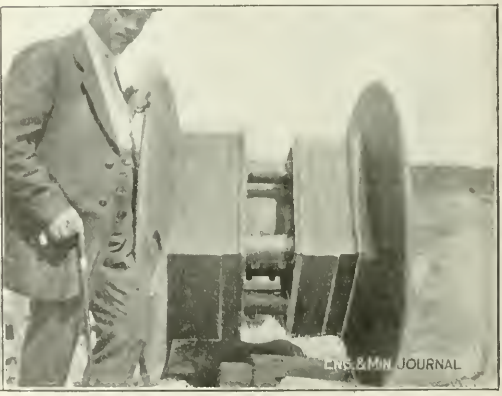
DISINTEGRATING CLAY

However, Russia has contributed to mining methods in having been compelled to attempt the solution of a difficult problem, that of dredging extremely clayey gravel. The alluvions of the Ural Mountains generally contain much clay, intimately mixed with the auriferous and platiniferous gravel. When mining began there, in the 18th century, it was found necessary to disintegrate the gravel, so as to liberate the valuable content from the cohesive clayey lumps and particles. This was done first in small operations, as it often is still, by raking the gravel by hand back and forth over a perforated iron plate. Later, a mechanical device for raking and hoeing gravel in a semi-cylindrical trough was tried. This was found to be slow, unsatisfactory, wasteful of power and costly in upkeep, although it is still used in some mines. Later, the "chasha" was evolved. This resembles an arrastre but has a stirring and not a crushing action. It has 8 to 10 arms, is 4 to 5 ft. long and rotates about 20 to 30 r.p.m., giving the arms a peripheral speed of from 500 to 925 ft. per min. This gives a rapid and effective stirring motion to the finger-like projections dragging through the gravel. The bottom of the chasha has perforated cast-iron plates with ¼- to 1½-in. round holes. This device is used generally where clayey gravel is found.

Its operation is as follows: Gravel up to 10 in. in diameter is dumped or sluiced into it intermittently and stirred until it is thought to be well disintegrated, water, in the meantime, being poured in from the top, or run through the sluice. The fine material that falls through the bottom is run over tables. The oversize falls out on opening one of the bottom plates. There are, therefore, both intermittent feed and discharge, and in this respect the chasha is a poor machine. It does good work as a disintegrator and when improved with a constant feed and discharge, it will be an excellent machine.



Grab Hook for Tearing up Bedrock, Demidoff Dredge



Lower Tumbler, Demidoff Dredge

Chashas Poorly Built

The construction of the shasha is usually poor, however, some of them having no iron in their construction, except the bottom plates. In many parts of Siberia, chashas are used with all the moving parts made of wood, driven by wooden, overshot waterwheels, through wooden gears, shafts and boxes. Eventually the chasha principle will be adopted, and proper structural materials used. With such a machine having constant feed and discharge, and a water-supply under pressure from nozzles or spray pipes, clayey gravel will no longer be dreaded in any kind of placer mining.

The Pokrovsky dredge has a machine incorporating the log-washing principle, for disintegrating clay. It consists of a strong, hollow, cast-steel shaft, about 15 ft. long, rotating in a semi-cylindrical trough. Arms are bolted helically to this shaft and beat and stir the clayey gravel, as it is sluiced, with a small amount of water through the trough. The helical arrangement of the arms tends to advance the gravel to the discharge end. This machine has continuous feed and discharge but it does not do as clean work as the chasha and it cannot handle such large boulders. The latter wedge between the beaters and the sides of the trough and do damage. The chasha, when properly built, can handle 18-in. boulders without wedging or damage. The clay disintegrator of the future will be an improved chasha rather than an improved log-washer. On dredges, particularly, several chashas, in series, would be superior to a log-washer, for the chashas can be introduced without any modifications of dredge design, other than substituting them for the trommel. As the log-washer needs a revolving screen between it and the hopper, to take out boulders larger than 1 in. diameter, and another screen below it to screen the material before passing it over the tables, its use requires a long dredge. Also there must be a high bucket discharge to get the material from screen to log-washer to trommel. These features necessitate a long and wide hull. The Pokrovsky dredge which has 3½-cu.ft. buckets and digs to a 25-ft. depth, has a hull about 20 ft. longer, and a bucket discharge about 5 ft. higher than would be necessary with chashas on a dredge of similar digging depth and buckets.

Bucket-Emptying Devices

Another need developed in Russia is a device for removing sticky gravel from dredge buckets. Sticky gravel would not fall out of the buckets, as they rounded the upper tumbler, in time to fall into the hopper and frequently buckets would not discharge at all, but would retain the clayey gravel packed in them until dug out, which had to be done several times per day. On some dredges there is now used an automatic arrangement of weighted levers and cranks, with a projecting finger which enters into each dredge bucket as it rounds the upper tumbler. This finger is pushed into the bucket by weights supported on the opposite end of the lever, and loosens the material adhering to the hood of the bucket. Clayey material is generally packed against the hoods of the buckets and a slight loosening effort will cause complete discharge. In case the projecting finger encounters a large boulder or piece of wood, it can be pushed back and will swing clear without doing any damage. After loosening adhesive material in one bucket, the finger slips out, as the bucket rounds the upper tumbler, and is raised by the counterweights to engage the next bucket. This device has been used only with open-connected buckets, but it is likely that a similar one can be designed for close-connected buckets.

Ural Mountain Region

This is the most important dredging field in Russia. It begins about 30 miles south of Ekaterinburg, and extends to about 300 miles north of that city. The dredging areas are situated in the beds and along the banks of present rivers; and no bench or terrace gravels are being worked. The alluvion consists of detritus from the erosion of crystalline schists, limestone, granite and other rocks containing much feldspar, through a considerable period and without any great or rapid upheaval or subsidence. The deposition of the gravels has continued without any rearrangement from earth movements. As a result, clay in considerable quantity is found everywhere in the gravel section, from the uppermost layer of overburden to the bedrock. Pay-streaks seem to have a marked lateral concentration in constricted channels, and a vertical concentration close to the soft bedrocks. Only the bottom-most gravel is profitable to work. In fact, in many places more than nine-tenths of the gravel section is quite barren. This condition has an advantage, not fully appreciated in Russia. It is really unnecessary to wash the top gravel and with properly designed dredges, it could be quite cheaply and rapidly wasted as is done in other dredging fields. Large boulders and buried timbers are not often encountered and cemented gravel is not found.

The gravels are shallow, seldom more than 30 ft. deep, there is usually plenty of water to float dredges. The Perm Ry., with its branches, serves the dredging fields well, but the transport of heavy machinery by Russian horse-hauling methods is slow and expensive. To haul 5-ton pieces costs four times as much per ton as for stuff that can be loaded on one-horse wagons, and it requires about twice as many animals per unit of weight to haul the heavy as compared with the light parts. This is due not so much to the roads, which are often wide, hard and level, as to the mediæval method of hitching the horses and to the absolute ignorance of the Russian teamster about the handling of horses when hauling heavy loads.

Short Working Seasons

The climate is severe and the working season, with the Russian dredges, is only about six months per year. It is quite possible that with proper design and construction the working season in normal years could be lengthened to eight or 10 months. While there is no perpetually frozen ground, seasonal frost sometimes penetrates 5 ft. below the surface in places where snowfall is light. The topography of the Ural region is not rugged and sharp as is frequently supposed. Much of the dredging ground is less than 2000 ft. above the sea level. The topography is not favorable to hydro-electric installations and none of the dredges is run by hydro-electric power. Wood, costing about $5 per cord, or peat, which is often cheaper, are burned. Labor is plentiful and cheap, common labor costing from 25 to 35c. per day. Skilled labor ranges from 50 to 75c. per day and women are often employed at 25c. per day. Supplies are proportionately cheap.

Dredges in the Ural Region

There are about 40 dredges at work in the Ural region. More than one-half of them are working on platinum-bearing material, although some are working where no platinum exists. There are a few dredges recovering less than 1% gold with the platinum. With the platinum are found the other associated metals, iridium, osmium and palladium.

Stripping by Hand in Winter

The future of dredging in the Urals will be for the recovery of platinum, as the gold placers have been almost exhausted by hand labor. Gold was discovered in the Urals about 200 years ago and the gold placers have been worked intensively ever since. Opencutting was generally practiced; as a result, the ground was thoroughly worked and no pillars were left and little ground was lost. The old tailings piles and ground adjacent to the old opencuts, have been reworked. The Ural peasant has no work in winter, so he takes his whole family and works at the old placers. As his time is valueless, in winter, he is content with a small amount of gold. This has been going on for many winters and little is left for the gold dredge.

The richest platinum placers have likewise been exhausted but there are extensive areas of platiniferous ground, that, until the last few years, could not be worked profitably, but which are now valuable with the increased price of this metal. These areas are now controlled by large companies, which are reserving these areas for exploitation by dredging.

Platinum Dredges

About 25 dredges are working platinum placers in the Urals and they are doing bad and expensive work. This is due to unsuitable design, faulty construction and amateurish manipulation. For example, one company has six dredges working in one valley, and these are good examples of what dredges should not be. They have 8-cu.

ft., open-connected buckets with $2\frac{1}{8}$-in. pins, and all the parts are proportionately weak. Screens are too small and too short, stackers are too short, and, with ground only 14 ft. deep, the ladders have a digging depth of 40 ft. The reason for this follows:

The valley has a fall of from 50 to 100 ft. to the mile. It was thought the dredges could not work up that grade, so dams 40 ft. high have been constructed behind each dredge, raising the water high enough to allow the ground allotted to each dredge to be worked out. The dams also permit working the low, bench deposits on the banks. Dredges are worked up steeper grades in other fields without the use of such dams and such long ladders. Each of these dredges employs 39 men per day.

The yearly production from these six dredges is worth, at the present price of platinum, about $1,620,000, or about $270,000 per dredge, each working about 150 days per year and producing $1800 worth of platinum per day from 1000 cu.yd. The total cost per cu.yd. is about 8c. With such rich returns, it seems unpardonable that so little is being done for the advancement of dredging, for this company could well afford to solve its serious clay problem. Probably from 15 to 25% of the total platinum content is lost by incomplete disintegration and faulty manipulation of the dredges.

Important deposits of platiniferous gravels are situated as terraces, and in the flat slopes between the terraces and the present stream beds. The operators think that dredges cannot be worked on these terraces and flat slopes, and plan to work them by hand or with dry excavators. Such work will cost much more than it now costs to dredge in the Urals and from four to five times what it would cost if the dredges were properly designed, constructed and operated. In general, dredging in the Urals is as inferior to that in other countries, as drift mining in the Lena region, where the working cost is $8 to $9 per cu.yd. for gravel that can be mined by pick, is inferior to drift mining elsewhere.

Advance Stripping

The Ural region is one of great vertical concentration and probably more than 90% of the metallic content is in the $2\frac{1}{2}$ to $3\frac{1}{2}$ ft. of gravel on the bedrock, and in the bedrock itself. No advantage has been taken of this in dredging, although the dredge operators, in several instances, are stripping for opencutting, where the top material is hand-shoveled into horse carts, only the bottom pay gravel being washed. But with the dredges all the barren and clayey top material is washed. It is strange that it has not occurred to them to strip with the dredge. The capacity of the dredges, when stripping, is two or three times as great as when washing, and there is also the great advantage of keeping "sluice-robber" clay off the tables. A dredge costing no more than the ones now being used can be designed for the Ural region, that can handle twice the material at one-half the working cost and effect a greater saving. At present, gravel, rich in platinum, is being wasted in great quantities, and the operators realize this, for they say they intend to rework all the tailings.

Hand Stripping

At one operation, where there is a heavy clay overburden, about 10 ft. of stripping is done by hand, ahead of the dredge, and in an interesting and cheap manner. In winter the material is stripped from a vertical face about 10 ft. high. Shallow cuts, 5 ft. apart, 8 to 10 in. deep and 4 in. wide, are made with a pick on these faces, and are filled with straw to prevent the bottoms freezing. When the surface has frozen to a depth of 6 to 10 in., which takes about a day, the frozen face of the block between two of the cuts is broken off in large slabs with wedges. These slabs are hauled on low, one-horse sleighs, to a waste dump, either to the side, or to the tailing pile behind the dredge. This is accomplished with a minimum of handling.

When the frozen face has been wedged off, the process is repeated. With a face several hundred feet wide, freezing progresses fast enough to permit the stripping of all the pay gravel that the dredge can work in the following summer. The cost of such work is less than 6c. per cu.yd., the contract price, and probably under 5c. per cu.yd. The dredging cost for subsequently working the pay gravel underneath was 9c. per cu.yd.

Conclusions

The future for dredging in the Russian Empire is not bright, except in the platiniferous region. The latter is small and well known, and no great expansion can be expected. The cream of the gold-placer ground has been exhausted by open cutting with hand labor and the skim milk is not good enough for profitable dredging. The watersheds of the Ob, Yenesei, Lena and Amur Rivers have been investigated thoroughly and no areas of great size or richness are likely to be found. Russia is gradually pushing its frontier south for its great length along the Chinese Empire, and into a region that produced much gold in prehistoric times. Mongolia is known to have rich placers that have been overlooked by the native miners. Whether this region has dredging possibilities is problematic, although rich deposits of other metals are not unlikely. Frozen ground is found in Mongolia at a latitude of 50° N., a serious handicap. The lack of railways will also be an obstacle for some time.

The Anadyr region, opposite Seward Peninsula, Alaska, contains gold placers, but the Russian Government interferes with the opening of this district instead of welcoming it. However, no great addition to the dredging fields of the world can be anticipated here. Conditions are more difficult than at Nome and the deposits do not seem as rich and extensive. There is a large region along the Arctic Ocean that has been quite unexplored. It is possible that placers may be found here but a condition of perpetual freezing is probably a hopeless obstacle to dredging.

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Tungsten Ore in Siam

A report from Vice-Consul General C. C. Hansen at Bangkok says that mining for tungsten ore in Siam is a new development. According to a recent state report, this mineral had been known to the Chinese tin miners for a long time as "dead ore" but its commercial value was unknown until some of the ore was taken to Singapore for analysis, and this black mineral was found to be wolfram and to have a workable value.

The richest deposits of wolfram were found in Nakon Sri Tamarat on the east coast of the Siamese portion of the Malay Peninsula. Here the wolfram ore had been left in great heaps as valueless material after having been separated from the tin ore by the Chinese miners. The amount of wolfram recovered during the fiscal year 1912-

13 was 309 tons, against 119 tons for the previous year.

Not long ago a European company started working for wolfram in Koh Samui, an island near Nakon Sri Tamarat, but the experiment was not successful and the works have now been abandoned. Wolfram in moderate quantities has also been found at Puket on the west coast of the Siamese Malay Peninsula, and this mineral is said to be quite widely distributed throughout the peninsula.

Griggs, Castleton & Carter Cyanide Mill

By George T. Castleton*

This mill was erected in 1913, at Eureka, Utah, in the Tintic mining district, to leach the tailings from the concentrator owned by the May Day Mining & Milling Co. The ore was an oxidized lead-silver mixture with a little gold; the gangue was quartz and limestone. The jig tailings, originally coarser than the fines and slimes from the tables, were dumped with the fines, and the entire mass is handled without regrinding.

The general arrangement of the plant is shown in the accompanying illustrations. It will be noticed that the tanks are placed higher than the tailings dump, and this is to obtain room for the treated tailings, none being available below the dump. This necessitated hoisting the tailings to the tanks, for which purpose a 15-hp. electric hoist is used. An electric motor of 2 hp. is also used to run a rotary pump for the solutions.

Griggs, Castleton & Carter Cyanide Plant, Eureka, Utah

Old May Day Mill in the background

One tank of 250 tons capacity was installed for leaching. A partition was placed across this tank making two, each with a capacity of 125 tons. By loading one tank one day, unloading the second the second day, loading the second tank the third day, followed by unloading the first tank the fourth day, the operation of the plant is continuous, and it has a capacity of 62½ tons per day. At this capacity, the ore has 60 hr. leaching, including washing and draining. The first solution contains 3½ lb. cyanide per ton. The lime is placed in a box, and the solution is used to slack the lime as it is added to the tailings. The solution is built up by running through the lime box, to carry from 2½ to 2.7 lb. lime per ton of solution, and the way of adding has proved satisfactory. The lime box is placed at the side of the tank above the ore. Precipitation is on zinc shavings, which cost in this market $14 per cwt. The shavings are of satisfactory quality.

The slimes in the tailings dump are loosened by drawing a harrow over them. Then they are allowed to dry, after which the dry slimes are skimmed off with a scraper This operation is repeated as often as the thin, loose layer dries.

Leaching Tanks on the May Day Dump

Lime box shown over tanks

In the following table of costs, it will be well to note that while the labor costs appear to be high, they include a team used on the dump for scraping, which costs $6 per day. The costs include the payroll, labor being paid at the rate of $3.25 to $4 per 8 hr. In addition to hiring a team, the company also owns a horse used on the small drag scraper.

GRIGGS, CASTLETON & CARTER CYANIDE PLANT
Costs for 1913

	Per Ton
Lime	$0.017
Labor	0.463
Superintendence	0.084
Stable account	0.009
Water	0.013
Cyanide	0.227
Zinc	0.025
Mill-site rental	0.008
Power (electric)	0.024
Miscellaneous expenses	0.0195
Total	$0.8895

"The Mineral Industry"

The 22nd annual volume of "The Mineral Industry."[1] appears under a new editorship, G. A. Roush, assistant professor in the Department of Metallurgy, at Lehigh University, being the present editor. The plan of the volume remains the same as in recent years and, in general, the system of treatment for each subject is the same as formerly, but there is a galaxy of new contributors, which has much refreshed the appearance of the work and conferred upon it a certain interest of novelty.

The real value of a volume of this kind can be determined only by actual use in the office, library and laboratory. The preliminary examination of the 22nd volume, which is all that we have yet been able to give, is satisfactory. We think that the statistics might have been brought a little more up to date, and there is not always the best discrimination among authorities on statistical and technical subjects.

However, it is not expected by anybody, not even by the editor himself, that this great volume of 1000 pages can be prepared without any flaws. As a whole, it is an excellent and valuable compilation. The present volume well maintains the usefulness, reliability and prestige of its predecessors.

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*Eureka, Utah.

[1] The Mineral Industry Its Statistics, Technology and Trade during 1913 Edited by G A Roush 6x9, [illegible] 1010, illus.; $10. McGraw-Hill Book Co., New York.

Modern American Rock Drills--V

By L. O. Kellogg

SYNOPSIS—Variations in design of stoping drills with telescope air-feed. The only American machine with automatic rotation is that made by McKiernan-Terry. The Ingersoll-Rand Imperial is an example of the valveless type of hammer drill.

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Apart from the differences in their valve action, the most striking differences in the stoping drills lie in the telescope feed; this may be either of the "ordinary" or the "reverse" type. In the ordinary feed there is a cylinder fastened to the back of the drilling cylinder, and a plunger or piston works in this, having a point in the end, which bears against the ground. The cylinder is usually called the outer tube and the piston, the inner tube. In the reverse feed, the plunger is fastened to the drilling cylinder, and the feed cylinder is stationary. The latter type is heavier, but offers the advantage that the hose connection need not be swung with the drilling cylinder when this is rotated, since in this case the air is admitted to the feed cylinder. Furthermore, if the machine is to be mounted on a bar as a "drifter," the reverse feed is almost essential; since in this case the feed cylinder has to be clamped rigid.

The stoper consists of a drilling cylinder more or less closed by front and back heads. The front head may be a part of the cylinder, especially in the valveless type. Through bolts may be used to hold these parts together, or separate pairs of short bolts may be used for the front head and the back head. The through bolts, and the short bolts on the front head, work against helical springs. The front head may itself receive the drill-steel shank, or a separate bushing may be used. The anvil block works for the most part in the front head. The striking hammer is sometimes symmetrical and sometimes not; it is always unsymmetrical in the case of the valveless drills and in the rotating model, having a forward-projecting smaller portion.

The feed cylinder or plunger is fastened to the drilling cylinder in different ways. The joints between the plunger and the walls of its cylinder are kept tight by packing of one kind or another. A catch of some kind must be used to hold the plunger and cylinder together when the machine is being carried about. The end of the cylinder or plunger which bears on the ground is equipped with a metal point of some shape, called, usually, a spud.

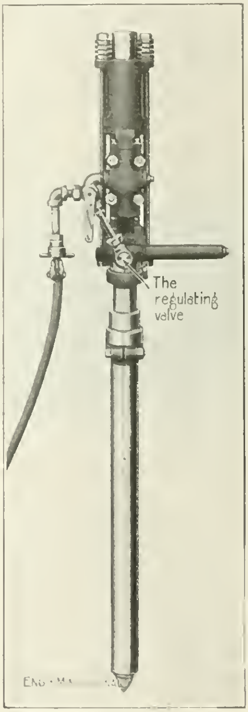
The throttle, control or air-supply valve may be built into the machine or may be separate and set in the hose connection. It is usually arranged so as to have at least four principal positions; in one of these, air is shut off; in another it is admitted to the feed cylinder only; in a third, it is admitted to the drilling cylinder so as to strike a light blow; and in a fourth a supply for full drilling speed is furnished.

When cross bits are used, as they most commonly are on stopers, it is necessary to rotate the bits continuously through at least 90° while drilling, so as to keep the hole round. This is done by rotating the whole drilling cylinder, and for this purpose a handle is attached to some part of the cylinder, usually near the back head, so as to project at right angles. The end of this handle may or may not be bent back at right angles, but ought always so to be as a safety precaution.

Special features of the several machines will be described in more detail.

McKiernan-Terry Automatically Rotating Stoper

The McKiernan-Terry Drill Co. put upon the American market the first and so far the only automatically rotating stoping machine. This stoper is actuated by a spool valve, has a ratchet mechanism in the back, and is normally fitted with a reverse telescope feed. A novel attachment is a valve for varying the pressure in the telescope feed.

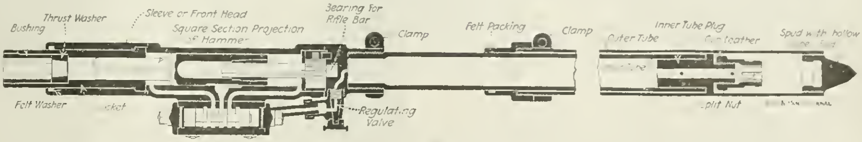


McKiernan-Terry Rotating Stoper

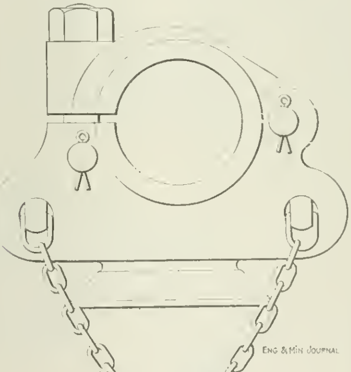
The four-spool valve is mounted in a valve chest in the center of the cylinder. It is thrown by differential pressure and its operation involves no new principles.

The hollow hammer contains a bronze rifle nut sliding on a rifle bar, in the same way that the rotation is arranged in a piston machine. The ratchet nut turns with the rifle bar, and is controlled in the direction of rotation by four pawls, held by springs in the ratchet ring. The back end of the rifle bar forms an additional bearing. On the front end of the hammer piston is a projection having a square cross-section. This fits loosely in the socket, which is thus forced to revolve with the hammer piston. Sufficient air passes the projection into the socket and thence into the drill steel, to clean the cuttings from the hole. A bushing is screwed into the front of the socket, and brings what is called a thrust washer to bear between the bushing itself and a shoulder on the inside of the socket. The bushing has normally a hexagonal cross-section inside to take the hexagonal steel. The thrust washer has a conical hole and the shank of the drill steel is also coned to fit the thrust washer through which the drill shank projects for about half an inch to receive the blow from the hammer piston. Thus the use of either an anvil block or of collars on the steel is done away with. Housing the socket, but permitting it to extend somewhat, is a sleeve, really the front head. The drill is assembled by means of two side rods which extend through from the back head to the forward end of the drill. Helical springs are interposed between the nuts on the side rods and the lugs on the front head. Within this sleeve or front head and at its lower end is a groove to receive a felt washer which rests against the socket and prevents the escape of oil from the drill or the admission of cuttings.

The air supply is controlled by a three-way valve attached to the valve chest with a connection to the regulating valve of the telescope feed. Air passes first through the connection and regulating valve to the telescope feed and by a further movement of the valve control, air is admitted to the valve chest. The air supply to the telescope feed, as heretofore stated, is further controlled by a novel regulating valve enabling the pressure in the air-feed cylinder to be regulated from full pressure to zero at will. This is an ingenious device, by means of which variable pressures can be compensated for. It is common to find one mine using air at 100 lb. pressure, and another as low as 80 lb., thus making considerable difference as the area of the piston needed in the air feed. Furthermore the character of the ground being drilled is continually changing, requiring a change in the feed pressure for best efficiency. This is made possible by this valve. The operation of the valve is such that at first the air supply is gradually throttled to the proper working pressure in the air feed and by a further movement there is set up an escape or exhaust, which reduces the pressure to conform with any condition that may arise.



LONGITUDINAL SECTION OF THE MCKIERNAN-TERRY AUTOMATICALLY ROTATING STOPER



CLAMPING DEVICE FOR REVERSE TELESCOPIC FEED OF MCKIERNAN-TERRY ROTARY STOPER

The air entering the inner tube of the telescope feed, passes on down through it, and exerting pressure against the closed end of the outer tube, forces the inner tube out, and holds the machine against the rock. A plug is screwed into the lower end of the inner tube, and a cap or lock-nut over this, holds a cup leather in position. The cup leather expanded against the outer tube makes the joint tight. The end of the lock-nut is split, and this is gripped by the hollowed upper end of the spud, which is screwed into the end of the outer tube. The spring of this split plug against the collar of the spud is sufficient to keep the feed from extending by itself. The top of the outer tube is closed with a screwed collar. A felt packing ring fitted in a groove in this collar and bearing against the inner tube, prevents dust from entering the telescope feed. The back head and inner tube are also screwed together and locked with a clamp.

The short handle provided is not for rotation, but merely to facilitate the handling of the machine. This handle, however, is utilized for lubrication. It is hollow and is packed with fibrous material. The outer end is closed with a plug; the inner end of the cavity connects with the cylinder. By removing the plug, the cavity may be filled with oil and when the drill is in operation, a small quantity of oil will be induced to flow to the cylinder by the pulsation of the drill.

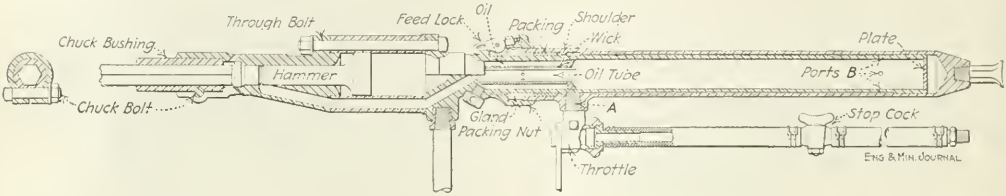
This stoper is particularly designed for mounting on a bar or column and for this purpose an ingenious clamp is provided which deserves special mention. In changing long steel, it may become difficult to force the steel past the machine even when the latter is run back to the limit. This can be overcome by revolving the machine with the clamping device as a pivot, but this requires time and care to bring it back to exact line upon resuming drilling. In this clamp, not only is the top hinged so that by swinging down and bolting, the telescope tube is held securely, but also the whole upper part of the clamp is hinged, so that it will swing up and over to one side, carrying the machine with it. When the new steel is in place, the machine is swung back to exactly the same position again and there is no time lost in getting lined up. This is effected by knocking out and inserting one pin in the lower part of the clamping device.

The stoper has a stroke of $3\frac{5}{8}$ in., a cylinder diameter of 2 in., a feed of 21 in., an overall length of 63 in., and a weight of 100 lb.

THE INGERSOLL-RAND IMPERIAL VALVELESS

The Ingersoll-Rand Co. makes a valveless stoping machine, the Imperial type; it is valveless in that it contains no moving parts which govern the reciprocations of the hammer other than the hammer itself. The machine is usually equipped with a reverse telescope feed, i.e., the cylinder of the feed remains stationary as the machine moves up.

In Diagram 1, the piston is shown at the beginning of a back stroke. The air under pressure enters at the port A and is carried to the front of the small portion of the hammer, which is under the full air pressure at all times. There is no pressure back of the piston, and through the port *B* there is free exhaust to the atmosphere. The piston is thus forced back until the small portion uncovers the port *E* of Diagram II. Through this and the passage *F*, live air is now conveyed to the back of the hammer. Since the area here is larger than at the front end, the movement of the hammer is checked and it starts forward on a striking blow. When in moving forward it passes the port *E*, air is shut off behind and motion is continued from the force of inertia and the expansion of the air, until the piston strikes the anvil block.



Longitudinal Section of Imperial Valveless Stoper

The exhaust port *H* serves to remove the air from in front of the piston until it is covered, when the entrapped air acts as a cushion to the blow; thus the piston cannot strike the front head even when there is no steel in the chuck. It should be noted that the large end of the hammer is concave. The ports *J* permit the escape of the slight amount of air leakage which takes place around the anvil block; the effect of this is to keep dirt and rock cuttings from working down into the machine.

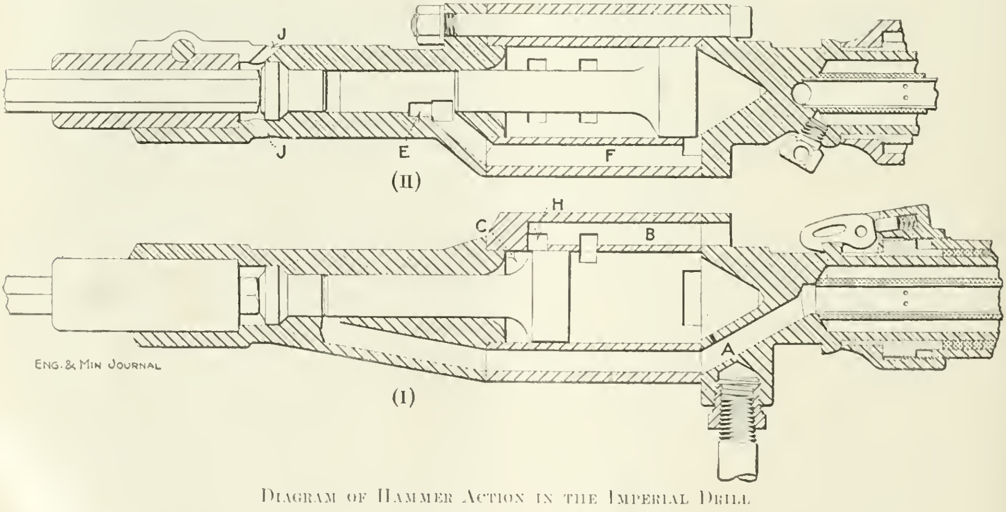


Diagram of Hammer Action in the Imperial Drill

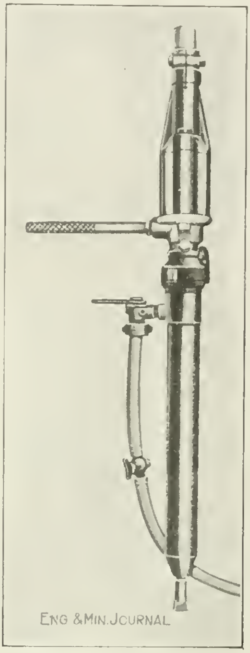
The end of the front head contains the chuck bushing. This is made of a section to accommodate any of the ordinary steel cross-sections. The bushing is held in position in the head by a bolt which engages a groove in the side of the bushing. The front head is slotted longitudinally for some distance back from its end, so that by drawing up the bolt tight, the bushing is bound against all movement.

The through bolts holding together the front head, cylinder and back head pass through holes in the cylinder walls.

The machine is shown equipped with a typical reverse telescope feed. In operation, all the air used by the machine is taken in at the opening *A* of the longitudinal section through the whole machine and passes down between the two tubes until it reaches the ports *B*, through which it enters the inner tube, and thence up to the drilling cylinder. The lower end of the inner tube is closed with a plate *C*. While the clearance between the lower end of the inner tube and the outer tube is so slight as to permit this end to act as a guide, it is sufficient to pass a portion of the compressed air to the bottom of the outer tube, where it exerts pressure against the plate *B* and forces out the inner tube so as to hold the drill steel against the rock. When the ports *B* pass under the shoulder on the outer tube, air is shut off from the hammer and the machine stops drilling.

Two other telescope feeds of the ordinary type are furnished with this machine. These differ from each other only in the fact that one carries an extensible spud to use when a greater length of drill is required. When these ordinary feeds are applied, the lubricator is placed in the handle, as it is in the case of the butterfly-valve stoper, the throttle valve is set in the handle, and the exhaust is carried some distance in a tube down parallel to the feed.

In the reverse type of feed, a bleeder in the throttle permits the exhaust of the air in the telescope so that the machine can be run back. The end of the outer tube is screwed into a packing nut which can be adjusted to keep the gland tight on the packing, and prevent leakage of air at that point. A hook or feed lock is provided to catch automatically over a shoulder in the inner tube whenever the telescope feed is closed. The spud is screwed into the end of the outer tube.



INGERSOLL-RAND IMPERIAL VALVELESS

Lubrication is effected by a device screwed into the upper end of the inner tube. It consists of an oil tube which forms part of the circuit of the drilling air on its way to the hammer. The space between the outside of this oil tube and the inner tube of the telescope feed acts as an oil chamber. It is filled through a plugged oil hole which can be seen in the outside view of the machine. The oil tube is perforated with a series of small holes and is surrounded by a cylindrical wick, such as is used in a Rochester-burner kerosene lamp. When the machine is running, the oil is held back by pressure; when it stops, and pressure is released, the oil oozes through the holes in the oil tube and accumulates until it is carried to the hammer when the air is turned on again. The wicking acts as a filter and keeps dirt out of the cylinder.

The throttle valve has a lever handle. It is arranged to give a closed position, a throttled-air drilling position, and a full-speed drilling position; between these points other speeds and pressures may be had. The connection to the hose consists of two short lengths of hose with a stopcock between them. This provides the double-valve control necessary to enable the machine to be disconnected without shutting off the air at the main pipe line. However, a simple single-length connection without stopcock is also furnished.

These Imperial type machines, MC-32, are made with hammer having diameters of $1\frac{3}{16}$ in. and $2\frac{1}{2}$ in., and a 4-in. stroke, the feed length is 20 in., the overall closed length 50 in., and the weight 65 pounds.

(To be continued)

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Indian Mineral Production, 1913

The mineral output of British India for 1913 included the following items: Coal, 15,486,318 long tons; mica, 2183; manganese ore, 637,391 long tons; rubies, sapphires and spinels, 278,706 carats; gold, 11,019 oz.; wolfram ore, 1376 long tons; and chromite, 3411 long tons as against six in 1912.

From the official report it would appear that India also produced iron, tin, galena and other minerals, but no idea can readily be obtained as to how much.

Mine-Rescue Car in California

By LEWIS H. EDDY*

U. S. Mine-Rescue Car No. 5, which entered California on Sept. 8 and began work at Grass Valley, was scheduled to complete the trip Oct. 29 at Kennett. The car goes from California direct to Billings, Mont., where it will make winter quarters. The itinerary of the car was laid out by H. M. Wolflin, mining engineer, and the operation of the car was directed by Edward Steidle, junior mining engineer, and George W. Riggs, first-aid instructor. The classes varied from four to 28 in rescue work and from 10 to 26 in first-aid work. There was a total of 62 men instructed in rescue work and 130 in first aid. At Grass Valley, the class in rescue work contained five, in first-aid work, 26; Nevada City, rescue work, four, first-aid, 10; at Jackson, rescue work, five, first-aid, 17; Jamestown, rescue work, five, first-aid, 11; Kennett, rescue work, five, first-aid, 15; Stanford University, rescue work, 10, first-aid, 26; University of California, rescue work, 28, first-aid, 25. Several mining engineers of San Francisco joined the Berkeley classes.

It was found that only two mines of those visited by the car were in possession of oxygen breathing apparatus. The North Star mine at Grass Valley has two sets; the Mammoth at Kennett has two sets. I believe that these four sets were the only ones in the state up to the time of the visit of the rescue car. There will be five sets put in by mines at Jackson and five sets by those at Jamestown.

The work taught during these visits of the rescue car attracted the attention of the mine operators, and many miners also took an interest in the proceedings. A total of about 1500 men attended the several lectures that were delivered on both rescue work and first-aid work. The operators of the various mines visited donated the time of the men engaged in the classes; that is, they allowed them full pay while they were employed in taking the lessons.

Messrs. Steidle and Riggs were formerly with car No. 6, and have endeavored to get the most practical method of training. Mr. Riggs arranges his classes in teams of five men each, designating one as captain and the team selecting one of the remaining four as a patient, the same student not being required to act as patient more than once during the demonstration. By this means all the men have an opportunity to take part in the actual demonstration of the first-aid work. Organization and discipline are insisted upon in both classes. At the mines the rescue work was carried on in every instance underground. Where demonstration in mine fires was given the end of a drift would be bulkheaded off and a fire of timbers made. When the air was reduced in oxygen to the point where a carbide lamp would not burn the men were sent in with the oxygen-breathing apparatus. In the thickest of smoke and injurious gases the men were able to work not only in extinguishing the fire, but in actual mining under the same conditions, including drilling and timbering and loading of cars. Of course, during the first day of the fire they were unable to do a great deal except explore, but at night when the smoke had passed out they proceeded to work under conditions that would be absolutely fatal to men not provided with the apparatus. The men were able to work at least two hours under such conditions, and when more than one team was being trained they alternated. The men were also drilled in the use of the life line and the horn signals. The instruction was under rules laid down by Mr. Paul, the chief mine-rescue engineer of the Bureau, and the apparatus is of the Bureau of Mines standard.

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*Associate editor, 3430 Peralta St., Oakland, Calif.

The visit of the car in California has created a great deal of interest and there will be a request for another visit next year. In fact, at the universities an effort will be made to secure annual visits of a mine-rescue car in order that students may have advantage of repeated training which will enable them to carry on permanent classes.

In addition to the work carried on by the car, A. A. Krogdahl visited points inaccessible to the car, and also visited points where the car had been and gave further instruction in first-aid work. During the time the car was in California, Mr. Krogdahl gave instruction to 150 men. He visited the mines along the Mother Lode from Plymouth to Shawmut, and assisted in the first-aid contest on Labor Day at Jackson. He visited Redding, French Gulch and Kennett in Shasta County; Weaverville, and the Globe Consolidated in Trinity County; and rejoined the car at Berkeley for comparison of methods with Riggs. While the car was concluding work at the University of California and visiting the Mammoth mine in Shasta County, Krogdahl went north into Plumas, Sierra Nevada and Placer Counties, visiting the Engles copper mine at Taylorville, and the Dairy Farm copper mine at Van Trent, near Sheridan, and mines at Sierra City, Allegheny, Pike, Nevada City and Grass Valley.

I have talked with producers, owners, miners and students regarding the value of this sort of training and they are for it seriously and earnestly. There is sufficient interest and enough work to keep a mine-rescue car employed in California, Nevada and Arizona, with headquarters at San Francisco. The relative geography of the three states is such that the car could be operated continuously and economically in this territory.

The American Iron & Steel Institute

The seventh general meeting of the institute was held at Birmingham, Ala., Oct. 29, with a large attendance. The morning session was opened by an address from President E. H. Gary, in which the leading topics were the necessity of fairness and coöperation among the leading business interests and the possibilities of future trade expansion. As to the condition of trade, Judge Gary said: "Without particularizing, it would seem safe to predict that in many important respects business conditions in the United States for the next three months will be better than they have been for the past three months. As to the long future, I don't hesitate to say with emphasis that the opportunities for progress and success in this country are greater than ever before."

At the morning session, the following papers were read and discussed: "The Use of Steam Turbines for Various Purposes," Frank G. Cutler, Birmingham, Ala. Discussed by Leif Lee, Karl Nibecker and Alexander L. Hoerr. "The Repair Department of a Modern Steel Plant," John Hulse, Pittsburgh. Discussed by Bertram D. Quarrie and Howard L. Bodwell. "The Use of Titaniferous Ores in the Blast Furnace," Frank E. Bachman, Port Henry, N. Y. Discussed by Arthur H. Lee and Richard H. Lee.

The afternoon session brought out the following papers: "The History of the Iron and Steel Industry in the South," James Bowron. Discussion by Hiram S. Chamberlain. "The Modern Development of the Iron and Steel Industry in the South," Thomas K. Glenn, Atlanta, Ga. Discussion by George W. Connors and M. P. Gentry Hillman. "Southern Foundry Pig Iron," James W. McQueen, Birmingham, Ala. Discussion by L. R. Lemoine and Paschal Shook.

The annual dinner of the Association was held at the Tutwiler Hotel in the evening, Judge Gary presiding. A number of speeches and short addresses were made by members.

On Oct. 30 and 31, visits were made to the furnaces, steel works and mills in Birmingham, Ensley and other places in the district.

Australasian Gold Production

Corrected official statements for the year 1913 bring the total gold production of the Commonwealth of Australia and New Zealand for that year up to 2,565,718 oz. fine; a decrease of 70,673 oz., or 2.7%, from 1912. The details of the production are given in the accompanying table, in which comparisons are made with the corrected statement for the previous year:

GOLD PRODUCTION OF AUSTRALASIA
(In fine ounces)

	1912	1913
Western Australia	1,282,658	1,314,043
Victoria	480,131	434,932
Queensland	347,946	265,735
New South Wales	165,295	149,657
Tasmania	37,973	33,400
South Australia	6,592	6,556
Northern Territory	5,000	3,11[illegible]
Territory of Papua	...	14,681
Commonwealth	2,325,595	2,222,123
New Zealand	310,796	345,595
Total, oz.	2,636,391	2,565,718
Total value	$54,494,202	$53,033,391

Western Australia and New Zealand showed increases, but all the other states had smaller output. The territory of Papua is reported separately for the first time.

The production for 10 years past has been as follows:

GOLD PRODUCTION OF AUSTRALASIA, 10 YEARS
(Value)

1904	$87,241,662	1909	$71,254,182
1905	85,970,779	1910	64,243,704
1906	82,358,207	1911	58,322,070
1907	75,849,349	1912	54,494,202
1908	73,314,671	1913	53,033,391

The decrease in the 10 years from this production of 1904 was $34,208,271, or 39.2%. The decrease has been continuous, being most marked in 1907, 1910 and 1911. In 1913 the movement was checked to some extent, the decrease from 1912 being only 2.7%. The reasons for the decline have been frequently discussed; there seems to be no present reason to expect a change in the course of production.

* * *

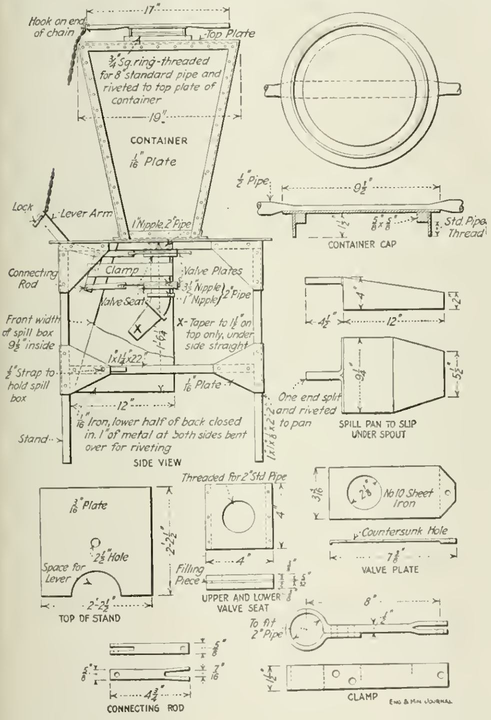
Free Distribution of the "Daily Consular and Trade Reports" ceased July 1, 1914. The Bureau of Foreign and Domestic Commerce of the Department of Commerce announces that the constantly increasing demands have been far in excess of the edition authorized by Congress for free distribution, and under this new plan, the charge, which is less than the cost of printing and paper, permits all firms and individuals who desire the publication to obtain it promptly. Many persons who were formerly unable to obtain the reports because of the limited edition fixed by law, now have the opportunity to subscribe and thus have access to the commercial information gathered by the Federal Government from all the countries of the world for the benefit of American business houses. Subscriptions are received by the Superintendent of Documents, Washington, D. C., at $2.50 per year for the reports mailed daily, and $6 per year for cloth-bound quarterly volumes, with index.

Details of Practical Mining

Carbide Container and Measurer

By E. W. R. Butcher*

With the introduction of carbide lamps, it has been found unsatisfactory to allow the miners to help themselves from the carbide cans. The Republic Iron & Steel Co. therefore furnishes each of its miners with a small can having a screw top which holds enough carbide to last one shift. These cans are filled from the carbide container, a drawing of which is shown herewith.



The Assembled Container and Details of Certain Parts

By means of the valves, one motion of the lever arm, up or down, gives out just enough carbide to fill a miner's can. The spill pan is used to catch any carbide which falls. Since the container has been in use, the carbide consumption has been reduced nearly one-half.

A screw top with a 1/2-in. pipe for a lever handle is provided on the top of the container. The carbide issues from the container bottom through a 2-in. pipe connection. In this connection are set two valves, each consisting of a seat and a plate, in both of which are 2 1/8-in. holes. The plate slides over the seat, and when the holes register, the valve is open and carbide can pass. When the holes do not overlap at all, the valve is closed. The sliding back and forth of the valve plates is effected by the lever arranged to close one valve while opening the other. Between the valves is a 3 1/2-in. nipple of 2-in. pipe, which forms the measuring box. A chain connection between the pipe handle of the cap and the end of the operating lever can be kept locked. The details of the construction of the entire apparatus can be seen in the drawing.

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Relation between Appearance of Carbons and Their Wearing Qualities

By E. S. Dickinson*

Some years ago while doing considerable diamond drilling in the Lake Superior iron region, I started out to gather data which would assist me in selecting carbons. I found that no two men had the same idea as to how to judge the stones. One would rely upon the specific-gravity test; another would use this as well as the acid test and boiling the stone in acid to detect doctoring; the largest number would use their own judgment after looking the stone over and making a few simple tests with a file, nippers, etc. Some wanted red-tinged stones, some greenish, others only grayish stones; some wanted broken stones so that they could see the grain, others wanted stones with the outer skin unbroken, believing this skin to be tougher and longer wearing. Some wanted stones of regular shape without any sharp corners or projections to wear or break off; others maintaining that the best stones could not be broken as desired, would select those with the more irregular shapes and with sharp corners.

I found that no reliable data could be had and furthermore that weighing each bit as it was set and again as it was cut out, and noting the footage drilled, the number of the hole and its depth at the start and finish of the run of the bit, together with the nature of the ground passed through, did not give the desired information. I therefore, in addition, had each stone weighed separately at the time of setting in the bit, and again when cut out. Each stone was numbered; when it was set the number was stamped near it on the bit; when it was cut out, it was put in a numbered compartment and kept there. The drilling was done in hard-ore and jasper-ore formation for the most part, but a little of it was in soft slate. There follows a part of the data collected:

Stone No. 1—Purchased from Mr. A. at $75. Natural, unbroken stone with yellowish glassy, slaglike appearance and vitreous luster. Weight, 4 [illegible] carats.

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*Mining engineer, Republic Iron & Steel Co., Gilbert, Minn.

*Iron River, Mich.

Bit No.	Hole No.	Feet Drilled	Loss in Weight of Bit, Carats	Loss in Weight of Stone, Carats	Remarks
2	8	8	$\frac{34}{64}$	$\frac{2}{64}$	
3	38	18	$\frac{2}{64}$	0	Soft slate
6	38	17	$\frac{9}{64}$	$\frac{5}{64}$	
9	38	22	$1\frac{25}{64}$	$\frac{39}{64}$	Stone broke

The two small pieces were afterward used as inside stones, but no longer weighed.

Stone No. 2—Purchased from Mr. A. at $75. Natural surface rounding and smooth, black with dull luster. One face flat, grayish white, with black and yellow spots. No pores visible to the eye. Fracture face gray, with white and yellow spots and small pores. One streak of white running through the stone. Weight, $5\,^{42}/_{64}$ carats.

6	38	17	$\frac{9}{64}$	$\frac{1}{64}$
9	38	22	$1\frac{25}{64}$	$\frac{3}{64}$

Another stone broke in this bit. No further history of this stone.

Stone No. 3—Purchased from Mr. A. at $75. Small pores, black with bright luster. One face flat, looked as if it had been ground and polished. Fracture face dull, slaty black, showing minute crystals. Weight, $7\,^{32}/_{64}$ carats.

3	38	18	$\frac{2}{64}$	0
6	38	17	$\frac{9}{64}$	0
9	38	22	$1\frac{25}{64}$	$\frac{8}{64}$

Stone No. 1 broke.

Stone No. 4—Purchased from Mr. B. at $70. Round, natural stone, not broken, with black, dull luster; medium rough. Weight, $2\,^{58}/_{64}$ carats.

6	8	7	0	0	
4	7	14	$\frac{6}{64}$	0	Set with old stones.
5	7	16	$\frac{13}{64}$	$\frac{4}{64}$	
7	11	61	$\frac{21}{64}$	$\frac{20}{64}$	Black slates and quartz.
19	8	12	$\frac{2}{64}$	0	
16	8	3½	$\frac{16}{64}$	$\frac{1}{64}$	
17	8	7	$\frac{8}{64}$	$\frac{1}{64}$	
21	8	12	$\frac{6}{64}$	$\frac{1}{64}$	
23	8	9	$\frac{2}{64}$	$\frac{1}{64}$	
25	8	16	$\frac{10}{64}$	$\frac{2}{64}$	
2	12	3½	$\frac{3}{64}$	0	
4	21	6	$\frac{5}{64}$	0	
6	21	9	$\frac{2}{64}$	$\frac{1}{64}$	
8	21	8	$\frac{3}{64}$	$\frac{1}{64}$	
10	21	7	$\frac{5}{64}$	0	
14	21	8	$\frac{1}{64}$	$\frac{1}{64}$	
16	21	2	$\frac{2}{64}$	0	

Total loss of stone, $^{29}/_{64}$ carat in 164 ft. of drilling; 5.65 ft. per $^{1}/_{64}$ carat loss.

Stone No. 5—Purchased from Mr. B. at $70. Brownish black, natural stone. Little luster. Comparatively flat faces and small pores. Weight, $3\,^{10}/_{64}$ carats.

4	9	10	$\frac{47}{64}$	$\frac{24}{64}$	Slates.
6	9	23	$1\frac{7}{64}$	$\frac{4}{64}$	Slates.
8	9	37	$\frac{37}{64}$	$\frac{23}{64}$	Slates.
3	38	18	$\frac{2}{64}$	$\frac{9}{64}$	Cherty carbonate slates.
1	58	85	$\frac{15}{64}$	0	Cherty carbonate slates.
3	58	78	$\frac{38}{64}$	$\frac{2}{64}$	Cherty carbonate slates.
5	58	35	$\frac{24}{64}$	$\frac{16}{64}$	Cherty carbonate slates.

Total loss of stone, $^{51}/_{64}$ carat in 286 ft. of drilling; 5.6 ft. per $^{1}/_{64}$ carat loss.

Stone No. 6—Purchased from Mr. B. at $70. On natural faces black, shining luster; uneven faces; one flat face. On broken face, metallic luster. Close grained; no pores visible. Corners sharp. Weight, $5\,^{12}/_{64}$ carats.

Stone No. 7—Purchased from Mr. B. at $70. Brown, dull luster; corners well rounded. Small, shallow pores. Weight, 3 ² [illegible] carats.

				No. 6	No. 7	
4	9	10	$\frac{47}{64}$	$\frac{2}{64}$	$\frac{1}{64}$	Slates.
6	9	23	$1\frac{7}{64}$	$\frac{19}{64}$	$\frac{19}{64}$	Slates.
8	9	37	$\frac{37}{64}$	$\frac{3}{64}$	$\frac{6}{64}$	Slates.
10	9	54	$\frac{19}{64}$	$\frac{2}{64}$	$\frac{2}{64}$	Slates.
12	9	30	$\frac{38}{64}$	$\frac{2}{64}$	$\frac{3}{64}$	Slates.
14	9	18	$\frac{22}{64}$	$\frac{1}{64}$	$\frac{4}{64}$	Slates.
16	9	9	$1\frac{21}{64}$	0	$\frac{6}{64}$	
18	9	19	$\frac{16}{64}$	0	$\frac{10}{64}$	
20	9	12	$\frac{38}{64}$	0	$\frac{13}{64}$	
22	9	5	$\frac{6}{64}$	0	$\frac{1}{64}$	
24	9	15	$\frac{4}{64}$	0	0	
26	9	25	$\frac{5}{64}$	0	$\frac{1}{64}$	
28	9	9	$\frac{6}{64}$	0	$\frac{6}{64}$	

This bit was used in ground which was mostly slate, but contained some hard material. Total loss of No. 6, $^{30}/_{64}$ carat in 266 ft. of drilling; 8.87 ft. per $^{1}/_{64}$ carat loss. Total loss of No. 7, $1\,^{28}/_{64}$ carats in 266 ft. of drilling; 2.6 ft. per $^{1}/_{64}$ carat loss.

Stone No. 8—Purchased from Mr. C. at $75. Broken stone; no natural faces. Square in shape, with sharp edges. Grayish white, but slightly pinkish around the pores. Slight sparkle from crystal faces. Weight, $3\,^{1}/_{64}$ carats.

Stone No. 9—Purchased from Mr. C. at $75. Four broken faces. Grayish, quartz-like, highly crystalline. Good luster; numerous large pores. One face had pink and white streaks. Skin, or natural face, dull black. Weight, $2\,^{43}/_{64}$ carats.

				No. 8 Loss	No. 9 Loss	
15	21	6	$\frac{15}{64}$	$\frac{5}{64}$	$\frac{1}{64}$	Hard ore and quartz badly broken up.
18	21	3	$\frac{32}{64}$	$\frac{13}{64}$	0	
20	21	21	$\frac{1}{64}$	0	0	
22	21	4	$\frac{2}{64}$	0	$\frac{2}{64}$	
28	21	4	$\frac{23}{64}$	$\frac{7}{64}$	$\frac{8}{64}$	
31	21	12	$\frac{16}{64}$	$\frac{7}{64}$	$\frac{3}{64}$	
34	21	14	$\frac{11}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	
39	21	6	$\frac{13}{64}$	$\frac{4}{64}$	$\frac{2}{64}$	
25	21	37	$\frac{13}{64}$	0	$\frac{8}{64}$	
42	21	7	$\frac{11}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	
45	21	2	$\frac{52}{64}$	$\frac{30}{64}$	$\frac{2}{64}$	
49	21	3	$\frac{7}{64}$	0	0	
36	21	4	$\frac{21}{64}$	$\frac{4}{64}$	.	

Total loss of No. 8, $1\,^{45}/_{64}$ carats in 113 ft. of drilling; 1.1 ft. per $^{1}/_{64}$ carat loss.

Total loss of No. 9, $^{38}/_{64}$ carat in 109 ft. of drilling; 2.9 ft. per $^{1}/_{64}$ carat loss.

Stone No. 10—Purchased from Mr. C. at $75. Two broken faces; rest of the stone with natural skin. Broken surface green, close grained, sparkled with minute crystal faces. Natural faces black with a little luster. No pores. Sharp edges. Weight, $2\,^{61}/_{64}$ carats.

Stone No. 11—Purchased from Mr. C. at $75. Two fracture faces close grained with greenish tinge, small crystal faces causing a well defined sparkle; sharp edges. Natural skin, black with some luster, and no pores. Weight, $2\,^{61}/_{64}$ carats.

				No. 10	No. 11	
7	8	18	$\frac{20}{64}$	$\frac{11}{64}$	$\frac{3}{64}$	
5	8	31	$\frac{27}{64}$		$\frac{1}{64}$	
9	8	16	$1\frac{2}{64}$	$\frac{3}{64}$	$\frac{2}{64}$	From No. 11 $\frac{21}{64}$ broke off; used in reamer.
11	8	42	$\frac{32}{64}$	$\frac{4}{64}$	$\frac{6}{64}$	
13	8	33	$1\frac{28}{64}$	$\frac{20}{64}$	$\frac{26}{64}$	
15	8	40	$\frac{35}{64}$	$\frac{11}{64}$	$\frac{15}{64}$	Lost $4\frac{32}{64}$ carats of bortz, in this bit.
17	8	22	$\frac{15}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	
19	8	30	$\frac{33}{64}$	$\frac{11}{64}$	$\frac{2}{64}$	
21	8	15	$\frac{10}{64}$	$\frac{2}{64}$	$\frac{1}{64}$	
25	8	13	$\frac{4}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	
27	8	8	$\frac{8}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	
29	8	15	$\frac{10}{64}$	$\frac{2}{64}$	$\frac{3}{64}$	
2	18	8	$\frac{14}{64}$		$\frac{1}{64}$	

Total loss of No. 10, $1\,^{9}/_{64}$ carats in 283 ft. of drilling; 3.88 ft. per $^{1}/_{64}$ carat loss.

Total loss of No. 11, $1\,^{18}/_{64}$ carats in 291 ft. of drilling; 3.55 ft. per $^{1}/_{64}$ carat loss.

Stone No. 12—Purchased from Mr. C. at $75. One broken face, grayish white, close grained, with a few small shallow pores, and a slight sparkle. Skin black with high shining luster. Shallow pores, yellow inside. Rounded corners Weight, $2\,^{47}/_{64}$ carats.

4	8	2	$\frac{43}{64}$	0
10	8	10	$\frac{17}{64}$	$\frac{2}{64}$
13	8	3	$\frac{4}{64}$	$\frac{2}{64}$
16	8	3	$\frac{15}{64}$	$\frac{2}{64}$
21	8	2½	$\frac{3}{64}$	0
24	8	4	$\frac{4}{64}$	$\frac{2}{64}$
27	8	6	$\frac{7}{64}$	$\frac{2}{64}$
31	8	3	$\frac{8}{64}$	0
34	8	4	$\frac{4}{64}$	$\frac{1}{64}$
37	8	4	$\frac{8}{64}$	$\frac{6}{64}$
43	8	6	$\frac{13}{64}$	$\frac{2}{64}$

The material drilled by this stone was exceptionally hard broken jasper and quartz.

Total loss, $^{19}/_{64}$ carat per 119 ft. of drilling; 6.3 ft. per $^{1}/_{64}$ carat loss.

Stone No. 13—Purchased from Mr. D. at $80. Highly polished black skin, with white spots and shallow pores. One fracture face gray, with yellowish white spots; dull luster; close grained; edges sharp. After use, was shown to be extremely porous.

9	9	5	$\frac{14}{64}$	0	
11	9	17	$\frac{38}{64}$	0	
14	9	1½	$\frac{4}{64}$	$\frac{1}{64}$	
6	7	14	$\frac{14}{64}$	0	**Black slates.**
15	9	6	$\frac{16}{64}$	$\frac{3}{64}$	
18	9	6	$\frac{10}{64}$	$\frac{4}{64}$	
20	9	9	$\frac{25}{64}$	$\frac{8}{64}$	
22	9	9	$\frac{17}{64}$	$\frac{4}{64}$	
24	9	13	$\frac{15}{64}$	$\frac{4}{64}$	
26	9	10	$\frac{20}{64}$	$\frac{1}{64}$	
3	21	9	$\frac{14}{64}$	$\frac{4}{64}$	Hole 21 hard ore; quartz and jasper badly broken up.
5	21	7	$\frac{13}{64}$	0	
7	21	3	$\frac{29}{64}$	$\frac{4}{64}$	
9	21	20	$\frac{17}{64}$	$\frac{3}{64}$	
11	21	13	$\frac{4}{64}$	$\frac{1}{64}$	
13	21	25	$\frac{5}{64}$	$\frac{3}{64}$	
18	21	22	$\frac{3}{64}$	$\frac{2}{64}$	
20	21	22	$\frac{1}{64}$	0	
23	21	6	$\frac{13}{64}$	$\frac{2}{64}$	

Total loss, $^{41}/_{64}$ carat in .218 ft. of drilling. 4.93 ft. per $^{1}/_{64}$ carat loss.

Stone No. 14—Purchased from Mr. E. at $55. Ballas bortz, unbroken, egg-shaped, dark, translucent, with many dark, semitranslucent spots. From a distance looked like a piece of black graphite. Weight, 2 $^{1}/_{64}$ carats.

7	11	61	33/64	0	Black slate and quartz.
16	9	3½	15/64	0	
19	9	12	3/64	0	
17	9	7	8/64	0	
21	9	12	8/64	0	
23	9	9	3/64	1/64	
25	9	10	10/64	1/64	
2	21	3	2/64	0	
4	21	6	5/64	0	
6	21	9	3/64	0	
8	21	8	2/64	0	
10	21	7	6/64	0	
14	21	8	4/64	0	
3	58	78	56/64	0	Soft red slates.

Total loss, $^{2}/_{64}$ carat in 236 ft. of drilling; 118 ft. per $^{1}/_{64}$ carat loss. Average for other five stones in the bit, 8.13 ft. per $^{1}/_{64}$ carat loss.

Stone No. 15—Purchased from Mr. E. at $55. Ballas bortz, unbroken, round, yellowish white, translucent, with few dark spots. Adamantine luster. Weight, 2 $^{23}/_{64}$ carats.

4	8	10	47/64	0
10	8	54	14/64	1/64
12	8	30	28/64	[illegible]
3	58	78	56/64	0

Stone showed a cracked appearance and some well defined cleavage.

Total loss, $^{11}/_{64}$ carat in 172 ft. of drilling; 12.3 ft. per $^{1}/_{64}$ carat loss. Average for the other five stones of this bit, 6 ft. per $^{1}/_{64}$ carat loss.

Stone No. 16—Purchased from Mr. E at $55. Ballas bortz, egg shaped, black, slightly translucent, with adamantine luster. Looks like graphite from a distance.

3	86	81	0	0	Black slate, quartz and pyrite.
1	60	105	1/64	1/64	
9	60	43	1/64	1/64	

Several stones which were regarded as doubtful proved to be excellent and a few which were regarded as good stones proved to be poor ones, but as a rule the results showed that we had been selecting good stones.

The ballas bortz served well for uniform ground and soft ground and even in hard ground showed little loss until the outer skin had been worn through, when the stone quickly went to pieces. All the ballas showed well defined cleavage under the natural skin.

The loss on these stones is large, partly on account of the ground and partly because they were new stones not worn down to shape so that all the sharp and rough edges had to be worn off.

*

Blasting Supplies Used

By Percy E. Barbour

The following blasting supplies were used by 20 men at Iron Mountain, Idaho, doing 475 ft. of work during four winter months, when the camp was practically snowbound and all surface conditions were such as to hinder underground progress. Of this total footage, 50 ft. was a winze and 50 ft. was a small drift from the bottom, and the remainder was a tunnel 5x7 ft. in the clear, timbered with sawed 8x8 timber, giving a total cross-section of excavation of 51 sq.ft. The progress was considered good, considering the conditions.

SUPPLIES USED

	Total	Per Ft. Driven	Per Cu.Ft. of Excavation
Powder	2600 lb.	5.4 lb.	0.112 lb.
Fuse	9600 ft.	20 ft.	0.375 ft.
Caps	1100	2.3	0.043
Candles	640 lb.	1.33 lb.	0.025 lb.

Safety in Charging Dynamite

In a consideration of the causes of untimely and disastrous explosions of dynamite while loading holes, H. N. Freeman, in *Coal Age*, Oct. 3, 1914, enumerates the following causes which may be responsible:

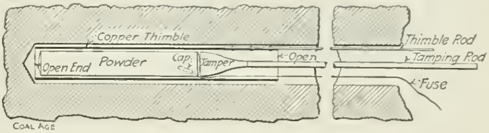
(1) The hole may not have been cleaned properly, and a small piece of coal remaining may break the cartridge and allow the powder to become distributed along the hole. This is liable to be, and often is, exploded either by forcing other cartridges into the hole and grinding the stray powder or by the friction of the tamping bar.

(2) If the powder is not properly thawed it will leave small particles of nitroglycerin on the sides of the hole, which are liable to be exploded by the friction of the tamping rod.

(3) The hole may have been bored with drills that are not of the same gage. These leave collars in the hole, so that when the powder is being inserted, it will jam against one of them.

(4) There is a practice prevailing among miners to force the powder, thereby causing the premature explosion of the charge.

(5) It frequently happens that in his hurry a miner may neglect to put the first stick of powder to the back of the hole. He then puts in the primer and forces it on to the powder, driving the charge back a couple of inches or more. This is a common practice among miners and a large percentage of accidents may be attributable to this cause.



Section through Drillhole, Showing Charging Thimble and Charge of Powder

The accompanying figure illustrates a device that should prove a great benefit to miners in both quartz and coal. It will enable one to place his powder to the back of the hole without its coming into contact with the sides.

The charger consists of a light copper tube or thimble with a rod or handle of ⅜-in. round copper riveted to the side of the tube. The thimble is made ½ in. larger in diameter than the cartridge, and ½ in. less than the diameter of the hole. A slot is made in the tube to accommodate the fuse. The charger is open at both ends, thus enabling the tamping bar to be inserted next the powder and preventing undue pressure. Both charge and tamping bar are inserted into the hole at the same time.

After the charge has been delivered to the back of the hole, the charger is withdrawn over the tamper, and the powder is pressed into a solid mass in the back of the hole. Some miners make a practice of splitting the paper cartridge and compressing the powder to the full diameter of the hole. This can be done more safely with the charger, as the split cartridge does not come into contact with the hole at any point, thus eliminating these causes for premature discharge previously referred to.

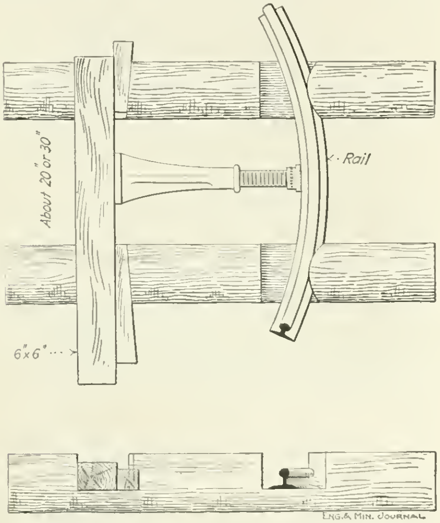
The chargers can be made for about 10c. each, and if properly used are time savers in tamping a shot, all the powder being placed in the charger before it is inserted into the hole. They are especially useful when charging a hole drilled on an angle, as the full charge may be put into the hole at one time, while otherwise something must be used to keep one stick in place when preparing to insert the next one.

⁂

Notched-Log Rail Bender

By Charles F. Spaulding*

A sturdy and handy device for bending rails can be made of two logs, a 6x6-in. piece and a screw jack. The logs are laid side by side and two notches cut at opposite points in each. In one pair of these, the 6x6-in. piece is wedged. In the other, the rail is laid. The distance between notches along the logs should be such that a $1\frac{1}{8}$-in. or $1\frac{1}{4}$-in. jack, footed against the crosspiece, will easily reach the rail. For curves of different radius, the logs can be laid a greater or less distance apart.



Screw-Jack Rail-Bender with Timber Frame

⁂

Don'ts for Rescue Corps†

1. Don't fail to notify the man in charge of apparatus at once in case of trouble.
2. Don't tamper with the apparatus. It is ready for service.
3. Don't use old batteries in your lamp.
4. Don't hurry when using the apparatus.
5. Don't put the apparatus on alone and go into the danger zone without having someone make a thorough inspection of the apparatus. Don't go into the danger zone alone.
6. Don't use old cartridges in dangerous work.
7. Don't fail to look at pressure gage before going into the danger zone.
8. Don't fail to inspect all connections before putting the apparatus on.
9. Don't fail to keep in communication with the other helmet men.
10. Don't take helmet off in danger zone.
11. Don't forget that the rescue of men is the first consideration.
12. Don't forget to send for the first-aid immediately.
13. Don't chew tobacco in the helmet.
14. Don't disturb too much wreckage on first inspection. It might start something.
15. Don't fail to note conditions.
16. Don't fail to report conditions noted.
17. Don't fail to report any abnormal behavior of the apparatus.
18. Don't forget to return immediately if you think apparatus is not working properly.
19. Don't take chances—PLAY SAFE.
20. Don't fail to follow instructions.
21. Don't go into a strange mine without a guide.
22. Don't expect to be able to work as hard or as fast with the apparatus on as without it. You are carrying a load.
23. Don't, under any consideration, when exploring a mine in which electricity is used, get in contact with bare wires, unless you are sure the current is off.
24. Don't fail to take extra electric lamps with you from the rescue station—some may not work properly.
25. Don't forget the apparatus is only good for two hours.

⁂

Some Pointers for Rock Excavation

There seems to be a tendency among shovel men, when digging rock, to make the shovel "bite more than it can chew." In other words, to try to force as big a move as possible—this is a mistake for several reasons, says the *Excavating Engineer*.

In order to make an extreme move it is necessary to dig with the handle run out practically to the end. In rock work the twisting stresses are great and although a shovel will stand up to it for a while, a breakdown is very probable, due to the strains caused by hard digging in this position. A shovel does not exert its maximum power with the dipper run out as far as it will go. Furthermore, there is much more strength when the dipper is kept in as far as possible.

When an operator tries to stretch things and make a big move he often gets the front of the shovel so close to the face that in attempting to get the dipper back, he will frequently batter the front end of the car body to pieces, pound the circle, and often cut the swinging cable.

Don't try to make too big a move in rock work.

Don't dig with the handle run out to its end.

Don't run the shovel up too close to the new face.

Short moves and more of them will get you farther ahead in the end.

⁂

The Efficiency of Pump Motors on Gold Dredges deserves sideration, says Girard B. Rosenblatt ("Proc. A. I. E. E.," Aug., 1914), as the amount of total power used by the dredge for pumping is considerable, usually as high as 40%, and sometimes higher. Centrifugal pumps are ordinarily used on account of the low head and large volume to be handled, and these are best driven by direct connected squirrel-cage motors.

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*Superintendent, Ogle Mountain Mining Co., Oregon City, Ore.

†From book of instructions of Susquehanna Coal Co., Wilkes-Barre, Penn. Published in "Coal Age," Oct. 3, 1914.

Details of Milling and Smelting

Effect of Acid Solutions on Bronze and Monel Metal*

In the search for acid-resisting alloys for use in the hydrometallurgical experiments on the Ajo ores, Krupp bronze and Monel metal were submitted to the following tests. Pieces of both metals were allowed to stand in acid solutions and in acidified copper-sulphate solutions of varying strengths—the bronze for two and one-half and the Monel metal for three months.

The bronze precipitated the copper completely from all but the two strongest solutions. The Monel metal precipitated no copper, but passed into solution to a greater extent than the bronze. The results were as follows:

WITH SULPHURIC ACID

Strength of Acid, Per cent. H_2SO_4	Per cent. Loss in Weight Bronze	Monel Metal
0.12	3.22	3.89
0.25	3.26	5.92
0.50	3.77	8.86
0.75	3.54	7.62
1.00	3.64	7.55
1.50	4.55	10.07

WITH ACIDIFIED COPPER SULPHATE SOLUTION

Strength of Solution, Per cent. Cu	Per cent. Loss in Weight Bronze	Monel Metal
0.05	1.22	14.50
0.10	1.22	7.20
0.20	0.76	4.73
0.30	0.82	5.08
0.40	0.10	2.17
0.50	0.22	7.87

The Monel metal was also allowed to stand about six weeks in the following solutions:

	Loss in Weight, Per cent.
10 per cent. sulphuric acid	2.81
10 per cent. sulphuric acid and 10 per cent. copper sulphate (2.5 per cent. Cu)	4.88
10 per cent. copper sulphate (2.5 per cent. Cu)	1.99

A high-silicon iron, under the trade name of "Duriron" was tested in a similar manner by these solutions. So far as could be observed at the end of a few weeks, this metal was not corroded in the least, but the experimental work was closed before this test was finished.

⁂

Tube-Mill Costs and Specifications

By Percy E. Barbour*

The accompanying table gives details of tube-mill specifications and quotations made to a large mining and milling company in Pachuca some time since. The prices are in U. S. currency, and have been reduced to prices per pound of tube mill complete, f.o.b. factory, and prices per cubic foot of charge when full to 2 in. above the center line. This gives two interesting methods of comparing the quotations. Mill *D* was selected, partly on account of price, although it was not the lowest in cost, and partly on account of superiority in certain mechanical features and construction.

TUBE-MILL QUOTATIONS AND SPECIFICATIONS

	A	B	C	D	E	F	G
Size....	4′ 7½″ x 19′8″	4′ 6″ x 20′ 0″	5′ x 20′	5′ x 20′	5′ x 20′	4′ 6″ x 20′	5′ x 18′ 3″
Thickness of shell..........	Welded about $\frac{13}{32}$″	¾″	⅝″	$\frac{7}{16}$″	½″	½″	
Material in gear and pinion......		Cast iron	Cast iron	Cast iron, cut	Cast iron, steel pin	Semi-steel	
Gears—face and pitch..........			8″ F., 2″ P.	12″ F., 1¼″ P.	11″ F., 3½″ P.	8″ F., 1⅞″ P	
Shaft dia. and rev. per min........	125 r.p.m.	$4\frac{7}{16}$″—142	$4\frac{7}{16}$″—200	$4\frac{9}{16}$″	$4\frac{7}{16}$″—168	$4\frac{7}{16}$″—200	—160
Clutch pulley..........	94½″ x 10¼″	60″ x 14½″	36″ x 20″	78″ x 16″	78″ x 18″	60″ x 20″	74¾″ x 10¼″
Area of belt contact per min......	2524 sq.ft.	2603 sq ft.	4549 sq ft.	3829 sq.ft.	4805 sq.ft.	4976 sq.ft.	
Size of trunnion..............		15″ x 15″	16″ x 18″	15″ x 18″	15″ x 18″	16″ x 18″	
Trunnion bearing pres. per sq. in.		115 lb.	118 lb.	122 lb.	131 lb.	142 lb.	
Vol. of charge 2″ above C.L. 3½″ lining	136 cu.ft.	132 cu.ft.	158 cu.ft.	161 cu.ft.	165 cu.ft.	133 cu.ft.	144 cu ft
Weight of charge @ 135 lb. per cu.ft.	18,300 lb.	17,800 lb.	21,300 lb.	21,700 lb.	22,300 lb.	18,000 lb.	19,400 lb
Net weight of unlined mill	25,580 lb.						
Gross weight of unlined mill	27,120 lb.	24,050 lb.	36,600 lb.	27,625 lb.	30,000 lb.	35,000 lb.	36,960 lb.
Weight of cast-iron ribbed lining....	20,290 lb.	15,000 lb.	23,500 lb.	25,000 lb.	25,000 lb.	25,000 lb.	21,200 lb.
Weight of cast-steel ribbed lining..			19,000 lb.	19.500 lb.	17,600 lb.	14,500 lb.	
Net weight of unlined shell.......	15,430 lb.		23,500 lb.		24,000 lb.	28,500 lb.	
Gross weight mill with c. i. lining....	47,410 lb.	39,050 lb.	60,100 lb.	52,625 lb.	55,000 lb.	60,000 lb.	58,160 lb.
Price unlined mill, f.o.b. factory....	$2385	$1775	$2566	$1900	$1500	$2750	$2342½
Price unlined mill per lb...........	8.8c.	7 4c.	7.0c.	6.9c.	5.0c.	7.9c.	6.3c
Price cast iron lining............	$1095	$407.50	$799	$960	$750	$687.50	Mex. $1178
Price cast iron lining per lb.	5.1c.	2.7c.	3.4c.	3.8c.	3.0c.	2.75c.	5.6c.
Price cast steel lining.......			$860	$1015	$1056	So. B. $440	
Price cast steel lining per lb...			4.5c.	5.2c.	6.0c.	3⅛c.	
Price of mill with cast iron lining	$3480	$2182.50	$3365	$2860	$2250	S. F. $3437.50	$3520 50
Price of mill with c. i. lining per lb. .	7.3c.	5.6c.	5.6c.	5.4c.	4 1c.	5.7c.	6 1c
Freight, fees, etc., but not duty. .		$ 437	$ 703	$ 547	$ 665	$ 636	
Price f.o.b. Pachuca.......		$2619	$4068	$3407	$2915	$4073	About $3720
Price f.o.b. Pachuca per lb...		6.7c.	6 8c.	6.3c.	5.3c	6.8c.	6 4c
Price per cu.ft. charge, 2″ above C.L.		$19.80	$25.70	$21.20	$17.70	$30.60	$25.80
Delivery at factory..........	60 days	45 days	90-105 days	45 days		30 days	

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Electrostatic Fume Precipitation at Anaconda

Supplementing W. H. Howard's paper on "Electrical Fume Precipitation at Garfield," presented at the Salt Lake meeting of the American Institute of Mining Engineers, Edgar M. Dunn, of Anaconda, gives in the November *Bulletin* an account of the experiments that have been conducted at Anaconda this year, under the direction of Dr. Cottrell and the supervision of J. O. Elton and D. R. Kellogg, representing the Anaconda Smelter Commission. For the amount of gas to be treated at Anaconda, the 5-in. pipe adopted at Garfield means a cost for installation that is practically prohibitive, and experiments were made with a view of reducing installation cost by increasing the size of the pipe. Th [illegible] is as yet in the experimental stage but Mr. Dunn reports having obtained good clearance on mixed roaster and converter gases with a 3-ft. pipe treater 20 ft. long and 5-ft. velocity therein; the discharge electrode was a single No. 29 nichrome wire set in the middle of the 3-ft. pipe, with a consequent electrode spacing of 18 in. The current used had a voltage of 150,000 to 160,000 and, of course, there were troubles relating to insulation and rectifying. Blast-furnace gases did not give so good clearance, probably due to the relative poverty in moisture and SO_2 contents making the blast-furnace gases poorer in conductivity.

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*Excerpt from a paper by Stuart Croasdale, read at the Utah meeting of the A. I. M. E.

*Mining engineer, 887 Middle St., Bath, Maine

The experiments were sufficiently satisfactory, however, to induce the erection of an experimental plant on a somewhat larger scale in which a 4-ft. pipe, with consequent greater electrode spacing, and voltage up to 220,000 will be attempted.

In the matter of fractional precipitation, Mr. Dunn states that this was used in the arsenic plant last December to separate As_2O_3 from the dust carried along from the first roasting furnace in the gas stream. Two treaters were used. In the first, with gases entering hot, at about 310 deg. C., practically all of the dust was precipitated; while in the second, the gases were cooled to 90 deg. C. by admission of air, and white arsenic of 99.7% purity was thrown down directly. Fractional precipitation thus eliminated the refining furnace formerly necessary.

In the regular practice, the Brunton roasting furnaces had passed so great an amount of the flue dust to the settling "kitchens" that refining of this arsenical product was necessary to eliminate the 5% to 20% of dust it contained. Hence, the manufacture of As_2O_3 was effected in two stages, with a reverberatory roast of the first product to obtain the final 99.5% As_2O_3. Part of the dusting trouble was due to too high a temperature and draft in the first roasting furnace. The process is simply one of volatilization of the As_2O_3 present in the flue dust; no chemical change of an appreciable nature occurs in this practice, the arsenates contained in the dust not being commerciably reducible below a smelting temperature. New flue-dust roasting furnaces of a different type are being installed and will be equipped with fractional-precipitation treaters. This installation is expected to eliminate the necessity of refining the product; the operation, however, is still regarded as experimental, due to change in the type of roasting furnace.

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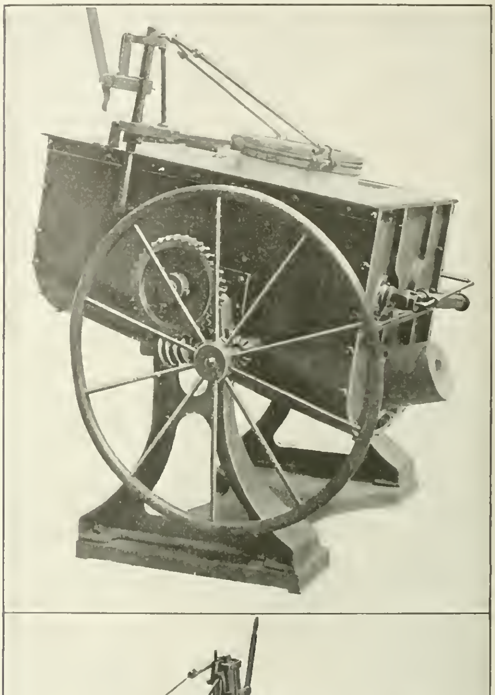
Tilting Reverberatory Furnace

In order to bring the advantage of mobility to the reverberatory furnace, the Monarch Engineering & Manufacturing Co., Baltimore, Md., has designed and built a tilting reverberatory, views of which are shown in the accompanying photograph. These furnaces are built in several sizes, with capacities varying from 500 to 2500 lb. per heat. The fuel used may be either oil or gas, two burners being placed in each furnace. The necessary air inlets are properly provided for, and there is a discharge opening through which the contents may be poured when the furnace is tilted, a large handwheel and the requisite gearing being provided for the latter purpose.

To conserve and concentrate the heat an insulating layer of sheet asbestos is placed next to the shell. Inside this is the refractory furnace lining. The top is formed of heavy molded refractory material, and there is no metal near the fire chamber. A swing-aside cover is arranged at the top or charging door. At the rear there is a door, heavily lined with fireclay, for cleaning the furnace or skimming slag during refining. The device is applicable to all reverberatory-furnace uses and is more convenient to operate than the usual stationary type.

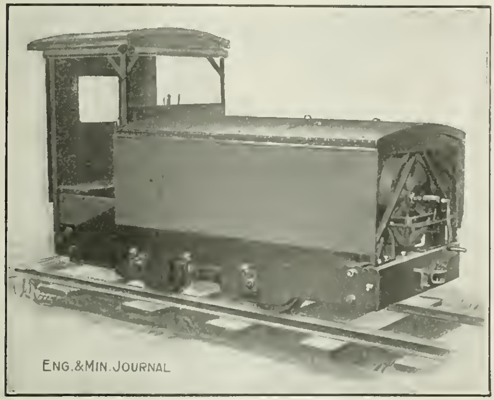


A Tilting Reverberatory Furnace

Mining & Metallurgical Machinery

Fate Gasoline Locomotive

A new gasoline industrial locomotive, recently placed on the market by the J. D. Fate Co., Plymouth, Ohio, was described in these columns, Sept. 12, 1914, p. 488. Since the preparation of that article, the manufacturers advise that instead of the two-cylinder, air-cooled Monarch motor originally installed, a Continental, four-cylinder, water-cooled motor, 3¾x5 in., is now being used in this locomotive. An accompanying illustration shows the general appearance of this machine.



Fate Gasoline Locomotive

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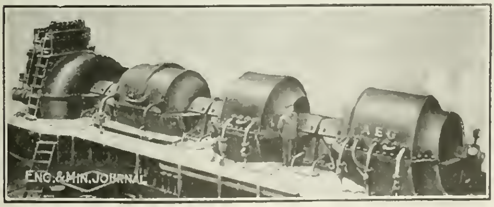
Large Rotary Compressor for the Rand

The accompanying photograph shows one of three sets of turbo-compressors recently ordered for the Victoria Falls & Transvaal Power Co. on the Rand. The machine is rated at 12,000 hp. and is supposed to deliver 100,000 cu.ft. of free air per min. against a head of 10 to 12 atmospheres.



Turbo-Compressor for the Rand, 100,000-Cu.Ft. Capacity

The compressor is driven by a steam turbine at one end of the set. The three compressor units are direct connected to this. The set operates at 3000 r.p.m. The compressor units are in series, the partly compressed air of the first being cooled and supplied to the second and the same with the second and third.

The machines are made by the Allgemeine Elektrizitäts Gesellschaft of Berlin.

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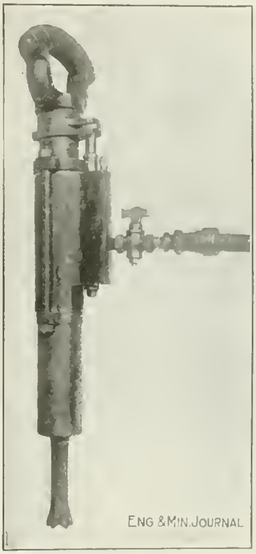
A New Hardsocg Drill

The accompanying illustration shows a new light-weight drill, that the Hardsocg Wonder Drill Co., Ottumwa, Ia., has recently developed. Up to the present, this drill has been used practically in the slate regions of Pennsylvania, New York and Vermont, where it has given great satisfaction, but there seems to be no reason why it should not be adapted to certain kinds of ore mining. The drill is known as the Hardsocg No. 65A, and like the other drills made by this company, is a valveless machine. The machine weighs 29 lb., is equipped with an automatic push handle and is a self-rotater. In the slate work, referred to above, this drill is boring holes from 10 to 14 ft. deep, with a ¾-in. round or hexagonal hollow bit and ⅞-in. shank, and uses about 40 cu.ft. of air per minute. For work in limestone quarries, a ⅞-in. bit is being used. The drill is also well adapted for side-hole work in banks, and when fitted with a plug and feather bit, does excellent work in granite. It is being used for the latter work in the South, with solid diamond-point bits.



A New Hardsocg Drill

The design of this drill, and also the No. 65, a still lighter type, weighing 25 lb., has been changed somewhat from the earlier type of Hardsocg drills, and the result is an increased cutting speed. This is due to a difference in the position of the air intake, which permits greater speed and imparts more force to the blow of the piston. It also insures more constant and uniform rotation of the bit. The operation of the drill is simple. A slight pressure on the push handle opens the airway to the piston, which is also the valve. The rotation, which is positive with every blow, is secured by the reciprocation of the piston on a rifled bar, operated by a ratchet box. The piston has keys on its lower end, and these keys engage ways in the rotating sleeve, and impart the rotation to the bit. All working parts are made from vanadium steel, and, including the drill barrel, are hardened.

The No. 65 drill measures 34 in. over all with bit and 22 in. without bit. The latter is held automatically in place when moving the drill. For use in slate work, the drill is furnished with ordinary 7/8-in. hexagon bushing, and if desired, the makers will also furnish 3/4-in. round, hollow bits with six- or eight-point rose bit for finishing a hole as small as 7/8 in. The following are some of the records that have been made with the No. 65 A machine: Nine inches in one minute, in limestone, with a 3/4-in. hollow bit, 7/8-in. gage; in Quincy granite, 3 1/4 in. in 30 seconds, using a solid, 7/8-in. steel, diamond-point bit; in limestone, 3 1/2 in. in one minute, with 1 1/2-in. bit, making a 1 5/8-in. hole. In the last case, a crucible, hexagon, hollow-steel bit was used, with a plug and feather.

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Wernicke-Hatcher Rotary Air Compressor

An air compressor of novel design has been introduced by the Wernicke-Hatcher Pump Co. The machine delivers 75 cu.ft. of air per min. at 100-lb. pressure when running 400 r.p.m. It weighs 1400 lb., is 46 in. long, 28 in. wide and 35 in. high.

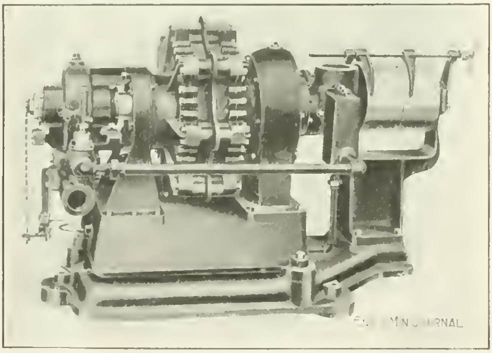


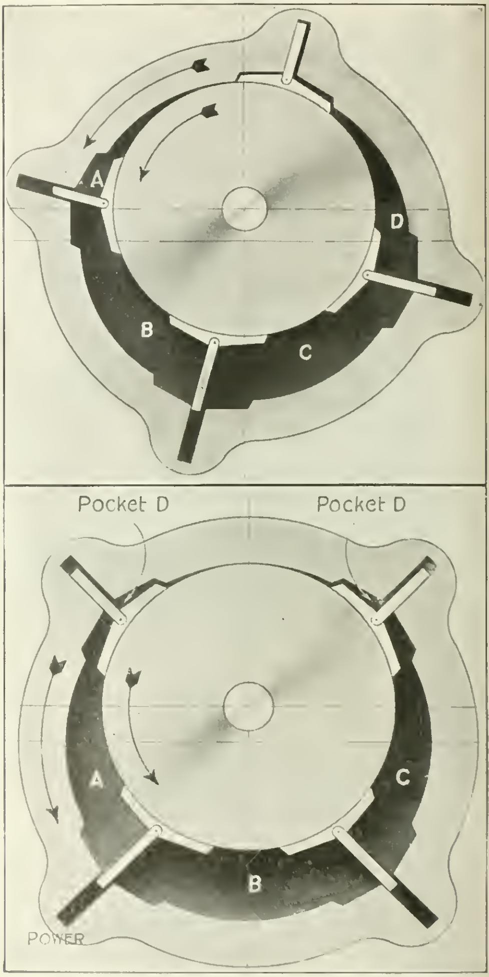
Fig. 1. Wernicke-Hatcher Compressor

It consists principally of two elements, a rotor and a rotor casing, both of which revolve in the same direction and at the same speed on independent axes eccentric to each other. Plates extending radially from the rotor and fitting into slots in the casing and case heads, divide the displacement of the compressor into eight independent pockets. The plates are pivoted to shoes which slide on the surface of the rotor. To allow for the eccentricity and maintain a permanent seal between pockets, the plates slide back and forth in the slot.

The operation may be understood by the illustrations, in which, for simplicity, the pockets are reduced to four. In Fig. 2 *A* has begun to take air, *B* is still taking it in, *C* has begun to compress, and *D* has compressed still further.

In Fig. 3, *A* is still drawing air, *B* is completely filled, *C* is still compressing, and *D* has discharged. With eight pockets, the discharge is practically continuous.

As can be seen, the machine is compact for its capacity.



Figs. 2 and 3. Scheme of Compressor Working

Wear on the shoes and sliding plates is said to be small as their motion is slow. As the difference in pressure between successive pockets is only one-fourth the difference between initial and final pressures, leakage is low.

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The Digging Motor of a Gold Dredge uses about 40% of the total power required by the dredge. The power for digging, writes Girard B. Rosenblatt ("Proc. A. I. E. E.," Aug., 1914), is about proportional to the yardage dug, i.e., the kilowatt-hours are proportional to the yardage handled times the number of hours during which it was dug. Mr. Rosenblatt gives the power consumption of moderate-sized dredges, with buckets of from 5 to 7 cu.ft. capacity and monthly yardage of from 60,000 to 100,000 cu.yd., as 1 1/4 to 1 3/4 kw.-hr. per cu.yd.; for larger dredges with buckets up to 15 cu.ft. capacity and monthly yardage of from 125,000 to 250,000 cu.yd., the power consumption is from 1 to 1 1/2 kw.-hr. per cu.yd. The very large dredge of the Conrey Placer Mining Co., having 17-cu.ft. buckets, has dug 520 cu.yd. of material, weighing 3000 lb. per cu.yd. per running hour, and a monthly tonnage of about 325,000 cu.yd.; this dredge has a power consumption of 1.28 kw.-hr. per cubic yard.

Men and Machinery of the Comstock--Hydraulic Machinery

By G. W. Dickie

SYNOPSIS—The connection between a hotel and a mining problem is sometimes not easy to discover, but the installation of hydraulic elevators at the Palace Hotel in San Francisco gave their originator the idea of installing the hydraulic machinery in the various Comstock mines. The idea at first was to have a central station for all the mines, but this was found to be impracticable, and in fact hydraulic-pumping machinery found many enemies among those interested in the manufacture of steam-pumping machinery and in the mine owners who already had large pumping plants. Finally, a tentative drawing of such a system was made for three of the more important mines.

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In the former articles, I have considered in a brief way the various systems of deep mine pumping that had been put in operation on the Comstock in the years 1874-'75-'76; these were years of great effort on the part of the men who designed and installed these pumping works for in many cases we had to design and make the necessary tools by which to produce the character of work required. It never occurred to us to sit down and figure what we could or could not do. We had no limitations; we figured out what had to be done and set about doing it as quickly and effectively as we could. There were no data to guide us in deciding for any given mine what amount of water we would have to contend with, at what level we would encounter this dread enemy, nor did we know how deep the mine was to be. Once when he was starting a new shaft, I asked James Fair if he proposed to have a pumping plant immediately or to wait until he struck water. "My son," said he, "I am going to have the biggest and best pumping plant you fellows can design for me. My experience as a miner has been that if you have a fine pumping plant ready, the water somehow will not come into your mine, but if you have no pumping plant it is sure to break in and flood you out. A good pumping plant, my son, has a moral effect on the water." Mr. Fair's doctrine resulted in some of the finest pumping plants being installed where there was little water and these gave no trouble, but other mines where the pumping plants were not so powerful got more water than they could handle and efforts to speed up these engines resulted in disastrous breakdowns, and the possibility of draining the Comstock became a most [illegible] problem.

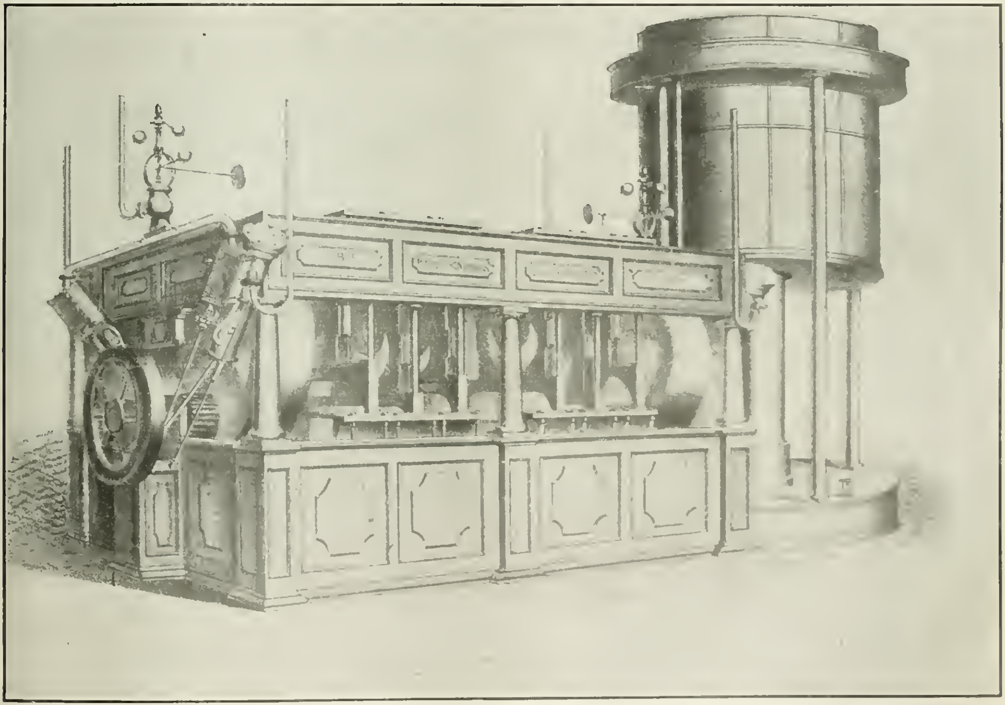

FIG. 1. PUMPING ENGINE AND ACCUMULATOR FOR PALACE HOTEL ELEVATORS

At this time Mr. Ralston was building the old Palace Hotel in San Francisco and I was requested to design five elevators for this. He wanted them to be fast. This was before the days of electric elevators and I decided to risk my reputation on hydraulic elevators on a more extensive scale than had ever been attempted. I decided on gearing them 12 : 1, that is, the elevator was to move 12 ft. for 1-ft. movement of the rams. I used five rams in the hoisting machine. The two outside rams were smaller than the other three. These small rams had the accumulator pressure always on them and their function was to balance the weight of the elevator car. The other three were the power rams. With four passengers, the center ram only was used; with eight passengers, two rams were used, the center one being out; with twelve passengers, all three rams were used. The crosshead carried six sheaves, 40 in. diameter, each with three grooves for the three steel hoisting ropes; six similar sheaves were mounted at the back end of the cylinders and were stationary; the valve gear was of the differential type operated by a rope in the elevator. Fig. 1 shows the pumping engines and the accumulator.

THE PALACE HOTEL ELEVATOR MACHINERY

Mr. Ralston had a marble wainscoting around the interior of the accumulator house, which was across a street from the hotel, and he desired the engine to match this finish. I therefore made the tank, which received the return water to be repumped into the accumulator, of cast iron, heavy enough to carry the six pumps, which were vertical, the crankshaft working in yokes, operated by an internal gear in which the engine pinions worked. A pair of engines at right angles was mounted on each end of this structure and the entablatures were so designed as to hide the guides. The accumulator ram was made from a spare shaft of one of the big side-wheel steamers of that time; it was 22 in. diameter and had a traverse of 22 ft. This piece of machinery was destroyed by the great fire of 1906. Fortunately, I have a print from a lithograph that I made of a design that I submitted to Mr. Ralston at the time—1875; from this Fig. 1 is taken. While I do not believe in architectural finish for engines, I am proud of this one for it turned out successfully and the accumulator house became an attraction for the guests of the hotel.

For two or three months after the opening of the hotel, there was some trouble with the hydraulic machinery; the operators did not understand hydraulic work and I was often kept all night in the basement of the hotel trying to put things right. One evening about 11 p.m., I was feeling downcast about the numerous little troubles that were affecting the complete success of the hydraulic elevators, when the hotel manager brought an English guest down to see me and introduced him as Sir William Armstrong (later Lord Armstrong). He complimented me on the whole design of the plant, said that he had come to San Francisco to see it, and comforted me by saying, "Young man, do not be discouraged by the little troubles that you are having. I have built a great deal of hydraulic machinery and my experience is that hydraulics need a wet nurse for the first three or four months, after which, if nothing fundamental is wrong, you are over all your troubles." He was right; but while my mind was busy with this hydraulic work it was also busy with the Comstock pumping plants and so the two got together in the plans that followed for the Comstock.

A PUMPING SCHEME FOR THE COMSTOCK

Before launching out into any comprehensive scheme, I first made some propositions to relieve certain pumping works by removing some of the lower pumps and doubling the upper sets so as to enable the engines to speed up, then taking the water from the upper rising column to work hydraulic pumps below, thus using the extra speed obtained to provide power water for the lower levels. While this was being discussed, a large body of water broke into the Savage mine, far beyond the capacities of the pumps on the Savage and the large pumping engines on the Chollar, Norcross and Savage combination shaft. This led me to propose a general hydraulic-pumping scheme for all the Comstock mines, dispensing with the great moving masses required in the spear-rod system, which limited the speed of the engines and consequently the power that could be applied to the drainage of the mines. With a view to interesting them in this matter, I sent a circular letter to the mining superintendents and directors at the time, which ran in part as follows:

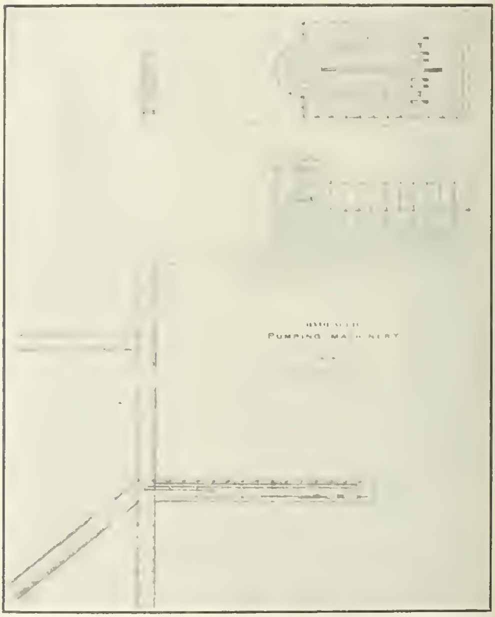

FIG. 2. ARRANGEMENT OF HYDRAULIC-PUMPING MACHINERY, 2500-FT. LIFT, 700 GAL. PER MINUTE

> I would propose to group the mines and work them from a central station and, to illustrate, I will suppose the Virginia City mines to be drained in this way, and the depth to be worked to be 3000 ft. The quantity of water that power would have to be provided for would be, for the Consolidated Virginia & California, 500 gal. per min.; the Ophir and Mexican, 400 gal.; Gould & Curry, 500 gal.; Savage, 500 gal.; Hale & Norcross, 500 gal. Thus there is an aggregate of 2900 gal. to raise 3000 ft. or 72,210,000 ft. lb., equal to 2180 hp., and if I add 25 per cent. for transmission, the total horsepower would be 2735. This is considerably in excess of the pumping power now provided for these mines, but all this and more might be required before the 3000-ft. level is reached and the hydraulic pipes would have to be laid large enough to carry that amount of power. The

engine power need not be provided for the whole work until required. The central station or engine house would be located in any convenient place as near to the center of the mines to be drained as possible and made large enough for future additions to the engine power as might be required. If we suppose that 1500 hp. would be required within say 2 years after the completion of the works, then four sets of engines would be provided of 500 hp. each, the spare set being provided in case of any repairs being required in any of the others. Each set of engines would be constructed after the best type of compound condensing engines with one common separate condenser. Each engine would actuate a set of eight hydraulic pumps so arranged that any number can be thrown out of gear, all the pumps to draw water from a common cistern which receives the water that returns from the mines after doing its work, and pump it into accumulators. There would be four at the start loaded to a pressure of 800 lb. per sq.in. equal to a head of water or column of 1860 ft. These accumulators would consist of strong cast-iron cylinders 16 in. inside diameter and say 25 ft. long. The accumulator rams would be 16 in. diameter and about 28 ft. long, having a dead load of sand, stone or scrap iron heavy enough to secure the desired pressure; these weight boxes in working up and down would be guided in a suitable framework. The accumulators would be all arranged to work together and to stop and start the main engines as the requirements of the work demanded. Each accumulator ram having an area of 261.0624 sq.in., the load including ram and box would be 160,849 lb. or a little over 80 tons; the stored up power in the four accumulators would therefore be equal to 512 hp. or a little over a third of a minute full work, but the power required in pumping being always a constant quantity, variations would only be slight.

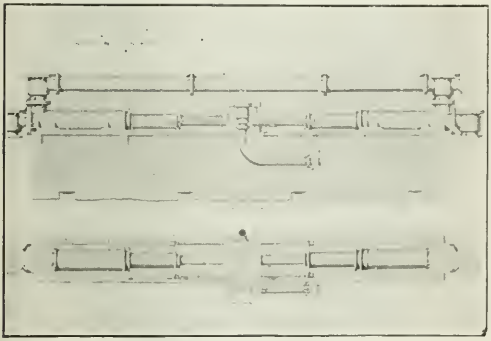
Am Machinist

Fig. 3. An Adaptation of the Davey Type of Hydraulic Pump

Suppose one pump of 25 hp. in one of the mines to be stopped and the accumulator half down. There would be 10 min. for the main engines to accommodate themselves to the alteration in power before the accumulators reached the top; then if the pump in the mine were started up again, the engines would have 20 min. to accommodate themselves to the increase, so that the accumulator power here provided is far in excess of that usually provided in the flywheel of rotating engines. In the above statement I have endeavored to point out some of the most important features of the hydraulic pumping system showing wherein it has the advantage over the spear-rod system. The only objection that can be urged against it is that of the vested interests.

What shall be done with all the present pumping plants should such a scheme be adopted for a number of the leading mines? I might answer this in my Scotch way by asking another question: What shall be done with it anyhow when it ceases to be able to drain the mines either from an increase of water or the natural increase of depth? The time for this question is not so far away as is supposed by some. It is now time for some of the mines mentioned in this scheme to answer it. I do not suppose that the engineers of these mines are deceived themselves in regard to the capacity of those engines but they have allowed the companies interested to believe a good deal of nonsense regarding the depth to which they can go with their pumping plants. Time will settle the question of what shall be done with the present plant, in some cases very soon. The question then will be: What shall be the future plant? Then I ask for a careful study of the hydraulic system by all those interested in the progress of the mines. I know that my views are opposed by those of some of the leading engineers on the Comstock and also by my engineering brethren in the business of designing and building such machinery. I will, however, hold to my plan and urge it as the best that can be adopted as far as the work to be done is concerned. Whether the interests of several companies can be united in a general drainage scheme is not the part of the problem that belongs to me to discuss.

The Sutro Tunnel Again

This rather lengthy quotation serves to show the condition of the Comstock mines in regard to drainage at the end of 1875. From this time on the Sutro Tunnel was to be a marked factor in the drainage question, especially in regard to the North End mines. It intersected the Chollar, Norcross and Savage shaft at the 1600-ft. level, and I. L. Requa, who was the general superintendent of the group of mines that this shaft was intended to serve, lost no time in changing the pumping works to take advantage of the 1600-ft. reduction in the height he had to pump the water; the pumps were changed to a double line of 15-in. plungers with double-sinking pumps discharging into the Sutro Tunnel. The pumping engine on this shaft, which has already been described, was one of the finest on the Comstock and did good work on the large body of water that had to be cared for. At the time the change was made to the Sutro Tunnel for discharge, a drift had just been completed between the Savage mine and the Combination shaft on the 2400-ft. level; a great body of water broke into the Savage mine and reached the Combination shaft through this drift. By working the Savage pumping engine at eight double strokes and the Combination shaft large beam engine at eight and one-half double strokes, the water could be held stationary at the 2400-ft. level but no mining work could be done. To reduce expense and make working in the Combination shaft possible, a masonry bulkhead was built in the 2400-ft. Savage drift. I think this bulkhead or plug was 20 ft. thick, firmly rabbeted into the solid rock walls; through this wall of solid stone work, an 18-in. pipe was fitted, with a valve on the end next the combination shaft. When this piece of work was completed, the valve was closed; a pressure gage had been fitted between the valve and the bulkhead to show how high the water would rise in the Savage mine. When everything was ready the Savage pump was shut down and the water allowed to rise in that mine until it stopped, which would show the source of the water. When the water stopped rising, the gage showed 664 lb. per sq.in. pressure, corresponding to a head of 1600 ft. Many a time I looked at that gage and wondered what would happen if that thing should ever fail; but there was no chance of failure there. Mr Requa had an underground foreman, Charley Matheson, whose work was sure. In him and his work I learned to place absolute confidence; he was a remarkable man, slow of thought and speech, but a worker who never tired. The stone bulkhead was one of his monuments.

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Production of Precious and Semi-Precious Stones in 1913 in the United States was valued at $319,454 by the Geological Survey. The greater part of this value is represented by the sapphire production, principally from Montana, estimated at $238,635. The next most valuable production was [illegible], amounting to $15,130, there having been increased [illegible] in the Virgin Creek district of Nevada. Other [illegible] produced in amounts exceeding $5000 in value were (in the order of their importance): Agates (chalcedony, onyx, etc.), turquoise, tourmaline, spodumene (kunzite, hiddenite, etc.), diamonds, variscite (amatrice, utahlite, etc.), jasper (petrified wood and bloodstone).

Frederick Augustus Heinze

Frederick Augustus Heinze, for many years one of the picturesque figures in the mining industry, died suddenly at Saratoga Springs, N. Y., Nov. 4. A year or so previously he had been seriously ill, but he recovered, and the seizure which proved fatal, was unexpected. His death ended a spectacular career, which embraced a marvelous rise in fortune and an equally rapid decline.

Mr. Heinze was born in Brooklyn, Dec. 5, 1869, of German-Irish parentage. His father was Otto Heinze. His mother, before her marriage, was Lida Lacey. The family was well-to-do, and the children enjoyed many advantages in schooling and travel. "Fritz" Heinze was graduated from the Columbia School of Mines in 1889, and immediately afterward went to Butte as a protégé of Leonard Lewisohn, who assisted him in obtaining a position on the surveying staff of the Boston & Montana company. Heinze, who was at this time a young man of conventional habits with a liking for the good things of life, did not quite relish the drudgery of underground work, and after a year or two threw up his job. It became clear subsequently that beneath a shell of apparent slothfulness and inactivity there was a brilliant imagination and a keen power of observation.

Returning from Butte in 1891, Heinze joined the editorial staff of the ENGINEERING AND MINING JOURNAL and remained with it during most of that year. He is recollected as the only man who habitually came to the office wearing a top hat and frock coat. He was at that time a handsome young fellow, genial in manner, popular among his associates, but exhibiting no great liking for hard work and being especially averse to anything confining. During this time he referred frequently to his experiences and observations at Butte and his idea that there was a fine chance for a custom-smelting business to be inaugurated there.

About this time Heinze's father died, leaving to him and his brothers a moderate fortune. Obtaining possession of his share of the money, Fritz Heinze did just what he said he was going to do if he had the chance, viz., he went immediately to Butte to start a smelting business, this being about 1892. He organized the Montana Ore Purchasing Co. and in an incredibly short time erected his furnaces and began smelting. His plant was a rather ramshackle affair, but it worked and there was the big profit in the business that Heinze had seen in his visions. He made money quickly and thus laid the foundation for the great fortune that he was subsequently to accumulate.

In the prosecution of its custom-smelting business it came naturally to the Montana Ore Purchasing Co. to add to its ore supply by leasing small mines. Having thus become a mine operator, Heinze had some more visions. He grasped the idea of the extraordinary complexity of the vein system of Butte hill at this early date in its history and foresaw the possibilities of capturing some big veins through the acquisition of apparently insignificant surface areas. With the aid of his lawyers, he examined records and titles, and whenever he perceived an opportunity to seize an "apex" that had been overlooked by the Anaconda, Boston & Montana, and other big companies, he located it.

This is, however, somewhat anticipatory. Before he became involved in the great litigation, he made a successful venture in British Columbia. Being in possession of funds derived from his smelting works in Butte and the Rarus mine, he went to Trail, British Columbia, in 1895, and built a small smelter for the Rossland ores. Then he built a narrow-gage railroad from Trail to Rossland, and followed this with a project to build another from Trail to Victoria, B. C. This project obtained for him a land grant from the Dominion government. He also owned the Rossland *Miner*, then the only newspaper in the district. The end of his Canadian venture came when the Canadian Pacific R.R. bought him out and paid him his own price for his smelting interests, railroad, land grant, and newspaper. It was understood that he received $1,200,000. During this time, however, Heinze's chief interests and his headquarters remained at Butte.

Almost from the beginning Heinze was involved in litigation there. First there were suits over the Rarus vein and then over other veins, and sooner or later with almost all the big companies of Butte. Heinze had friends in office and in the courts, and it was charged that legislation favorable to him and inimical to his rivals was passed and upheld much according to his wishes. Anyway, he won many of his suits and steadily added to his fortune. He was assisted by some very able lieutenants, technical, legal and political, especially the last, and owed much to them.

F. AUGUSTUS HEINZE

When the Amalgamated Copper Co. was organized, the litigation between its constituents and Heinze attained its most furious stage. It may be imagined that Mr. Rogers' great conception inspired in Heinze's mind another vision, this time of cashing in all his property, lawsuits, etc., at the expense of the alleged octopus. Anyway, Heinze raised the cry of "Standard Oil" and posed as the David who was fighting Goliath. This carried the populace with him and in those stormy days at Butte there were many occasions when the miners in the streets cheered hoarsely for "Fritz." They remained true to him ever afterward and for a long time hated the capitalists of Boston and New York, although Heinze's protagonist was Marcus Daly, one of their own people and the original developer of Butte's mines.

To tell the whole story of the fight for fortunes at Butte would require a volume. It covered about every interest in the State of Montana from mining to agriculture. Politics boiled with it and elections turned upon it. It was a story of chicanery, bribery, besmirching of the courts, and even bloodshed. The Amalgamated Copper Co. was charged with all the crimes of the calendar and Heinze figured as a popular hero, the independent citizen who was fighting single-handed for his rights and his property against an immense corporation, no less than "Standard Oil." The Amalgamated officials of that time were guilty of many misdeeds, no doubt, but in looking back upon the events we are disposed to think that virtue was quite as much on their side as on Heinze's. The lawyers fattened as never they had before, but out of the enormous waste of money there came a redeeming feature, viz., a knowledge of the Butte ore deposits was gained to the subsequent profit of Butte that probably would not otherwise have been obtained.

In 1902 Heinze had transferred most of his interests to the United Copper Co. In 1906 this company, which was still Heinze, and the Amalgamated became tired of fighting and of the incurring of prodigious legal expense and of the stench of things generally. The Amalgamated purchased the more valuable of Heinze's property in Butte, paying him about $10,000,000, according to the popular belief. The exact amount was never officially stated, so far as we know. Thus was terminated victoriously a 10-years' fight for colossal fortune.

During the struggle Heinze had shown his versatility. He published newspapers, he started banks, he played politics, he did anything that would promote his mining interests. Having "cashed in his checks," he came to New York in 1906, a handsome, polished, daring man, willing to wager his last dollar, supremely confident that he would prevail over every obstacle. He established his brothers, Arthur and Otto, in the Stock Exchange firm of Otto C. Heinze & Co. He had an overwhelming ambition to figure as a great banking financier and this was preëminently the time of high finance. He bought control of the Mercantile National Bank from Edwin Gould, paying an enormous price, and became its president.

Working through this bank and his Stock Exchange firm, he and his friends established a chain of banks. Things were breaking big in the financial world and Heinze's name was heard wherever bankers and brokers got together. Then came the threatening days of 1907, and when every other banker was husbanding his resources Heinze started to corner United Copper. This company had been continued in existence, although most of its valuable property had been sold to the Amalgamated and the proceeds distributed. As to the value of what remained there was mystery and uncertainty. Yet the capital of the company was not written down, which was always regarded by critics as a preposterous neglect. The stock was a useful gambling medium.

The attempt of Heinze and his friends to corner United Copper failed. The firm of Otto C. Heinze & Co. failed. The State Savings Bank of Butte, Mont., a Heinze institution, suspended payments. The Clearing House committee compelled Heinze to resign from the Mercantile National Bank presidency and began an investigation of its affairs. This was the beginning of the panic of 1907. That started with the Heinze failure just as the European war started with the murder of the Austrian archduke. The first was not the cause of the panic and the second was not the cause of the war, but both were the sparks in the powder magazines.

During and after the panic there was house-cleaning, which eliminated Heinze, Charles W. Morse and some others from the banking business. Both Heinze and Morse were indicted for breaches of the banking law. Morse was convicted and served a term in Atlanta. Heinze was acquitted after a long trial. Butte went wild with joy. Then, comparatively poor, Heinze went back to Butte, but no longer had he his old buoyant, bold and enterprising spirit. Out of the wreck of his fortune he saved some things, and the Stewart mine in the Cœur d'Alene and the Mascotte tunnel in Utah subsequently turned out very well for him.

During the last few years he had been in the public eye chiefly as a litigant in actions growing out of his Wall Street career. His most recent appearance was as defendant in a suit brought by Edwin Gould to recover on promissory notes with which Heinze bought his way into the Mercantile National Bank. The judgment for more than a million dollars went against Heinze only a few months ago.

In 1910 Mr. Heinze married Mrs. Bernice Golden Henderson. A son, F. Augustus Heinze, Jr., was born on Dec. 6, 1911. A year later Mrs. Heinze sued for divorce. She obtained a decree soon afterward, fell ill and on her deathbed became reconciled to her husband and asked that the record of her divorce action be expunged from the court rolls.

*

Utah Copper Co.

Report of the Utah Copper Co. for the third quarter of 1914 shows production of a total of 28,686,672 lb. of copper, of which 13,768,958 lb. were produced in July, 8,245,520 in August and 6,672,194 in September. Both plants treated 1,466,606 tons of ore, 77% at the Magna plant and 23% at the Arthur plant. Average ore grade was 1.4356% copper, and 68.13% the average extraction.

Owing to existing conditions, it was considered advisable to reduce production by half, so the Arthur plant was shut down. Average cost of net copper is 7.760c. per lb. after allowing for smelter deductions and without crediting miscellaneous income. If this income were credited, including that from the Bingham & Garfield Ry., the cost would be 6.951c. per lb. of copper.

Net profit from milling operations and other income was $1,312,738. Dividends paid amounted to $1,218,367, leaving a net surplus for the quarter of $94,371. Earnings are based on 12.18c. per lb. for copper. Total copper on hand and in transit, sold and unsold, at the end of the quarter, was 50,118,797 lb. No income came from Nevada Consolidated Copper Co., as its dividends were deferred.

Bingham & Garfield Ry. operations were curtailed. An average of 11,515 tons of ore and about 1256 tons of other freight per day were moved.

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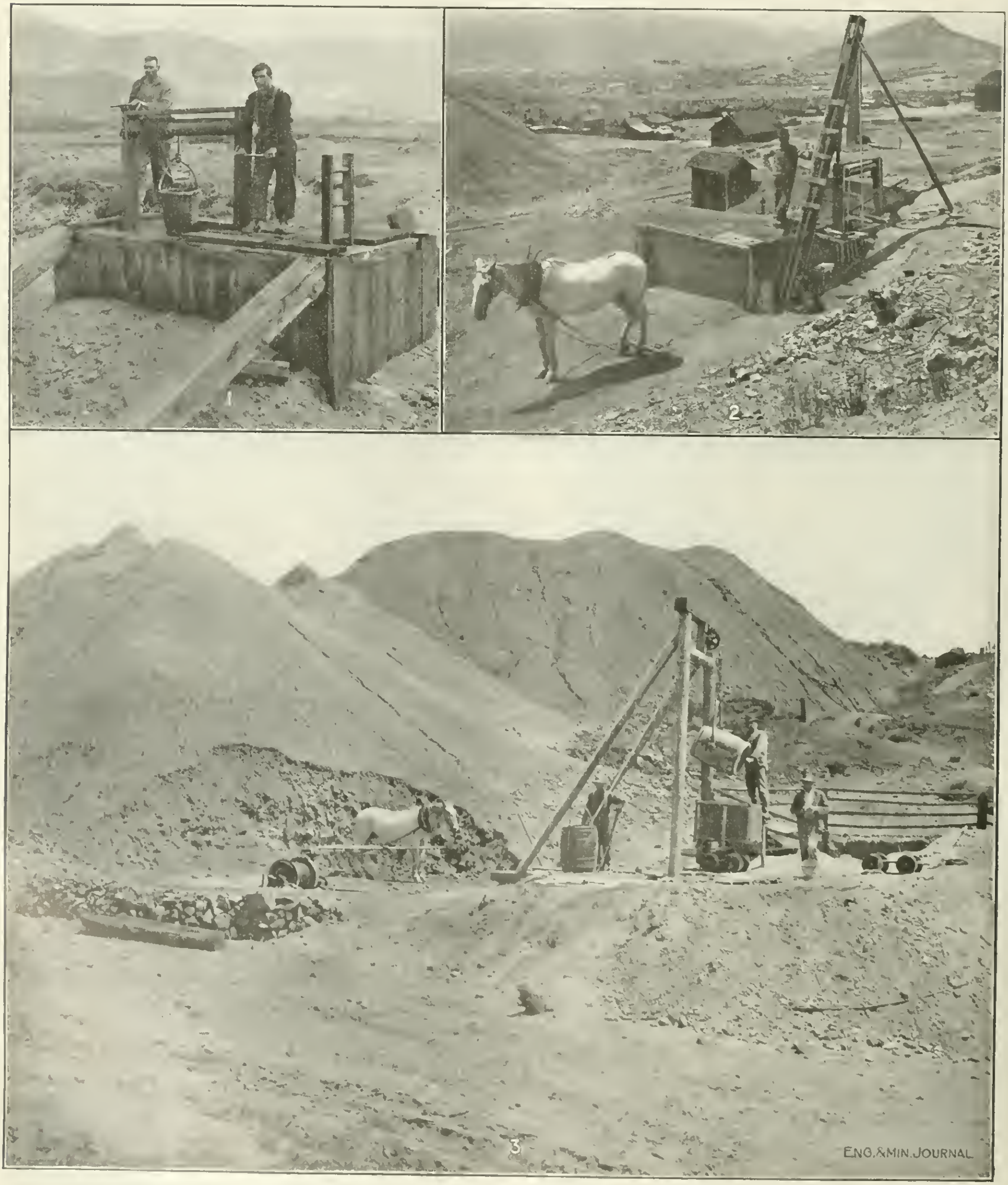
The United States Produced No Molybdenum Ore in 1913, according to the U. S. Geological Survey. Some ore was imported from British Columbia, and worked up in this country, as well as 7.8 tons of molybdenum and ferromolybdenum.

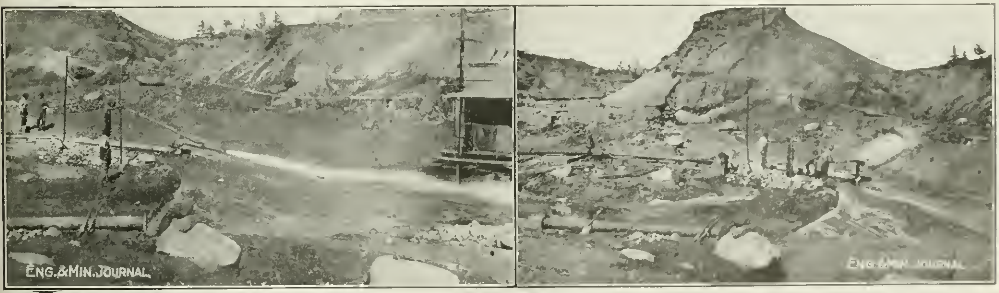
Photographs from the Field



The Way Shafts Are Started at Butte, Mont.

1. First step, the hand windlass. 2. Second step, the whip. 3. Third step, the whim.

War Eagle Mill, and Transformer House of the California-Nevada Power Co., Manhattan, Nev.
Manhattan is a promising camp, reached via Tonopah. There is no railroad.



Stripping the Rowe Mine, Riverton, Minn., Cuyuna Iron Range
Hydraulic system used for removing overburden.

Calumet & Hecla Dredge, Which Will Reclaim Old Tailings for Treatment
This dredge was described in the "Journal" of Nov. 7, 1914.

Correspondence and Discussion

Finding Fault with the "Faultless Faultfinder"

Admitting that some charts may be useful when available, it has been my experience that when the engineer is confronted with a problem, it has to be solved usually at a moment's notice. Though he may know of the existence of charts facilitating the solution and may have the leisure to make himself familiar with their intricacies, at that particular moment he is, as a rule, not within reach of such charts and must therefore evolve a solution.

In an article, "The Faultless Faultfinder," in the Journal of Aug. 15, Messrs. Weeks and Huntington justify the construction of their charts by the following statement: "All fault problems can, of course, be solved by tedious graphical or algebraic methods, provided the necessary data have been obtained or can be assumed. To obviate the necessity for such methods, and to effect a simple, rapid and accurate solution of many fault problems for which the data are at hand, the two charts here described were devised."

The trouble with the particular charts is that, after the necessary data have been obtained or assumed, the charts do not give an accurate solution as claimed.

Actual conditions in the field are, of course, never as ideal as those that must be assumed as a basis for calculations or graphical solutions. But after these assumptions have once been made, whatever method is employed should give results corresponding to the assumptions within reasonable limits. The authors of the charts admit that the latter permit of reading angle θ only to the nearest 5°. That may be a reasonable limit. But in problem 1, for instance, the fact that angle θ is in reality not 20° as found from the charts but 22° 30′ as obtained by graphical solution, leads to an error of nearly 100 ft. in the offset. The latter is in reality 475 ft. as found by graphical solution instead of 570 ft. as obtained from charts. To the practical miner who has to do the work and foot the bills, a hundred feet more or less of tunnel is of considerable importance.

The authors' statement that "all fault problems can, of course, be solved by tedious graphical methods" is no doubt true. But it is equally true that they can also be solved by simple methods consisting merely in the construction of two or, at the most, three ordinary right triangles. I venture the assertion that the graphical solutions presented herewith are even less tedious than is taking the desired data from the charts. They have the further advantage that they require no special tools and that the diagrams if drawn to a moderately large scale permit of reading angles to within 15′ or 30′ and distances to within a few feet. The methods I use consist simply in the application of elementary geometry to practical problems. My reason for presenting them is to discourage spending labor and energy upon the construction of unreliable and intricate charts for the solution of simple problems.

Fig. 1 is a perspective sketch, illustrating the position in space of the right triangles which are used in solving the problems. H represents a horizontal plane in space on which the strike of a vein and a fault plane are drawn as shown. The line of intersection of the two planes passes through the point a, marking the intersection of the strike lines. In the sketch, it is represented by ab. From any point b of this line drop a perpendicular upon the horizontal plane, piercing it at c. From c, draw lines cd and ce at right angles to the strikes of the vein and the fault respectively and connect b with d and e. This gives two vertical right triangles bcd and bce in which the angle bdc is the dip V of the vein and the angle bec, the dip D of the fault. It is seen that the side bc is common to both triangles. There is a third right triangle aeb, which lies in the fault plane and contains the angle θ or its supplement. Its side be is the hypotenuse of the triangle bce and its side ae is the distance between the point of intersection a of the strike lines and point e, where the perpendicular from c upon the fault strike intersects the latter. The hypotenuse of the triangle aeb is the line of intersection of the two planes.

In the graphical solutions the line dc is always drawn first and is given any convenient length. The triangles themselves are revolved into a horizontal plane, analogous to the methods used in descriptive geometry, to show them with their true sides and angles. The angle θ and the "offset" is then found by the simple means explained under problem 1.

In problem 1, a fault striking east and west, dipping 40° to the south, cuts a vein, striking N 60° E, dipping 50° to the northwest. The fault is of the reverse type. The movement of 300 ft. is in a direction 30° to the right of the dip line of the fault. It is required to find angle θ and the offset. These terms are used with the meaning given them in the original paper.

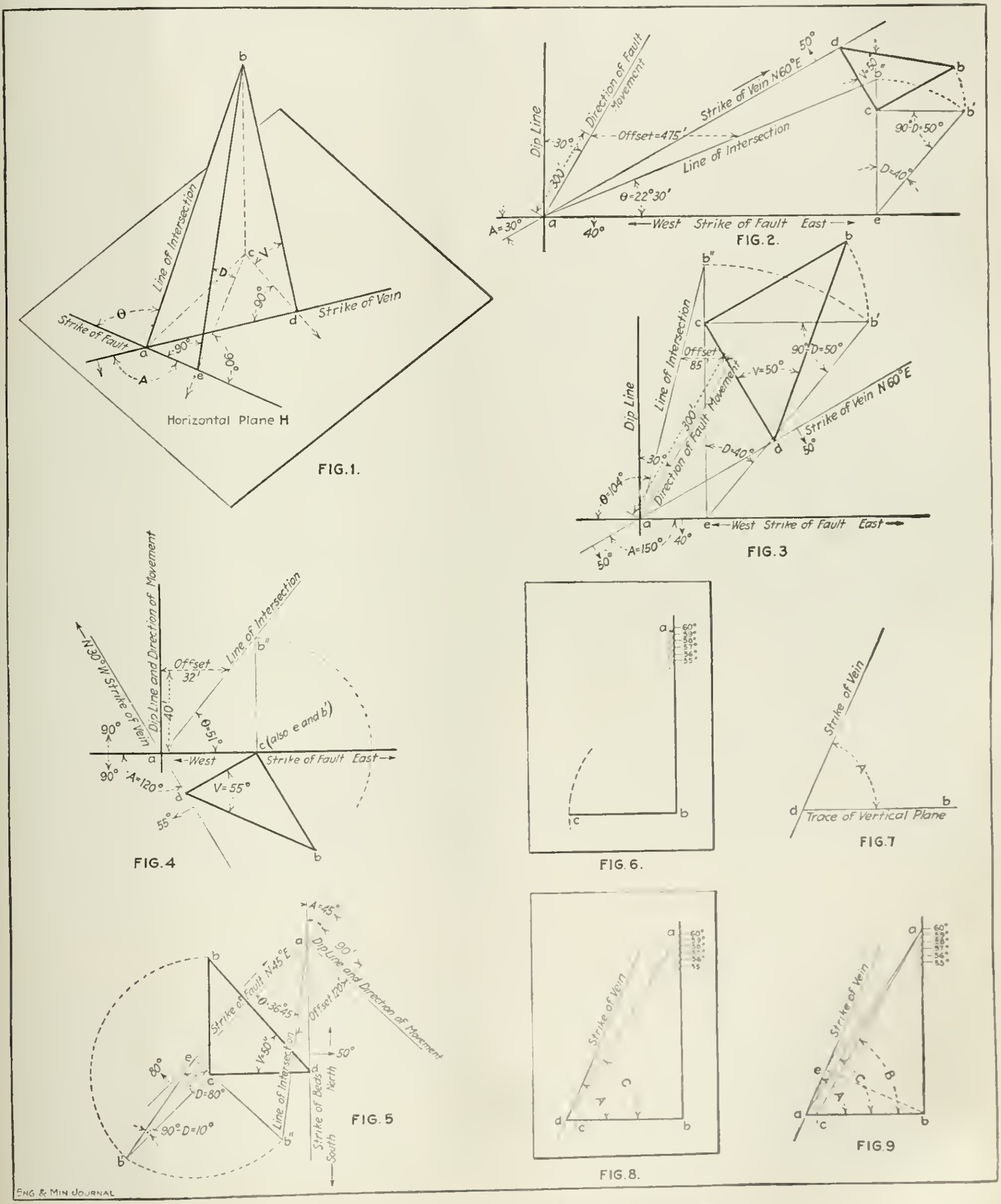
Graphical Solution—In Fig. 2, draw the strike of the vein as shown. From any point d of the strike draw the line dc at right angles to the strike and in a direction opposite to that of the dip. Make it any convenient length. At c erect a perpendicular to dc and from dc lay off the angle of dip of the vein, $V = 50^\circ$, intersecting the perpendicular at b. From c draw a line in the direction of the fault dip, also a perpendicular $cb' = cb$. At b' lay off the complement of the fault dip $(90^\circ - 40^\circ = 50^\circ)$, thus forming triangle $cb'e$. Through e draw the strike of the fault, intersecting the strike of the vein at a. Prolong ec and make $eb'' = eb'$. The line ab'' is the line of intersection of the fault plane and the vein, revolved into the horizontal plane. The angle $b''ae$ is the angle θ which by graphical solution is found to be 22° 30′ and not 20° as found by the charts. Through a lay a dip line of the fault plane, also a line giving the direction of fault movement. On the latter measure off the amount of movement, 300 ft., on any convenient scale and with the same scale measure the "offset" along a line parallel to the fault strike. By this graphical solution it is found to be 475 ft., whereas the charts give it inaccurately as 570 ft.

To construct the diagrams consumes far less time than it does to describe the procedure. In actual practice, most of the annotations and some of the lines shown in the diagrams for sake of demonstration, will be omitted as self-evident.

For problem 2, the conditions are the same as for problem 1, but with the vein dipping to the southeast instead of to the northwest.

Graphical Solution (Fig. 3)—Start with the line *dc* and construct the diagram by taking the steps described under problem 1 in exactly the same rotation.

Problem 3 assumes a vertical fault plane, striking east and west cutting a vein striking N 30° W and dipping 55° to the southwest. The fault movement of 40 ft. was vertical. Find the angle θ and the offset. The graphical solution (Fig. 4) is the same as for problems 1 and



DIAGRAMS OF FAULT PROBLEMS AND SOLUTIONS

2. Only two triangles are formed, triangle *ceb* being nonexistent in this case.

In problem 4, sedimentary beds are assumed striking north and south and dipping 50° to the east, cut by a fault striking N 45° E and dipping 80° to the northwest; the offset of a bed of conglomerates is 120 ft. The faulting movement is along the dip line of the fault. It is required to find θ and the amount of movement. The graphical solution is given in Fig. 5.

In Case I, taking up the use of the charts in plotting geological sections, it is required to find the apparent angle with which a vein should be plotted on a vertical section whose trace is not at right angles with the strike of the vein. I am informed that there are various charts in existence for solving this problem. The July *Transactions* of the A. I. M. E. contains a new chart by Howland Bancroft, which I discussed at the recent Salt Lake meeting of the Institute. On that occasion, I suggested the following simple graphical solution:

On a piece of tracing cloth, Fig. 6, draw a line *bc* on any convenient scale. At *b* erect a perpendicular *ba*. With a protractor cut off on *ba* a number of angles within the probable range of variation of dip, so that a line connecting *a* and *c*, for instance, forms an angle of 60° with *bc*, etc. With *b* as a center and *bc* as a radius, draw a circle through *c*. This completes the tool for solving the problem.

Fig. 7 represents the line of strike of the vein and *db* the trace of the vertical section on which vein is to be plotted with the apparent angle of dip, *C*: *A* is the angle this section makes with the strike.

Fig. 8 shows the application of the method: Place the line *cb* of the tracing over the line *db* of Fig. 7, and move forward and back until the line of the strike becomes tangent to the circle. Connect *d* with the point *a* that marks the true angle of dip as found by actual measurements, 60° in the case illustrated. The angle *adb* is the apparent angle *C* of dip to be used on the vertical section.

The proof is as follows: As is well known, this angle *C* is found from the equation:

$$\tan C = \sin A \tan B \qquad (1)$$

From Fig. 9, which is the same as Fig. 8, with a few lines added for sake of demonstration, we have:

$$\frac{ab}{bd} = \tan C\text{; whence } ab = bd \tan C$$

also

$$\frac{ab}{bc} = \tan B\text{; whence } ab = bc \tan B$$

whence

$$bd \tan C = bc \tan B$$

or

$$\tan C = \frac{bc}{bd} \tan B \qquad (2)$$

From Fig. 9

$$\frac{bc}{bd} = \frac{be}{bd} = \sin A$$

Introducing in equation (2) we get:

$$\tan C = \sin A \tan B \qquad (3)$$

This is the same as equation (1) and shows that angle *C*, in Fig. 8, is the required angle.

As regards Case II, the projection of the line of intersection of the vein and the fault plane upon a horizontal plane is the line *ac* in Fig. 1. It is therefore found in its true position in any of the preceding problems by connecting the points *a* and *c*. The angle which the projection makes with the strike of the vein or fault can be taken off with a protractor.

Case III assumes that the strike of a plane makes an angle of 30° with another horizontal line; the plane dips 60°. Find the angle between the strike of the plane and the vertical projection of the horizontal line on the plane.

The horizontal line in this case is the trace of the vertical section in case I. The angle *C* is the desired angle. The solution can be had by means of the method described under case I.

THEODORE SIMONS.

Butte, Mont., Aug. 29, 1914.

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This letter of Mr. Simons was submitted to Messrs. Weeks and Huntington, in order to present simultaneously arguments from both sides. Their reply is as follows:

⁂

Mr. Simons' criticism of our "Faultless Faultfinder" is summed up in the following statement: "The trouble with these particular charts is that, after the necessary data have been obtained or assumed, the charts do not give an accurate solution as claimed."

This statement is not true, as any one who cares to use the charts may readily ascertain. The charts are as accurate as any similar graphical method.

Mr. Simons is laboring under a misunderstanding when he states that "the authors of the charts admit that the latter permit of reading angle θ only to the nearest 5°." What the authors really said was that in the illustrative problems worked out in the text, the angles were read only to the nearest 5°. This was done merely for simplicity of exposition. In practical use, the angle θ would, of course, be read much more accurately. In problem 1, for example, if Mr. Simons will take the trouble to go through the steps indicated in chart I, he will find that the angle θ comes out in fact 22° 30′, precisely as it should. As stated in the footnote on page 291, the charts to be supplied for field use will be even more accurate than the copy published in the JOURNAL.

Mr. Simons adds that he desires to "discourage spending labor and energy upon the construction of unreliable and intricate charts." The charts here referred to are not unreliable; and the only intricacy involved in their use is the necessity of employing a protractor for measuring an angle. As a matter of actual experiment, starting with the data of problem 1, namely $A = 30°$, $D = 40°$, $V = 50°$, the time required to obtain the angle θ by the use of chart I is less than 25 seconds.

W. S. WEEKS.
E. V. HUNTINGTON.

Cambridge, Mass., Oct. 16, 1914.

⁂

[We are of the opinion that both parties to this controversy are more or less in the right. Mr. Simons' graphical methods are most available for the mining engineer; Messrs. Weeks and Huntington's charts for the geologist. The engineer with little work of such nature to do will not care to encumber himself with the charts in addition to the other tools of his trade, whether he be permanently situated or engaged on examination work. The geologist, on the other hand, with great numbers of such problems to solve, will find that the charts save him a large amount of time. In Mr. Simons' own city of

Butte there is a case in point. We have no data on the number of fault and vein intersections and projections which Messrs. Brunton, Winchell and Sales have calculated and plotted for the Anaconda company, but beyond doubt the use of these charts for the work would have saved many days of high-priced time, for the charts are extremely fast and they are accurate. Messrs. Weeks and Huntington are correct on that point. If Mr. Simons tested the charts and found them correct only to about 2½°, the difficulty lies in the reproduction of the charts, not in their construction. The JOURNAL is printed from plates bent to cylindrical form. In this process a slight degree of distortion is inevitable. It is for this reason that the article is offered as a pamphlet printed from flat plates, in which the error will be found extremely small.

On the other hand, Mr. Simons' methods, which are excellent in their class, will be found most convenient for such engineers as may unexpectedly run into a fault in their mine workings or who may in other ways occasionally encounter such a problem.—EDITOR.]

Science vs. Business

Science has never yet made a fortune. Business has. To bring these facts within our own purviews, they may be translated into the statement that a mining engineer never accumulated much money by technical skill. Shrewd business ability, posing as technique, has gained fame and emoluments. Sometimes science aids business, but it is business that acquires money. Science alone is impotent.

The great number of nontechnical men in charge of mining operations sufficiently demonstrates the truth of my premise. In addition to those who are not mining engineers, there are many who are not technicians at all, but business men who have entered the profession by a side door and found a short cut to the top. A peculiarly striking fact is that business men are always wise enough to employ skilled technical men to direct the technical work. They usually, too, see that these men remain under cover, so that the glory of success has but one resting place. In case of failure it is good business to have a technical man or two to carry the cross.

These observations are not profound, but they emphasize a situation which has been carefully evaded in professional discussions. It should be considered, not that it is one that should not exist, but in order to point out a proper course of preparation for those entering the profession and those already in it. The student is usually told that he will rise or fall according to his technical skill.

I believe this is not true; I know it is not true. There are too many properties successfully operated by men who possess no deep technical knowledge, to hold to such a belief. Business ability is certainly a requisite—I may even say a primary requisite. Business ability plus technical skill is ideal, but business alone will gain much more, financially, than science alone. It is true not only in mining, but in every trade and profession known to the civilized world. Why not recognize the truth and advise our profession accordingly? Business first! Science if you will, but business always!

HENRY A. MARVIN.

Yonkers, N. Y., Oct. 21, 1914.

Views of the Mexican Situation

From El Paso the other day I took a short excursion into Mexico. Juarez shows evidences of having been all shot up. If the rest of Mexico looks anything like Juarez, it is high time we did something to save the remainder of the country from ruin.

Whether or not the results of the election last Tuesday contained in them any rebuke to the present administration as to the policy in Mexico, it is difficult to say, but I am inclined to think from the evidence which I collected on the border that if the American mine and cattle owners interested in Mexico had a vote, they would cast it as a unit against the present policy of "watchful waiting."

Every day Villa seems to be increasing in strength by the acquisition of men, and, above all, by additions of arms and ammunitions which he obtains from this country. If we do have to intervene in Mexico, it will be a good deal more difficult to do so when he is thoroughly armed and equipped.

The opinion of men with whom I talked in El Paso is that the men of brains and ability, capable of governing Mexico, have fled the country, and that she is in far worse straits than ever before. The opinion of the American refugee resident in El Paso seems to be that there can be no peace in Mexico so long as the present "watchful waiting" policy of the administration continues.

I do not think it necessary, or that this country wishes, to make war on Mexico. At the same time I certainly think that something should be done to protect what is left of our American interests in that country and to try in some way to readjust the situation. Surely the conditions in Cuba are an earnest of what can be done by our government in the way of controlling political situations.

However, I do not pretend to have any opinion as to how the present situation can be relieved. All I do know is that unless something is done very soon Mexico will look like the pictures of Louvain.

OLD COLORADO MINER.

New York, Nov. 5, 1914.

The remarks about elections in Mexico in the JOURNAL of Oct. 24 score 100. I still have hopes that the drumhead and bayonet election will amount to something, but the pessimism in the City of Mexico is overpowering. In the meanwhile the delay is playing hob with everything.

X. Y. Z.

Mexico, D. F., Oct. 29, 1914.

Prisoners of War

In regard to the editorial in the JOURNAL of Nov. 7, an American precedent for the use of prisoners of war in the mining industry was furnished by the drafting of about 30 of the Hessians captured at Trenton for use in the New Jersey iron works of John Jacob Faesch, at Mount Hope. A good many of them afterward settled in this region. Being mercenaries and personally disinterested in the outcome of the war, it is probable that they welcomed the original arrangement.

E. P. B.

New York, Nov. 9, 1914.

Chronology of Mining for October, 1914

Oct. 1—Phelps-Dodge introduced company-store profit-sharing plan for employees.—El Oro company resumed operations on small scale after five months' shutdown.—Cave-in at American Davey mine, in Joplin district.

Oct. 2—First withdrawal of militia from Butte.

Oct. 6—Duncan deposed as mayor of Butte.

Oct. 8—Pittsburgh meeting of A. I. M. E.—Montana supreme court rendered decision to effect that military courts in Butte were illegal.

Oct. 9—City of Antwerp taken by Germans.

Oct. 12—Boer commando mutinied in South Africa.

Oct. 14—Dunbar blast furnace of American Manganese Manufacturing Co. blown in, using Cuyuna iron-manganese ores.

Oct. 16—Additional withdrawal of militia from Butte.—Cloudburst in southeastern Missouri did great damage to railroads and mines.

Oct. 17—Mason Valley suspended operations.

Oct. 18—Butte & Superior closed down.

Oct. 19—Fire broke out in Mexican mine on Comstock, soon controlled.—St. Joseph Lead Co. announced curtailment of 25% in output of lead.

Oct. 20—Alaska coal-land leasing bill signed by President.

Oct. 21—Settlement of Silver King Coalition-Silver King Consolidated suit by compromise, each company getting certain claims.

Oct. 23—War-tax bill signed by President.

Oct. 24—Announcement of negotiations looking to establishment of Bolivian tin-smelting plant in the United States.

Oct. 26—Bullwhacker stockholders accept reorganization plans.

Oct. 27—Generals De Wet and Beyers revolted in South Africa.

Oct. 30—Col. Maritz, rebel leader in Cape Province, beaten and driven out of colony.

Sir George Paish's Views

Sir George Paish is said to have expressed the following opinions respecting business prospects in the United States:

"I think there may be a considerable revival in trade next year. There is promise that the embarrassment in connection with the marketing of the cotton crop of the United States will be removed.

"As the bottom appeared to fall out of the cotton situation, prospective buyers were naturally apprehensive, and they will be reluctant to make commitments until they are assured that improvement is in sight. I think there is a good deal in the contention that India will begin to buy cotton once it is evident that the price has reached its low level.

"Britain's ability to loan, of course, depends very largely upon the ability of the rest of the world to meet obligations to her. With its enormous crops and good markets for its products, the United States must continue to save a great deal of money. It is a question for it to decide whether it will continue to lay additional tracks on its railroads, construct costly terminals and build beautiful buildings, or whether it will take up the task of helping to furnish the capital for the world's development, and particularly for the newer countries on the American continent.

"Through the failure of some of her creditors to pay their bills, a percentage of Britain's immediate income has been cut off, and the country must place aside the sums due to capital account. These sums are involuntary savings, which must be described as contingent assets. The German and Austrian liabilities are believed to amount to \$250,000,000 to \$300,000,000.

"The situation in the United States has improved greatly since we have been here. There is now a feeling that the credit position has been saved.

"The operation of the federal reserve banks will materially assist the United States' position. The main result of the establishment of this system will be to give the United States much greater freedom and power to meet the present situation."

Dry Chlorination at Bunker Hill & Sullivan

President Fred. W. Bradley, of the Bunker Hill & Sullivan company, announced at a reception tendered him at Kellogg, Idaho, this week, that it was apparent that within a short time a new industry would be established in Kellogg, that of producing metallic lead. He said that a series of experiments have been carried on by S. A. Easton and his assistants at the old north mill. "If these experiments develop as they are expected to do," he said, "it will do away with the necessity of shipping the ores to the smelters for treatment. The time is almost sure to come when all of this work will be done right here."

Mr. Bradley telegraphed to the JOURNAL as follows: The experiments referred to are not yet completed and much more experimental work must be done, but all work so far done promises ultimate success. We have installed a Malm modified dry-chlorination unit to have a capacity of 50 tons raw ore per day. The greatest difficulty has been in the electrolysis of the zinc chloride, but ultimate success here also seems certain. The metallic zinc liberated is to be re-used as a precipitant, and the chlorine gas set free is to be used for chloridizing all the metallic contents of our ore, containing lead, silver, zinc, iron, copper and gold, the idea is to make the process continuous, recovering all metal contents with little loss. Experiments indicate any excess iron can be disposed of by a light roast. Lead pigments may also be made.

The Cyanide Ship

Much interest has followed the movements of tank steamship "Sun," belonging to the Sun Oil Co., of Philadelphia, which has been chartered to bring a cargo of needed merchandise, including 1000 tons of cyanide for mining purposes, from Rotterdam. The entry of the "Sun" into Falmouth harbor gave rise to a report that she had been detained by the British Government, but investigation shows that this is not the case. The "Sun" put into Falmouth, following her owners' orders, for repairs and to show that her papers were in order, the object being that she would not later be delayed by British warships. She was released promptly and left for Rotterdam, where loading is now in progress.

Editorials

The Copper Export Controversy

The international copper imbroglio would have certain humorous elements were it not that the American copper producers are so seriously affected. Like the coon up a tree, they are not in a position to see the joke. The British also are not perceptive, but that does not surprise anybody. Anyway, the joke is not on them.

The British are determined that the Germans shall not obtain any copper from the outside. This is not going to render the Germans short of copper for military purposes. They have got the output of their own Mansfeld mines, which is probably sufficient. If it be not, the Germans will get what they need from scrap, even tearing down and remelting their trolley wires, if necessary.

German industries, however, can be made to suffer severely by deprivation from copper. In this the British are inconsistent. They are willing that German manufacturers shall have cotton, but not copper.

In order to keep the Germans from getting copper, they have seized it when carried in neutral ships from one neutral country to another neutral country. Eminent international lawyers say that this is contrary to the rights of neutrals. Probably the British know that. Anyway, after some formalities and some delay, they release the detained ships. Then our Department of State cackles over its achievement. We fancy the British diplomats laugh up their sleeves.

They take an untenable position, and one that they probably have no idea of trying to hold, but by detaining copper-carrying ships they scare the ship-masters, who have come to regard copper consignments like the plague and now refuse to take them. As for the detained copper, the British offer to buy it—at a substantial discount! Thus, Britain gets some cheap copper, stifles America's export trade to everywhere but herself and France, and by limiting America's markets plays for some more cheap copper.

This preposterous procedure puts the joke wholly on the American copper producer, which is a collective name embracing many thousands of persons—including miners in Michigan, Montana, Utah and Arizona and stockholders in New York and New England. All of these citizens have been as hard hit by the industrial earthquake as have the cotton-growers of the South, but they don't "holler" so loudly. The miner loses his work, and knowing that he has no ground for kicking against his employer just fades away. The stockholder loses his dividends, perhaps the sole source of his income, and resigns himself with the remark that he is unlucky, just as the New Haven stockholders were.

Conditions are compelling the sacrifice of the livelihood of these citizens and nothing is said about it. Their Department of State is smug and complacent. Yet if that department should take a firm stand for American rights, Great Britain would probably defer to us, for she does not want to vex her best friend. Indeed, that Great Britain has done as she has is probably merely an exhibition of bureaucratic stupidity, on all fours with her censorship of the news, which also has been the subject of criticism.

Italy and Scandinavia are normally considerable consumers of copper. That their demand should now be greater than formerly is in itself neither cause for surprise nor suspicion. Germany was formerly our principal customer for copper, but what she took from us did not wholly remain in that country. She took in ingots, cakes and wirebars and she reëxported a large proportion of it as sheets, wire, brass and other manufactures to other countries, including Italy. Those countries deprived of such supply naturally increase their own manufacturing. Moreover, several countries in Europe that are still at peace are nevertheless preparing for military emergencies, which is requiring copper. Let it be taken for granted that someone may try to transfer to Germany American copper that enters Italy. The merchant in Italy who buys a million pounds of copper on the basis of 11c. per lb., New York, and succeeds in getting it into Germany and realizing 20c. per lb. makes a fortune out of one transaction, and will do it if he can. The prohibition of such traffic, however, seems to us to be a matter between the Allies and Italy, not between them and the United States.

The American copper industry has been put in the position of being the only one of the furnishers of material used largely in war that is not profiting hugely by the needs of the combatants. The exporters of automobiles, ammunition, horses, saddlery, and hundreds of things are getting big prices. The copper producer is put in the position of having to sell at England's price, which at present is less than a living price.

Thus England and her allies are obtaining some of their important war material on very low terms. The American copper producers are depleting their principal in order to furnish it; in other words, they are *giving out of their pockets* to help the Allies carry on the war. Many of their employees are out of work. And Secretary Bryan thinks he is doing all that a diplomat can do when he secures the release of a cargo.

Affairs in Mexico

The essence of republican government is the consent of the minority to the measures of the majority. Indeed, the majority can seldom pass an important measure unless there is going to be such a consent of the minority. Were it otherwise, the Democrats would undo all that the Republicans had previously done, and when the Republicans came again into power they would reverse the actions of the Democrats.

This has not yet been learned in Mexico (nobody supposed that it had been), and after Villa and Zapata had won the election at Aguascalientes, Carranza declared he would not abide by it. Hence more fighting, with Carranza in the position formerly held by Huerta. We may picture a procession of provisional presidents, who have to be successively ejected. But of course this is too much of the nature of *opéra bouffe* to last.

In the meanwhile, the north of Mexico appears to be fairly quiet under the domination of Villa, with whom the industrial interests seem to be able to get on well. Consequently, mines and metallurgical works are being reopened and actual conditions are probably better than might be inferred from the press dispatches or even the gossip along the border.

Tidiness in Metallurgy

The best metallurgical practice is usually found in the best kept plants. This is not necessarily so, nor is it the result of order *per se;* nevertheless, it is generally true. Habits of order and cleanliness seem to inculcate the spirit of efficiency in every department, and on entering a mill that is kept in order, one instinctively feels that the metallurgical practice is good, and this is usually the case. At the property of the Miami Copper Co. in Arizona one is impressed by the cleanliness and order maintained at its mill, which immediately inspires confidence in the metallurgical efficiency of the plant. The shafts in the Miami mill are polished with emery cloth, so as to make them shine; any oil that spatters on the mill floor is covered with lime and cleaned up before washing the floor at the end of every shift. The actual cost of keeping the mill clean and orderly, once this habit is established, is small. It automatically prevents the men or the mill from acquiring a slovenly appearance, and is typical of the Miami spirit of efficiency.

Polishing the line shaft and scrubbing the floor look like ultra refinements, but they are of the same order of things as the macadam roads and little grass plots of the Washoe reduction works. A metallurgical plant need not be wholly an unlovely thing. The lawns in front of the Calumet & Hecla stamp mills at Lake Linden give a pleasing distinction to that instutution. Such things create a spirit among the staff that extends to the work that is being done. Show us a tidy plant and we will prophesy the excellence of the metallurgical records before examining the books. When we find the slovenly plant, disfigured by piles of scrap iron that nobody has taken the trouble to ship to the junkman, heaps of rubbish that no one has bothered about carting off, mud holes, tumbling down buildings and the rest of the characteristic phenomena, we know that the same carelessness is to be found in the watch for the metals being treated.

New Mining Legislation

Montana's proposed workmen's-compensation law was submitted to a referendum at the election this month. This law was directed especially against the Anaconda company, whose annual accident bill would be increased about $500,000 by its terms. The proposed law, which is quite outrageous, was the demand of the labor unions, who enlisted the support of the farmers of the state so far as they could. Naturally the employers worked against it. They would not object to a reasonable law, but that which is threatening in Montana is too much to swallow gracefully. A few days ago it was believed that it had been defeated and there were congratulations about the good sense the people had displayed, but according to the last advices the vote is so close that a recount may be necessary.

Arizona has just passed a new law requiring the mining companies to have at least 80% American citizens among the men on their payrolls. This will produce trouble for some of the companies which have heretofore employed a good many Mexicans. The vexation of this law may be offset, however, by the advantages that will accrue from Arizona having voted for the prohibition of alcoholic liquor, which has been the curse of all mining camps. Colorado also has become a prohibition state.

It is understood that some of the Arizona companies will contest the constitutionality of the 80% law.

Zinc in Germany

The last batch of German papers reported a recent sitting of the Zinkverband, which is the German section of what was the International Zinc Convention. There was some discussion of the status of that association. It is our own guess that the zinc, lead, antimony, aluminum and bismuth conventions, and all other international conventions blew up on Aug. 1. The zinc business in Germany seems to be in a bad way, which is not surprising, it being there that most of the great stock existed.

If the Russian advance continues a little further, the zinc mines and smelteries of Upper Silesia are likely to suffer. The principal towns of that region—Beuthen, Kattowitz, Tarnowitz, Königshütte—are but a few miles from the Polish frontier, and but short marches from Chenstohova in Poland and Cracow in Galicia. This is a rich part of Silesia and its capture probably figures in Russian military plans.

*

Business conditions due to the European War have generally disturbed and demoralized the markets for the more important metals. They have also had great effect on those for the secondary or minor metals, such as antimony, aluminum and quicksilver. In the case of nearly all of these, the outbreak of war was followed by rapid and erratic advances. In most cases, these have not lasted and prices have subsided to nearly or quite their old level, demand in most cases being light. The chief exception is antimony, in which there is a real scarcity, owing to heavy demand abroad, and sales of stocks for export.

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Pig-iron production in the United States has been steadily declining during the last six months, and is now at the rate of 19,800,000 tons a year. Should no further decline occur, the total for 1914 will be a little over 23,000,000 tons, or over 7,500,000 tons below the total of 1913. The decrease has been slightly greater with the merchant furnaces, which make pig iron for sale in that form, than with the steelworks stacks, the output of which is for immediate conversion into steel. As pig iron is the basic form of the iron and steel industries, it would appear that there has been this year a decline of nearly 25% in those industries.

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Dr. Henry Gannett, whose death is recorded on another page, did much to aid in the success of the Geological Survey during his 32 years of service as geographer of the Survey. Never sensational or self-seeking, his intelligent work made its impression on all who knew its extent and thoroughness. He found time also for much outside work of a lasting nature. Through the National Geographic Society, of which he was one of the founders, he did much to spread the study of geography and the appreciation of its importance.

PERSONALS

George H. Garrey is examining mines in British Columbia.

Robert Sticht, of Mt. Lyell, Tasmania, is in New York. He is revisiting America after an absence of 20 years.

Dr. Kuno Heberlein, of Mexico, president of the Peñoles company, is visiting New York.

Ex-Senator W. A. Clark, who recently returned from Europe, has been visiting Butte.

H. G. C. Thofehrn has opened offices as a metallurgical engineer at 1482 Broadway, New York.

Arthur J. Hoskin, of Denver, Colo., has been engaged on some professional work in the Dahlonega district, Georgia.

Adolph Lewisohn, of New York has been chosen president of Kerr Lake Mining Co. to succeed the late William G. Nickerson.

Alexander P. Rogers has gone to Peru, where he expects to be occupied with professional work during the next eight or nine months.

Walter Harvey Weed is spending a week in New York previous to leaving for an extended trip in Montana, Nevada, Idaho and Arizona.

R. P. Doucet, European sales manager of the Asbestos Corporation of Canada, has returned to Montreal, having had considerable difficulty in getting away from Hamburg.

W. L. Johnson and C. Harrington, of the U. S. Geological Survey, who have been investigating mines and prospects in the Port Wells district, Alaska, are on their way from the North to Washington, D. C., having completed their work.

E. Mackay Heriot, a well known English mining engineer and a frequent contributor to the "Journal," writes us that he is back in London after having been a prisoner of war in Germany. He reports that he was well treated while he was held there.

H. C. Hoover cannot restrain his generous interest in public welfare. Having done wonderful work in assisting the Americans in England, he has now turned his attention to aiding the suffering Belgians, and is playing an important part in the relief measures for that unfortunate country.

Pennock Hart has been elected president of Mackintosh, Hemphill & Co., Pittsburgh, succeeding Joseph Fawell, deceased. Mr. Hart has been connected with the company since its incorporation as a limited company about 35 years ago. For nearly 30 years he has been treasurer and will continue to act in this position.

T. H. Davis, for years identified with the Bayway Chemical Co., Elizabeth, N. J., has resigned his position as vice-president and general manager of that company and has been engaged by the Rahway Coal Tar Products Co. to conduct and manage the new plant which it expects to have in operation at Rahway, N. J., early in 1915. The new company is controlled by Merck & Co., of New York.

H. A. Sutliffe, for nine years master mechanic and chief electrician with the Bully Hill Copper Mining & Smelting Co., Winthrop, Shasta County, Calif., and for the past two years master mechanic and accountant with the La Grange Mining Co., Weaverville, Calif., has purchased a half interest in the Marine Iron Works, Eureka, Humboldt County, Calif., and will take charge of the mechanical end of the business.

J. C. Farrant, European manager of the Hardinge Conical Mill Co., was lost sight of for nearly one month, he being among the English combatants. The company informs us that he has just been discovered as a prisoner in the Doeberritz detention camp near Berlin. His description was: "J. C. Farrant, seaman, R. N. V. R., London, No. 3228, D Co., Hawkes Battalion, First Brigade. Last heard of at seige of Antwerp. Oct. 8." Mr. Farrant is a member of the Institution of Mining and Metallurgy, of London; also of the American Institute of Mining Engineers.

OBITUARY

Joseph Rupprecht died in New York, Oct. 26, aged 49 years. He was born in New York and was well known as a manufacturing chemist, having been for all his active life connected with the well known chemical firm of Eimer & Amend

Allen Roswell Tees was drowned in James Bay, Ungava, on Sept. 29. He was a resident of Montreal and a student at McGill University. He was a member of a survey party sent out by the Ungava Mining & Trading Co. to explore the territory.

Alfred E. Copp died at Brookline, Mass., Oct. 30, aged 46 years. Born in Canada, he had lived in Boston about 15 years. He was well known as a mining broker and promoter, having offices in Denver as well as Boston. He was connected with several important mining enterprises.

Charles Israel Newman died in New York, Nov. 4, aged 80 years. He was born in Prussia and came to this country when a boy. He was one of the few survivors of the Forty-niners, having gone to California in 1849 with the first adventurers from New York. He spent 16 years mining and prospecting in California and Nevada. He returned to New York in 1865, and had since been engaged in business.

Henry Gannett, president of the National Geographic Society, chairman of the United States Geographic Board, and geographer of the United States Geological Survey, died Nov. 6 in Washington, D. C. Dr. Gannett was born in Bath, Me., and was graduated from the Lawrence Scientific School of Harvard University in 1869, and from the Hooper Mining School the following year. He was an assistant at the Harvard Observatory from 1870 to 1871, and for the next seven years acted as topographer for the Hayden Survey of the territories. When the Bureau of Geological Survey was created Mr. Gannett assisted in planning its work, and in 1882 he became its chief geographer. He was geographer of the Tenth, Eleventh, and Twelfth censuses, and in 1902 was appointed assistant director of the census of the Philippine Islands. In 1907-08 he served in the same capacity in Cuba. During the years 1908-09 Mr. Gannett served as geographer of the Conservation Commission, and he was also associate editor of the "Bulletin" of the American Geographic Society, chairman of the United States Geographical Board, and a member of the American Geographic Society, the Scottish Geographic Society, the Philadelphia Geographic Society, the American Statistical Association, the Washington Academy of Sciences, and the secretary of the Eighth International Geographic Congress. He was also a member of the Cosmos Club, of Washington. Mr. Gannett was the author of a "Manual of Topographic Surveying," and prepared the statistical atlases of 1880, 1890, and 1900. He was also the author of a commercial geography, a dictionary of altitudes, and of "Building a Nation," "United States," "Stanford Compendium of Geography," "Magnetic Declination in the United States," besides many other Government reports, reports on forest conditions, and gazetteers of Massachusetts, Rhode Island, Connecticut, New Jersey, Kansas, Texas, Utah, Virginia, West Virginia, Maryland, District of Columbia and Indian Territory. He contributed to the "Encyclopædia Britannica," and also Johnson's and the New International, and was the author of the Contour Map of the United States and many other maps.

SOCIETIES

Mackay School of Mines—This school at Reno, Nev., which has heretofore been connected with the School of Engineering, has been made a separate and independent department of the University of Nevada.

American Institute of Mining Engineers—A meeting of the New York Section was held Nov. 4, at the Kaiserhof, Broadway and Thirty-ninth St., New York The meeting was preceded by a dinner. Following the dinner Dr. James Douglas talked informally. Dr. A. R. Ledoux presided

American Electrochemical Society—The New York Section held a joint meeting with the American Gas Institute and the Illuminating Engineers at the Chemists Club, Nov. 10. The subject of the evening was "Contributions of Chemistry to Illuminating Engineers." Five papers were presented and discussed.

University of Washington—Placer mining is receiving special attention in the School of Mines at Seattle. The short course for practical mining men, which the school has been conducting for 17 years past, will open on Jan 4, 1915, and will continue to Apr 10. A year ago there was an enrollment of 41 for this course, and a larger attendance is expected this year

American Society of Mechanical Engineers—A meeting of the New York Section was held at the Engineers' building, Nov 10. The subject for the meeting was "The Development of the By-Product Gas Producer Industry in Europe." [illegible] H. Lymn, London, England, presented the paper of the evening Mr Lymn is the inventor of the Lymn process and his talk was illustrated with lantern slides.

Editorial Correspondence

SAN FRANCISCO—Nov. 4

On the Comstock, the Mexican fire excitement is about over. A little fire remains, but appears to be under good control, and closer approach is being made to the seat of the trouble. The Mexican has removed two bulkheads on the 2000-ft. level, made pipe connections to carry water to the winze station on that level and cooled off the southwest drift. Repairs were also made on the hoist and motor at the winze.

DENVER—Nov. 5

In the District Around Red Cliff in Eagle County a good deal of work is being done although on a small scale. The Bleakhouse mine in Rock Creek has resumed operations under a contract for breaking the ore. Two grades are shipped, one silver-lead and one zinc-lead. This property has been a steady producer for several years past but has been closed on account of fire for the last eight months. Representatives of the Empire Zinc Co. have been looking over the camp thoroughly and already have acquired the Eagle Bird, St. Joe and Belden groups with several other claims on the Rock Creek side of Battle Mountain. They have had a party of surveyors in the camp most of the past summer running lines and reëstablishing old corners. The Black Iron Group at Bell's Camp is under bond to the American Zinc, Lead & Smelting Co. This is one of the old producers of the camp but had never been explored for zinc-lead ores. The outlook for large bodies is encouraging and already several cars have been shipped for trial treatment. The Iron Mask property operated by the Eagle Mining & Milling Co. is maintaining a production of 120 tons crude ore per day. During the summer a new wire-rope tram was installed to move the iron tailings from the mill. Several sets of leasers are at work on the Ben Butler, Tip Top, Maple, Pine Martin and Champion. The Wyoming group on Turkey Creek above Red Cliff is a regular shipper of high-grade silver ore. The new camps of Eagle County on Brush Creek near the town of Eagle have been quiet during the summer. A number of men have been at work on prospects but nothing equaling the Lady Belle has been uncovered.

BUTTE—Nov. 5

The Compensation Law voted on at the recent election, under the referendum, was at first reported defeated. Now it appears that the vote for and against was remarkably close, indicating that a recount will be necessary.

Election Returns up to the time of writing indicate the complete defeat of the Socialists in Silver Bow County and the election of the Democratic candidates, with the exception of sheriff, for which Charles S. Henderson, the Republican candidate, was chosen. This is equivalent to an indorsement of Governor Stewart's action in summoning the militia to maintain order in Butte, as well as of Judge Ayer's decision by which Mayor Duncan, Socialist, and Sheriff Driscoll, Democrat, were removed from office. By their votes, workingmen, miners, business and professional men and property holders have shown that to them the welfare of Butte is of chief concern; that in their efforts to continue mining operations on which every citizen is dependent, directly or indirectly, the mining companies must receive the moral support of the whole community; and that there is no occasion for antagonism, such as the members of the Socialist party and the professional agitators have been preaching unceasingly since their ascent to power here. With the defeat of the Socialistic régime, it is hoped that normal conditions will soon prevail and will result in the withdrawal of the troops and the return of civil government. [Latest reports are that Governor Stewart ordered final withdrawal of troops for Nov. 12. Editor.]

Muckie McDonald, Joe Bradley and Joe Shannon, by an order of Judge Donlan, will be transferred in a few days from the Silver Bow jail to the Jefferson County jail at Boulder, where they will be tried next week on the charge of kidnaping.

SPOKANE—Nov. 1

In the Coeur d'Alenes mining conditions are good, considering the demoralized metal market, and the output is being maintained at almost normal level, according to Robert N. Bell, state mine inspector of Idaho. He states that the mining industry there is marking time at present. Several of the mines are closed down and others are operating at reduced capacity. The lead is produced at an average loss of ½c. per lb., and it is only the associated silver that makes it possible for any of the mines to operate and at that only a narrow margin to work on is left for most of the operators. President Bradley, of the Bunker Hill & Sullivan Co., has promised his men that that mine will continue to operate at normal capacity as long as the smelters will receive the ore, a promise it is believed he is able to fulfull by reason of foresight in making smelter contracts. A notable feature of mining development in the district is the remarkable expansion of ore resources in the deep levels of the principal mines at Burke, where the Tiger for several years has indicated exhaustion with depth. The present great ore disclosures in the deep levels of the adjacent mines, however, lead to the reasonable conclusion that the Tiger was a poor guide as to permanency. On the strike of these Cañon Creek veins in the Nine Mile district the three principal producers, Tamarack and Custer, Interstate-Callahan and Success, have more than made good their remarkable promise of a year ago in developed resources, and are simply suffering a curtailment of output at this time on account of the lack of a market for their products and inadequate capacity. In the Kellogg-Wardner district, the Bunker Hill & Sullivan continues to expand and disclose new lines of ore resources in its deepest levels. The Last Chance is still giving employment to 200 men and managing to realize a small margin of profit. The Sierra Nevada, Ontario and Stewart mines show good reserves and continue almost normal production by virtue of the contained silver in their ores. The Caledonia has developed into the bright particular star of the district and in spite of low metal-prices is now paying monthly dividends and probably making more money per man employed than any other mine ever did in Shoshone County.

CHICAGO—Nov. 7

The Arrest of J. C. Roberts was made by officers of the Federal Department of Justice, Nov. 2, in Chicago, on an indictment returned recently by the Salt Lake City Federal grand jury, charging him with using the mails to defraud. This is alleged to be in connection with the American Radium Co. Roberts denies the charges.

The White Pine Copper Co.'s Mill, now being erected in Ontanagon County, Mich., is going to be unusually interesting, inasmuch as it involves a distinct departure from the standard practice of the copper country. Last winter, Allis-Chalmers furnished a large quantity of machinery for this mill, which is to be of 1000 tons daily capacity. While exact details regarding the flow sheet are not obtainable at present, it is understood that no stamps will be used, rolls having been substituted therefor.

Manufacturers' Reports of Inquiries received in reference to mines and milling machinery in this vicinity during the last few weeks indicate that while business with the mines is below normal, it is not entirely stagnant. There are also good indications that some of the properties are using the present time to make much needed repairs. This in itself should offer a fair volume of business. The Talc Products Co., with offices in New York City and mine at Glendon, N. C., is asking for figures on a complete plant for refining talc, of a daily capacity of from 50 to 100 tons. Elm Orlu and Butte Superior are figuring on new hoists, and the latter company is also planning some changes in its mill. Symons Bros. is shipping five 48-in. Style C, Symons disc crushers to the Braden Copper Co., at Valparaiso, Chile. Four of these machines previously were supplied to the Chile Exploration Co.

DULUTH—Nov. 7

Taxation has been a subject of keen interest of late. The state tax commission is attempting to levy a tax of 4c. to 4½c per ton on ore in stockpiles, but is encountering strong opposition on the part of operators on the Vermilion and Mesabi. There are between 4,000,000 and 5,000 000 tons stocked on the Mesabi and operators maintain that the tax on this would result in curtailment of winter mining operations and hardship to the men. The Steel Corporation recently paid its taxes for the latter part of 1914, a total of $2,047,994, in St. Louis County, distributed as follows: Active mines, $1,096,108; inactive mines, $936,624; Minnesota Steel Co.'s Duluth plant, $10,741;

Wolvin Building, Duluth (company headquarters), $2390; miscellaneous timber lands, $1931. The state tax commission will have a hearing Nov. 9, on the question of the value of Cuyuna ores in the ground. Until the present season Cuyuna range ores have escaped taxation on the per-ton basis such as is employed in the older iron-mining districts.

MARQUETTE—Nov. 7

Down at Iron Mountain an agreeable surprise for the Thomas Furnace Co., of Milwaukee, was the discovery that the old Indiana mine is not so wet as supposed. The inflow is only 400 gal. per min., well under the average for the district. Repair work is in progress, and with this completed, the development of orebodies revealed by exploration elsewhere in the tract will be instituted. Following similar work by the Milwaukee, the Northwestern is engaged in ballasting its main-line fill across the Chapin pit. It will require a thousand carloads of earth to bring the tracks to grade. This work by both railroad companies seems unending. The pit is gradually deepening as ore is extracted, and the Chapin will be producing for many years yet.

The Jones Furnace was described in the "Journal," Oct. 31. The plant was given its first trial Nov. 5. John Jones, the inventor, stated after the run that while the furnace was a success it yet remained to be proved whether the iron could be placed on the market at a price low enough to insure a profit. The product made was an extremely black wrought iron, ready to be used for any purpose for which wrought iron is suitable. The ore used came from the Cuyuna range; it carried 20 to 30% of iron, and was high in manganese, a typical Cuyuna manganiferous ore. Slabs, sawdust, pieces of bark and other such refuse as comes from lumber mills, were used to deoxidize the ore; no charcoal or coke was consumed. Many people were skeptical as to whether such refuse would take the oxygen out of the ore but Mr. Jones feels certain that he proved his case. The doing away with charcoal and coke will greatly tend to reduce the costs, since the refuse can be purchased at a low figure. Although the backers of the enterprise are elated over the first run, they realize that costs are what will count and that a long test will have to be made before anything definite is determined about putting the product on the market at a profit. The furnace is different from those erected several years ago at Iron Mountain and Republic by Mr. Jones, in that he is now using a vertical tube instead of a horizontal one. It is also claimed that the lining trouble has been settled and that the lining now used will last a long time. The furnace is a blast furnace without the blast and the action which takes place is similar to the action which goes on in the top of a blast furnace. The next ore to be tested will be hard hematite from the Barron mine of the Breitung Co. at Republic. The ore is now at the plant and ready to be run through.

HOUGHTON—Nov. 7

Mass Consolidated is frankly up against a situation which will call for drastic action. If existing metal conditions continue, Mass Consolidated can either cut wages again or suspend. Every other means of curtailing expenses has been applied. The management has already made one cut in wages, like every neighboring company, and has no desire to make another. It knows that the wages are as low as the men can stand. But the other alternative, shutting down altogether, would be still worse for the workingmen. Manager Walker contemplates a canvass of his employees to get their opinion. Mass is averaging a thousand tons daily and is working 340 men.

General Living Conditions, according to Doctors Olson and Patton, experts in the public-health section of the U. S. Treasury Department, are better in the Copper Country than in any other mining district in the United States. These men have been for several weeks making a thorough underground and surface examination of every mine in the district, as well as of the company locations, the homes of the workingmen, the provisions for the care of health and the general arrangements. They said that there was nothing to complain about and everything to praise, that locations were so far ahead of the average mining district that there was no basis for comparison; that general conditions were much better than in the most advanced industrial towns, manufacturing districts or agricultural sections. Furthermore they said that practically all of the company houses were better arranged from a sanitary viewpoint than the average privately owned residence.

JOPLIN—Nov. 7

The U. S. Public Health Service sent Dr. Anthony J. Lanza to the Joplin district, Nov. 7, to make a survey of hygienic and sanitary conditions in the zinc and lead mines, with a view to recommending measures to help the miners who have been suffering so greatly from tuberculosis. Doctor Lanza will, in connection with Messrs. Burch, Holmes and Harlan, state mine inspectors, go over the ground carefully, and then make his report and recommendations. The statistics of deaths from phthisis for the last year in the Joplin district have brought the attention of every thinking man to this problem. They have been so high as to seem impossible and many who saw the statistics for the first time did not credit them. Investigation has, however, seemed to establish their correctness. The number of patients being treated by nurses of the Anti-tuberculosis Society now reaches 150, besides those who have only begun to show signs of the disease.

Manipulation of Prices is being investigated by the Department of Commerce at the instance of Joplin ore producers. The investigation started Oct. 26; it will endeavor to ascertain whether the spelter and ore markets are manipulated by certain groups of smelting companies and metal selling agencies to the detriment of both the ore producers and the spelter consumers. The work in the Joplin field is in the hands of T. M. Barclay of the Department of Commerce. Little is known of the purposes of the Department's agent but among the ore producers there is great readiness to tell of the ideas which prompted their demand for an investigation. They charge that in their opinion, based on the fluctuations of the market and the action of certain buying agents, there is being made from time to time a speculative market, in which, part of the time, they are made the victims and part of the time they are used as pawns to victimize the consumers of the metal, when a bull market is created. To settle this question and if possible to stabilize the spelter and ore markets they asked the Department, through the district's congressman, to make this investigation and to finish the investigation started by the Department of Justice some time ago when the matters of controlling spelter prices, spelter output, and the interlocking directorates of a group of smelters were being considered seriously with a view to an indictment of the alleged combination.

SAN LUIS POTOSI—Nov. 3

Matters of Interest in the Mexican situation are the convention of chieftains at Aguascalientes, the proclamation of Villa in which he refuses to further recognize the authority of Carranza, the reply of Carranza to Villa's proclamation, and the departure of the Belgian ambassador.

The Convention succeeded in gathering under one roof representatives of Villa, Zapata, Carranza, and others, without damage to person or property, which in itself is a noteworthy achievement. This afforded an excellent opportunity for oratorical relief which in itself will help to clear up the atmosphere.

Villa's Proclamation charged Carranza with being false to his promises; with treating the Catholic clergy and Catholic charitable and educational institutions with unnecessary severity; with issuing some 130 millions of currency without anything behind it which has had a tendency to greatly depreciate the currency of the country; with usurping all executive, legislative and judicial powers. Carranza in answer charged Villa with being influenced too greatly by the reactionary elements; and with being unable to keep any semblance of order in that part of the country in which he is in control. He stated that if he dealt severely with the clergy, Villa did also; that if he issued many millions of currency it was because he thought best to do so; that if he took over the prerogative of the executive, legislative and judicial branches of the government it was because he considered it necessary In other words he appears to proclaim himself another dictator similar to Huerta but having different ideas as to what should be done. At this writing it looks much as if the convention will permit Carranza, Villa, and Zapata to retire from all authority, appoint a provisional president to work in harmony with the various representatives of the convention in carrying out the reforms thought to be necessary and set about establishing order through the republic.

The Belgian Ambassador. Paul May, is said to have addressed the authorities in Mexico City in a sarcastic manner regarding their inability or lack of desire to punish offenders who mistreated a Belgian subject Mr May was advised that he was persona non grata and requested to leave Mexico City within 24 hours

Business continues at a standstill. But little freight is moving, and without it little business can be done. Passenger trains between Mexico City and Laredo have had insufficient accommodations, and trains leave the stations with cars and platforms full of standing passengers It appears to have been considered more necessary to provide the delegates to the Aguascalientes convention with private cars than to encourage passenger traffic.

The Mining News

ALABAMA

AMERICAN TAR PRODUCTS CO. (Birmingham)—Contracts let to construct plant to utilize tar output of Woodward Iron Co. coke ovens.

ALASKA

DAN SUTHERLAND AND PARTNERS on Greenstone Creek near Ruby took out about $30,000 during the season just closed.

HUSTLING BUSINESS MEN of Ruby have bought automobile to make regular trips to Long Creek during winter, when trails are good. Have also bought new Keystone drill to operate on Big Creek, about five miles from town. Good pay found there.

CANADIAN-KLONDYKE (Dawson)—No. 4 dredge working on Klondike River recently made world's record, according to report, handling 14,575 yd. gravel in week's run.

ARIZONA

Cochise County

SHATTUCK (Bisbee)—Reported production stopped; only development to be continued. Company will sell no copper under 13c.

Gila County

IRON CAP (Copper Hill)—Stockholders notified by Pres. Frank P. Knight that mine and plant closed down Nov 1. Mine and plant in good shape; former is dry; so no pumping expense incurred.

CALIFOBNIA

Amador County

ORIGINAL AMADOR (Amador City)—Dam for impounding tailings being constructed on Amador Creek; estimated will hold over 1,000,000 tons.

KENNEDY (Jackson)—Construction of reinforced-concrete dam to impound tailings from 100-stamp mill in progress; dam 440 ft. long, 30 ft. high; estimated will impound waste for five years.

Butte County

OLD COAL (Nimshew)—This former producer being reopened. E. C. Wilson is interested.

SOUTH BANNER (Oroville)—Old tunnels and shafts being retimbered and cleaned out preparatory to continuing development. Richard Phillips, superintendent.

OROVILLE UNION GOLD DREDGING CO. (Oroville)—Dredging operations will begin soon on ground recently purchased, at present occupied by a prune orchard; Pennsylvania dredge purchased and being moved to new position, digging channel from Feather River to irrigation canal.

Eldorado County

CRAWFORD MINING & INVESTMENT CO. (Mt. Pleasant)—Company formed to take over Crawford and Murford claims owned by J. D. Crawford.

RED WING (El Dorado)—Property bonded to W. H. Diener, of Oakland, who contemplates installing compressor, drills and other machinery. Mr. Diener general manager of the Original Amador mines.

Glenn County

CHROME DEPOSITS in Newville district may be opened up following demand created by war. Former prices did not warrant operation of mines and they have been closed several years. Fruta, nearest railroad point, 30 miles distant; use of auto trucks contemplated. F. X. Templay, of Willows, interested.

Inyo County

BLACK EAGLE (Bishop)—Milling operations resumed. Mill thoroughly overhauled and new gasoline engine installed.

KRUGER (Keeler)—Three-stamp Hendy mill being installed. Stamps weigh 1250 lb. each, operated by gasoline engine. Ore low grade.

WILSHIRE BISHOP CREEK (Bishop)—Grading for new cyanide plant completed and erection of mill under way. Headframe moved from mine shaft to mill site and new skipway built. Mill capacity, 65 tons.

Kern County

PHILLIPS & CRANE—R. W. Graff, who has an option on 11 claims comprising this group in Amalie district, will sink 200-ft. shaft for development purposes.

ZENDA—This property in Amalie district equipped with mill and cyanide plant last summer, producing regularly; 30 men employed. Joe Fawcett manager.

GOLD PEAK—Tracy Engineering Co., of Los Angeles, which has purchased this property, will erect custom mill. This is third mill to be erected in Amalie mining district, as result of recent discoveries.

Mariposa County

DALY (Hornitos)—Erection of stamp mill contemplated. D. L. Oneto superintendent.

NUMBER ONE (Hornitos)—Shaft to be deepened 200 ft. James McGinn superintendent.

NUMBER FIVE (Hornitos)—New Lane mill, daily capacity 50 tons, installed. C. H. Gage superintendent.

RUTH PIERCE (Hornitos)—Electric power being installed. New compressor and hoist contemplated.

RED BANKS (Bagby)—Mine being cleaned out preparatory to thorough sampling. If ore warrants, mill will be erected. H. C. Callahan, of San Francisco, is owner.

CLEARING HOUSE (El Portal)—Property closed down owing to scarcity of water for operating power plant. As soon as the Merced River, on which mine is located, rises, operations will resume.

Modoc County

BIG FOUR (Highgrade)—Reported that Tonopah Belmont Development Co. has purchased this property and will commence extensive operations in spring.

San Luis Obispo County

CAMBRIA QUICKSILVER MINES (Cambria)—Mines reopened after being closed about four years.

Shasta County

MAMMOTH COPPER (Kennett)—George Baker, owning 229 acres of land in vicinity of Mammoth plant, has brought suit for $10,000 against company, alleging fume damage. Suit in line with those filed by Shasta County Farmers' Protective Association, which has been seeking to harass smelting operations of company.

Siskiyou County

SIXES MINING CO. (Etna Mills)—Company opening large hydraulic property on Klamath River. Lumber being sawed for flumes. Water for operation of mine will be piped from China Creek. Suspension bridge being erected across river. P. K. Kelsey superintendent.

Trinity County

BONANZA KING (Trinity Center)—Vein intersected in No. 4 tunnel. Mill will be moved to new entrance to expedite handling of ore.

HORSESHOE MINING CO. (Lewiston)—New concrete dam, just completed in Trinity River at cost of $10,000, washed out by first high water of season. Part of dam built in previous season and point of weakness developed where new and old work joined. Dam built to divert waters of river through tunnel so as to leave river bed open for mining operations.

Tuolumne County

ATLAS (Tuttletown)—Option taken on this property by E. J. Carter, of Los Angeles, and W. W. Elmer, of Portland. Will prosecute active development.

DE WERDT (Columbia)—Property bonded by Clark Sullivan, of Berkeley. Crosscut being driven from shaft to intersect ledge. Mine formerly good producer.

COLORADO

San Miguel County

SMUGGLER-UNION (Smuggler)—Contract taken to treat certain quantity of ore from Black Bear mine in north fork of Ingram Basin. Surveyors started on tramway route from mine to Pandora mill. Bear will mine ore for 30 stamps, probably 200 tons. Pandora equipment pretty well adapted for Bear gold-silver-copper-lead ore.

Teller County

EL PASO (Cripple Creek)—Shaft house and buildings at main shaft completely destroyed by fire Nov. 5. Loss estimated $150,000. Nicholls shaft not reached by fire. Work on drainage tunnel temporarily suspended, since it was carried on through El Paso main shaft.

IDAHO

IN SUIT AGAINST STEWART MINING CO., brought by Bourne and Bunker Hill & Sullivan, U. S. circuit court of appeals in San Francisco confirmed decision of district court in Idaho in favor of plaintiff.

MICHIGAN

Copper

WOLVERINE (Kearsarge)—Sinking started at No. 4 shaft from 37 to 38 level. Jackhamers being used.

MOHAWK (Mohawk)—From No. 6 shaft, most southerly and most promising, three levels driven to southern boundary, now ready for stoping back to shaft. This new shaft richer in general run of rock than any other of mine. Mine working 75 machine drills at present.

Iron

JONES & LAUGHLIN will not buy Mary Charlotte and Breitung Hematite mines. Rumor to that effect in circulation has no foundation in fact. Mines not for sale.

ASHLAND (Ironwood)—Most active property on Gobegic range at present. Force of 260 men working seven days a week in order to ship quantity contracted for.

CLEVELAND-CLIFFS (Ishpeming)—Company has started to drill property of Barnes Land Co., six miles west of here. Chase mine on this property is being operated. Iron-bearing formation extends across the forty, but only ore known to exist there at present is that being worked.

OLIVER (Iron Mountain)—O. C. Davidson, district superintendent, states Oliver mines on Menominee range will be worked on half time. Decision reached after conference with President W. J. Olcott, of Duluth, and D. J. Kerr, of Pittsburgh. Not known whether same plan will be adopted on other ranges.

REPUBLIC (Republic)—Steam shovel at work cutting into hillside to make more stockpile room. Will give space for storage of about 20,000 tons.

AMERICAN (Diorite)—Mine will be opened again before first of year. Task of repairing shaft going ahead rapidly. Steel sets being put in for entire distance. Shaft was concreted to depth of 160 ft. to fill in places where ore was removed close to shaft a number of years ago. Old shaft was in bad shape and caused much trouble. Shaft 8 ft. by 20 ft. 2 in. inside sets, will have four compartments, skip-roads, cage road and ladder- and pipe-way. Company also sinking small shaft and installing electric pumps to supply water to village of Diorite.

ATHENS (Negaunee)—Average advance of 60 ft. per month being attained; sinking was started last June. Operations hampered by water; expected progress will be increased soon to 75 ft. monthly. Present depth 250 ft. Three crews, six men each, employed in eight-hour shifts. For each blast 36 5-ft. holes drilled. Each charged with four sticks 80% powder. Shaft being concreted. Concrete mixed on surface by machine and run down through pipe. Each section requires 48 hr. to set. Steel dividers put in place as forms are removed. Mine has electrical hoisting machinery, air compressors, pumps and other equipment adequate for next five years. Capt. Joseph Thomas in charge of underground operations, with Capt. John Phillips assisting.

MINNESOTA

STEEL CORPORATION EXHIBIT at San Francisco will cost $100,000. Will include model of Alpena mine, Virginia, complete in every detail, including shaft houses, stripping and stockpiles, as well as underground operations.

CLOSE OF SHIPPING—According to schedule, Missabe docks at Duluth closed Nov. 7, steamer "Pollock" being last boat loaded. This dock loaded about 6,320,000 tons this season, as against 11,869,992 in 1913. Other docks still open; number of boats running later than anticipated, particularly Pickands-Mather fleet. Up to Nov. 1, Great Northern docks had shipped 10,319,415 tons, as against 12,273,689 last season, being best showing made by any Lake Superior road. This due to increased activity on Great Northern leases by Steel Corporation, leases providing for transportation via Great Northern. Soo Line dock handled 679,857 tons and N. P. 100,086, up to Nov. 1. These two handle total output of Cuyuna range, which is therefore 779,943 tons to Nov. 1, a little more than last season.

Cuyuna Range

H. J. KRUSE won suit against Chester D. Tripp to recover share of royalties from handling 80-acre tract of land adjacent to Armour mine. Kruse claimed Tripp was secretly receiving royalties and did not share with him, according to partnership agreement.

ROWE (Riverton)—One hydraulic unit suspended operations for present, leaving one unit and one shovel to continue stripping. No more shipments this season. Stated construction work on concentrating plant will begin during winter months.

CUYUNA-SULTANA (Crosby)—Work of getting No. 2 shaft through quicksand in progress. Plan, devised by A. R. McGuire, in charge of operations, as follows: Timbering suspended by wire cables from heavy oak bearers on surface, reinforced by heavy truss. Sand-box, or rather iron sump, forced down into the quicksand by jack-screws. Oak lath driven at angle immediately beneath last set, and hay put in behind to keep sand in place. Then sand and water taken from around iron sump, and next set put in place. Then iron sump emptied, another course of lath driven under set last placed, and sump again forced down to desired point to continue and make preparations for placing another set. Shaft now about 10 ft. above ledge. Company's property adjoins Cuyuna-Mille Lacs property on east; expected product is manganiferous iron ore, with manganese content 10 to 15%.

Mesabi Range

MAHONING (Hibbing)—Will probably continue shipping longer than any other Mesabi mine. Loading 200 cars a day. Should pass 1,500,000 for season.

GRAHAM (Virginia)—Closed for season Nov. 5, after shipping 200,000 tons; 50 men out of employment. Property's first full season, operating two shovels continuously. Is Oliver property.

MISSOURI—KANSAS—OKLAHOMA

ON THE T. B. CARPENTER LEASE on Moore farm, east of Galena, Kan., sublessees are finding good orebodies; practically virgin ground.

EXTENSIVE WATER in sheet-ground zinc field north of Webb City, Mo., may throw 1000 men out of employment. Effort to be made to erect large pumping station by joint action of land owners.

OLD CYCLONE LAND, owned by W. J. Land, Galena, Kan., rapidly coming to front as ore producer. Land lies inside of city, has been idle some time on account of strong water flow. Difficulty recently overcome by installing larger pumps and as fast as the water was lowered land was subleased to miners.

LITTLE PEACOCK MINES (Galena, Kan.)—Shut down for two weeks, to install pump and steam hoist, have been working on 60-ft. level, for some time one of the best producers in the district, but having good ore in bottom of drift, will sink shaft deeper and take up stope. W. G. Scott in charge.

NEVADA

Clark County

BOSS (Goodsprings)—Reported sold to Seeley Mudd and associates. Price named, $250,000; $50,000 paid down. Mine described in "Journal," Oct. 10. Rich platinum ore found. New owners to take charge Nov. 1 and do extensive development work.

Esmeralda County

REVIVAL OF ACTIVITY AT CUPRITE, 14 miles south of Goldfield. Recent discoveries of silver-copper ore made; surface indications said to resemble those of Bisbee. On Jupiter group, rich ore found in surface workings and profitable shipments made. Buildings being erected and machinery for shaft sinking installed. On Kurigen-Smith-Evans property vein cut at depth of 200 ft.; gold-silver oreshoot of shipping grade found.

DIAMONDFIELD-BLACK BUTTE (Goldfield)—Stated high-grade shoot opened recently in "flat" vein. Large tonnage of milling-grade ore developed and five-stamp mill may be built soon.

SILVER PICK CONSOLIDATED (Goldfield)—Winze from "hanging-wall drift" 600 ft. deep. Main shaft will be sunk to this depth and connection made. Oreshoot opened in drift for 100 ft.

Lander County

AUSTIN-DAKOTA (Austin)—Sinking inclined winze from 250-ft. level resumed. Crosscut driven, sump sunk and pump installed on 250-ft. level to handle water from deeper work. Pump delivering water from this level to surface repaired; expected water can be easily handled and work will continue all winter. Satisfactory results obtained in development work on lower level.

Lincoln County

LEASE ON TAILINGS DUMP at Bristol taken by Ely men. Stated other mines may be examined with intention of taking leases.

Lyon County

READING MERCANTILE & TRANSPORTATION CO. (Hudson)—Three five-ton and two three-ton auto-trucks and several teams now used to transport supplies from Hudson to Aurora.

NEVADA-DOUGLAS (Ludwig)—All orders for leaching plant machinery placed and most of material at site. Grading and foundations finished; force of 30 men employed; hoped plant will be completed by January. Plant designed to treat 50 tons sulphide ore daily; acid derived from this will be sufficient to treat 200 tons oxidized ore daily, making total capacity 250 tons.

Mineral County

TRUCKEE RIVER GENERAL ELECTRIC CO.—Power line extension from Pine Grove to Rockland completed.

ROCKLAND MINE (Rockland)—Old mill remodeled and new cyanide plant nearing completion. Roll crushing will be done; electric power used throughout. Capacity 100 tons. Development work under way for one year and estimated sufficient tonnage $10 to $12 ore blocked out to supply mill for two years.

Nye County

FIRE IN TONOPAH, Oct. 29, destroyed two blocks; damage estimated $20,000. Fire started in Nevada heater. Inadequate water supply and high wind prevented successful fighting. Head frame of West End Consolidated saved only by building bulkhead and dynamiting surrounding houses.

BIG PINE (Manhattan)—Mushett & Wittenberg, operators, have new mill coming; should reach Manhattan Nov. 10. Grading for mill-site begun. By last of November, mill should be in operation. Comprises 5x20-ft. tube mill, Dorr classifier, amalgamating plates, etc. Blake crusher now installed at collar of working shaft, will do coarse crushing for new mill. When installed and in operation, mill will handle minimum of 200 tons per day. Two Big Pine glory-holes now merged into one. Dimensions on surface, 300 ft. in length by 40 ft. at one end and 100 ft. at other. Four miners break all ore necessary to keep mill going, average hoisted over 200 tons per day, which after crushing and screening means 100 tons to mill.

WHITE CAPS (Manhattan)—Operations in Mushett-Wittenberg 10-stamp mill on White Caps oxidized ores surpassing expectations. On $10 gold ore tailings run from 40c. to 60c. In one shift per day, 30 to 35 tons of ore milled. Ore comes from glory-hole in east orebody. Churn-drill holes break down ore from between walls 35 ft. apart. This dropped to first level into large chutes, trammed to shaft, hoisted and dropped through large grizzly into bin. Grade raised one-third by the screening process. Since starting milling, total mine cost given as $1 per ton, to be still further reduced coming month. Raise being extended in west orebody, to connect with first level. Now up from bottom level about 70 ft., still showing black sulphide ore, said to average $30 to $40. As soon as Mushett & Wittenberg have new mill installed on Big Pine, White Caps will take over mill now used by both operators, and will then treat 60 to 70 tons per day, reducing costs still further. Estimation of oxidized ores in White Caps made by Engineer John M. Fox last month showed $40,000 worth of $10 ore available with probable and possible ore exceeding that from 15 to 20[illegible]. Ore should be mined, hauled two miles and milled for not more than $4 per ton.

White Pine County

NEVADA CONSOLIDATED (Ely)—Large blast set off in Liberty pit recently. Twelve holes, 65 to 125 ft. deep, were loaded with 58,000 lb. powder, mostly dynamite, and fired simultaneously. Estimated 200,000 cu. yd. broken. Mass raised to height of 18 ft. and fell to next lower level of pit, breaking well in good condition for steam shoveling. Cost estimated at $10,000. Moving pictures taken.

NEW MEXICO

Grant County

MAP OF PINOS ALTOS DISTRICT, first to be com[illegible] showing entire area three miles north and south [illegible] miles east and west, issued by J. C. McKee, mineral [illegible] at Silver City.

EIGHTY-FIVE (Lordsburg)—Company mak[illegible] to forces. Reported contract made for 3000 ton. [illegible]

JERRY BOYLE (Lordsburg)—Mine b[illegible] in[illegible] unw[illegible] main shaft dow[illegible] [illegible] ft. Abandoned 30 years a[illegible] S[illegible] ore in sight.

CHINO (Santa Rita)—Drilling for ventilation in lower workings of old Santa Rita mine in progress; cave-in said to have excluded air. Working conditions in camp unchanged.

LA FORTUNA (Pinos Altos)—Norris & Spitzley in drifting encountered good-grade galena carrying silver. Will go down and begin shipping soon. Property latest in district to be developed; is on main-vein system of camp, extension of Tip-Top.

Sierra County

COMPANY BEING INCORPORATED to develop mines in Caballo Mountains by Clyde N. Becker and associates at Rincon. Claims being consolidated. Vein showed content of gold and copper. Manganese ore developed in region.

NORTH CAROLINA

IOLA (Candor)—Mill again running after two months' shutdown. Uwarra mill also again running steadily.

COGGINS (Candor)—Extension of 272-ft. main shaft begun; will be carried to 500 ft. Mill running on development product.

OREGON

VALUE OF SALT DEPOSITS of Summer and Abert Lakes in Lake County determined by State Bureau of Mines, and deposits will be advertised for lease; Dec. 10 set for receiving bids. Bidders required to file $10,000 surety bond; leases will be on per-ton royalty basis. Bidders will also be required to name minimum annual royalty so that there will be no delay in beginning operations after contract is awarded. Jason Moore, representing New York syndicate, a few months ago offered $1,275,000 outright for lakes; understood he will be bidder for lease.

ORIOLE GOLD MINING CO. (Galice)—Suit filed by company in circuit court of Multnomah County against B. F. Rowland, president, for accounting. Complaint signed by M. J. Anderson, secretary and member of the board of directors, and demands $50,000 alleged due company. Investors mostly eastern people. In complaint Anderson charges that bulk of money did not go into development, charges that probably $200,000 was secured and about $80,000 used on property. Oriole good property, but stockholders were led to believe $20,000 milling plant was being erected when second-hand mill and concentrator were purchased for $1000. Anderson says development work will be kept up and mine is in good shape to pay.

UTAH

Beaver County

HORN SILVER (Frisco)—This mine closed down Oct. 31. Zinc ores being shipped to large extent and low price of this metal supposed to be the cause of shutdown. About 60 men were employed.

Iron County

OPHIR (Stateline)—Lease taken on this property by P. Kimball, who is working eight or 10 men. Several small veins being developed, and some material running well in gold encountered.

GOLD SPRINGS MINING & POWER (Modena)—Affairs of this company, which owns Jenny mine, and power plant at Modena, in hands of receiver, on account of debts to Capitol Trust Co. and Western Electric Co. Endeavor to sell for $22,000 having proved unsuccessful, receiver petitioned court for permission to advertise property at $12,000. On Nov. 2, order was issued permitting sale at this figure.

Salt Lake County

UTAH METAL & TUNNEL CO. (Bingham)—Former Utah Metal Co. reorganized under above name; in good financial condition, with large reserve in treasury. Some additional ground acquired.

OHIO COPPER (Bingham)—New trustees Clark Grove, Edward McCormick, and Charles F. Lark have qualified, filed bonds, and assumed charge of affairs. Alfred Frank and M. H Sowles named by them as local representatives of company. Mr. Sowles, secretary of Salt Lake Hardware Co., named chairman of local creditors' committee at meeting held shortly after receivers had been appointed. Mr. Frank, formerly manager of company, has charge of Bingham Central Ry.

CARDIFF (Salt Lake)—Ore recently opened in this property in South Fork of Big Cottonwood has been followed 75 ft., and is up to 9 ft. in width. Tunnel being driven along contact of quartzite and limestone is in 2600 ft. Seven feet of ore carrying galena in breast. Tunnel being driven to cut intersection of two ore-bearing fissures; 225 tons of ore has been taken out in development thus far. Road between portal and main roadway down cañon being put in order. Haul of about 20 miles to Murray smelting plant.

Summit County

THREE KINGS (Park City)—New electric hoist received and wires being strung to connect with Silver King Consolidated power line Property is in Nigger Hollow. E. F. Fisher general manager.

SILVER KING CONSOLIDATED (Park City)—Shipment resumed, following improvement in roads, and arrival of machinery now in process of installation. Daily rate of production, 40 to 50 tons first-class ore. No effort being made to crowd output on account of low metal-price. Ore followed for 1000 ft. from 1500 level to side line of Silver King Coalition, with which connections have recently been completed; 1100 level of Coalition connects with 1500 of Consolidated. Better air will be provided both companies, and an exit in case of accident.

WASHINGTON

WENATCHEE GOLD MINING CO. (Entiat)—Charles F. Pfeiffer, manager, retained as new board elected at recent annual stockholders' meeting. Property situated on Entiat River. Plans made to run 800-ft. tunnel to tap vein at lower level. In last two years, mines of company produced $75,000 and paid $14,000 in dividends.

CANADA

British Columbia

IN SANDON DISTRICT numerous mines active. Mountain Con. has packed down over 1000 tons of ore. On Reco Hill several lessees at work; Emerson & Johnson have big showing, expected to begin shipping soon. George Mayready will pack 20 tons from claim to Rambler mill. Payne mine started again after closing for repairs. J. Keene has taken lease on Ivanhoe mill for treating ore from the Surprise and the Wonderful.

STANDARD SILVER-LEAD (Silverton)—September report shows net operating loss of $19,762. Company has on hand 955 tons ore, 330 produced in September, which, if sold, would have wiped out loss.

SILVER WEDGE GROUP—T. S. Palmer, owner, says this property in Kootenay Lake district will have two-stamp mill in spring. Ore is high-grade silver-lead with small vein of free-milling gold near by.

SURF INLET—Mine held under option by Tonopah Belmont. Recently inspected by Frederick Bradshaw. Says he is well satisfied with work to date, although this has been largely surface improvements. Development been proceeding three months. Old lower tunnel driven on vein and ore showing satisfactory. Crosscut also started to tap vein at 360 ft. below tunnel; now in 450 ft., has cut foot wall of vein but not yet reached west or hanging-wall vein. Drifting started north on foot wall to get under shoots exposed in upper tunnel.

Ontario

MAPES-JOHNSTON (Elk Lake)—Mine opened up, using temporarily Silver Lake company's buildings, its own having been destroyed by fire. Short but rich oreshoot developed at 100-ft. level and same vein picked up at 180-ft.

BAILEY (Cobalt)—Another attempt to reorganize being made. Outstanding stock $5,250,000; proposed that new company capitalized at $600,000 take over the property, giving E. A. Benson, former president, mortgage for $90,000 for which he holds judgment against company. Bailey stockholders will get one share of stock in new company for every ten. Stated ore reserves amount to 400,000 ounces.

BEAVER (Cobalt)—Station on 900-ft. level being cut, and preparations made to sink another 100 ft. which will give Beaver deepest shaft in northern Ontario; while sinking to 900-, work was suspended on 700- and 800-ft. levels; this now resumed. Beyond short crosscut towards main vein no work will be attempted at 900-ft. level until shaft reaches 1000 feet.

KERR LAKE (Cobalt)—Draining operations of lake resulted in discovery of western extension of Fleming vein, which appears strong, and carries considerable high grade Crown Reserve has not so far discovered anything on its section of lake bed, as prospecting is more difficult there; bottom shelves steeply, heavily covered with mud, necessitating stripping and trenching before discoveries may be expected.

McKINLEY-DARRAGH-SAVAGE (Cobalt)—New vein recently found on 140-ft. level of Savage claim encountered in long exploratory crosscut about 600 ft. east of No. 4 shaft. Winze sunk 22 ft. on orebody has to date yielded nearly $30,000 and at bottom shows 4 in. of 8000-oz. ore. Within 100 ft. of new showing good indications of ore observed on two other leads, and management intends to investigate them soon. Heavy overburden has prevented surface exploration.

HUDSON BAY (Cobalt)—Report that company would pass next dividend later denied. However, since mine is about exhausted and company has assumed control of Dome Lake at Porcupine and is prosecuting development there, it is extremely likely dividends will be materially reduced or stopped altogether. Hudson Bay was most sensational dividend payer in Cobalt; had nominal capitalization of $25,000, actual $7761; will have paid by Nov. 10, $1,940,250, 25,000% on actual capitalization. Passing may be considered to mark epoch in history of camp.

MEXICO

Durango

PENOLES (Mapimi)—Mining and smelting resumed about end of October. Property had been idle during revolution. No damage suffered. Operations not yet on full scale.

Mexico

IN CAMP OF EL ORO, El Oro M. & R., Mexico and Esperanza working, El Oro and Mexico having begun Oct. 1 and Esperanza earlier. Des Estrellos still closed. There is great lack of foreign labor.

San Luis Potosi

J. T. MURPHY has been making some shipments to Monterrey. No work yet commenced at Esperanza mine, one of Murphy properties.

IN CHARCAS DISTRICT mines still idle are Alianza, Anaconda, Aurora, Bibiana y Anexas, Buen Suceso, Buena Suerte, Bufa (belonging to Empire Zinc Co.), Concordia, Cuprita (belonging to Tiro General), Denver y Anexas, Fortunas, Gallega, Garibaldi, Gitana, Guadelupe, Hermiga, Moctezuma, Morelos (belonging to Empire Zinc), Palomas, Plomoso, Potosi, Reforma, Reina, San Carlos y Anexas, San Diego, San Ricardo, San Sebastian (belonging to the Lesehens of St. Louis, Mo.), Santa Eulalia, Santa Inez, Santa Rosa, and Trinidad.

TRES AMERICAS—This mine, about five miles west of Charcas, extracting ore and piling it on patio awaiting resumption of operations at Aguascalientes smelting plant. A 7x10-in. station pump and No. 3 Cameron sinker being installed. W. H. Simpson, manager, now at property.

TIRO GENERAL (Charcas)—Shipments of 100 to 200 tons of ore from dumps being made daily to Monterrey smelter. Said that water has reached fifth level since pumps were removed, but believed it will be pumped out as soon as it is definitely settled no further political disturbances will occur.

The Market Report

METAL MARKETS

NEW YORK—Nov. 11

Copper and lead have been distinctly stronger. Spelter, on the other hand, has been a little weaker.

The present freight rate on copper and spelter to English ports is 16¾c. per 100 lb. The war risk insurance is now down to ¾@1%. The differential between London and New York prices for copper is reckoned as about 30 points; between London and St. Louis prices for spelter as about 37 points.

The London Metal Exchange reopened on Nov. 9, but the scope of transactions is still limited.

Copper, Tin, Lead and Zinc

Copper—At the beginning of our week of record, copper was still at about 11.10c., New York. A rather large business was done at 11.05c. with a seller who evidently needed to realize, while sales to consumers in Connecticut were made at 11¼c., regular terms, and bids of 11.05@11.10c., cash, New York, were received from Europe. About the same conditions prevailed during the two following days, European buyers raising their bids a little. On Monday a further increase of interest by domestic consumers was exhibited and sales were reported at 11¼@11⅜c., regular terms. By Tuesday the market had become well established on the basis of 11⅜c., regular terms, although this price was shaded a little in certain quarters. On the other hand, 11½c. was realized on some transactions, although these were not considered to be representative of the market. In the aggregate a rather considerable business was done, including some million-pound transactions. At close, copper is still offered at 11⅜c., regular terms.

The behavior of the copper market during the last four weeks has been encouraging. Having fallen to its lowest stage, it rallied by reason of some substantial buying, and then received some very bad news without declining more than a trifle; since which it has rallied again. The reasons for this are that domestic consumption is probably increasing, while it is certain that some of the largest producers will not sell liberally at the present level of price.

The Department of State issued the following announcement on Nov. 10: "The British Ambassador today informed the State Department that he has been advised by his government that Italy prohibits the export of copper, but does not prevent its transit over Italian territory. The ambassador said that in view of that fact, the British Government would feel compelled to detain copper shipments to Italy unless assured that they were for domestic consumption or were in transit to Switzerland." This amounts to a demand by the British Government that it shall supervise the copper export business of the United States.

The brass business in Connecticut is reported as being much better than for any time in the last year or two. The demand for brass for munitions of war is very large.

The copper on the steamship "Kroonland," held at Gibraltar, has been removed and the steamship has been allowed to proceed. The copper has been sent to a prize court for adjudication.

Base price of copper sheets is now 16½c. per lb. for hot rolled and 17½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 12@12½c. per lb. for carload lots at mill.

Tin—This market has been very strong for spot supplies, which are scarce. Futures are lower and not in demand.

Beginning Nov. 9, the New York Metal Exchange started business in tin as follows:

First—A "call" on tin in Manhattan warehouse in spot lots of five tons.

Second—A "call" on tin in 25-ton lots of spot, dock or store, port of New York.

Third—A "call" on tin in 25-ton lots, for shipment from European ports.

Fourth—A "call" on tin in 25-ton lots, for shipment from Eastern ports.

The Banka tin sale, which was appointed for Nov. 10, has been indefinitely postponed.

Lead—A rather heavy business was done again this week. Apparently the New York business is still going chiefly to the largest interest, the price of which remains 3.50c. In St. Louis, however, where several producers have been sellers, the market became fully established on the basis of 3.40c. early in the week, while in the latter part as high as 3.42½c. was realized.

Spelter—This market has been dull and weaker. A business of several hundreds of tons daily is reported, including some export business, which is going on right along, but the aggregate of all transactions is not large.

Zinc Dust is quoted at 10c. per pound.

Minor Metals—Quotations for **Bismuth** are $2.75 per lb., a decline of 10@25c. from the previous quotation.—**Magnesium**, $1.50 per lb., New York.—**Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, $5 per lb. for small quantities.

Nickel—Shot, blocks or plaquettes are 40@45c. per lb. Electrolytic is 5c. per lb. higher.

DAILY PRICES OF METALS

NEW YORK

			Copper	Tin	Lead		Zinc	
Nov.	Sterling Exchange	Silver, Cts. per Oz.	Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
5	4.8975	49⅛	11.05 @11.15	34	3.50	3.37½ @3.42½	4.97½ @5.02½	4.82½ @4.87½
6	4.9025	49⅛	11.05 @11.15	34	3.50	3.37½ @3.42½	4.97½ @5.02½	4.82½ @4.87½
7	4.9075	49⅛	11.10 @11.15	34	3.50	3.40 @3.42½	4.95 @5.00	4.80 @4.85
9	4.9063	49⅝	11.15 @11.25	34¼	3.50	3.40 @3.42½	4.95 @5.00	4.80 @4.85
10	4.9013	49⅜	11.20 @11.30	34½	3.50	3.40 @3.42½	4.92½ @4.97½	4.77½ @4.82½
11	4.8950	49	11.20 @11.30	34½	3.50	3.40 @3.42½	4.92½ @4.97½	4.77½ @4.82½

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

LONDON

		Copper				Tin		Lead		Zinc	
		Spot									
Nov.	Silver	£ per Ton	Cts. per Lb.	3 Mos	Best Sel'td	Spot	3 Mos	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
5	23	*	*	*	*	*	*	*	*	*	*
6	23	*	*	*	*	*	*	*	*	*	*
7	23	*	*	*	*	*	*	*	*	*	*
9	22¾	50¼	10.91	51¾	*	139½	*	18¼	3.94	24¾	5.27
10	22¾	50½	10.97	51½	*	139	*	18	3.91	21½	5.27
11	22¾	50¾	11.03	51½	*	138	*	18	3.91	24¾	5.27

*No quotations

Imports of Silver in Great Britain nine months ended Sept. 30 were £9,157,915; exports, £9,609,190; excess of exports, £451,275, which compares with an excess of imports of [illegible] 177 last year

Other Metals

Aluminum—Business is still quiet, with no special feature. Current quotations are unchanged, at 18@18.50c. per lb. for No. 1 ingots, New York.

Antimony—No more exports are reported this week. Prices have been too high, and stocks are not large enough to induce underselling. Ordinary brands—Chinese, Hungarian, etc.—are held at 12@15c. per lb., New York; while 17½@18c. is asked for Cookson's.

Quicksilver—The market for this metal has been greatly upset by importations of Italian and Spanish metal. Some quantities of Mexican mercury also have been coming here. These supplies have made New York more of a primary market than it has been heretofore. There is an unsold stock of about 1500 flasks of Italian quicksilver that is depressing prices. The market is about like this: The agents of the California producers ask $50 but are willing to take $45. Consumers bid $35 but are willing to pay $40. Business apparently is consummated at about $42@43, though the range in bid and asked prices is $35@50. Today the market is reported stronger, with sales at $45. London prices are altogether nominal.

Gold, Silver and Platinum

Gold—Shipments of gold from New York to Canada on British account were $8,500,000 during the week. There is nothing new in the gold situation.

Iridium—This metal continues scarce and dealers do not quote prices definitely, as they are settled by negotiation.

Platinum—The market is slow and prices are weaker. Sales are reported at $44@46 per oz. for refined platinum. Hard metal is from $4 to $6 per oz. higher, according to quality.

The latest report received from our Russian correspondent says the export of platinum has been entirely stopped, and at Petrograd no sales have been made for the home market. Consequently, there are no quotations. The platinum producers have petitioned the government to allow the State Bank to make advances on platinum at the rate of 20,000 rubles per pood.

Silver—A small order, said to be on India account, stiffened price to 23d., but after its execution the price again receded. The market closes quiet.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Nov. 7

The base price paid this week for 60% zinc ore was $43@44 per ton. Lead sales were made under contract.

SHIPMENTS WEEK ENDED NOV. 7

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	5,758,590	214,250	418,920
Year	140,624,500	4,444,950	29,269,550

Shipped during week to separating plants, 2,638,150 lb. zinc ore.

JOPLIN, MO.—Nov. 7

Blende, high price, $48.50; assay base, 60% zinc, $40@45; metal base suspended; calamine base, 40% zinc, $22@23; average, all grades of zinc, $42.54 per ton.

Lead, high price $43.50; base, $42 per ton of 80% metal content; average, all grades of lead, $42.12 per ton.

It is reported here that the American Metal Co. has closed down a large portion of its smelting furnaces, and producers are expecting this restriction of metal production to help the spelter market materially.

SHIPMENTS WEEK ENDED NOV. 7

	Blende	Calamine	Lead	Value
Totals this week	8,162,020	613,570	1,610,680	$220,570
45 weeks	443,860,940	33,302,960	77,059,750	$11,018,090

Blende value, the week, $179,080; 45 weeks, $8,828,610.

Calamine value, the week, $7550; 45 weeks, $389,500.

Lead value, the week, $33,940; 45 weeks, $1,799,980.

IRON TRADE REVIEW

NEW YORK—Nov. 11

While business continues light and production has not increased, there seems to be a slightly better tone and a more cheerful sentiment in the trade. A feeling that the turn is not far off seems to be quite general.

Pig Iron Production in October showed another decrease. The statistics of the furnaces, as collected and published by the "Iron Age," show that on Nov. 1 there were 158 coke and anthracite stacks in blast, having a total daily capacity of 53,250 tons, a decrease of 7200 tons from Oct. 1. Making allowance for the charcoal furnaces, the total production of pig iron in the United States in October is estimated at 1,809,000 long tons; for the 10 months ended Oct. 31, it was 20,106,000 tons. Of this production, 14,202,000 tons, or 70.6% of the total, were made by the furnaces owned or operated by steel companies.

PITTSBURGH—Nov. 10

The Steel Corporation's report of 3,461,097 tons of unfilled business at the end of October indicates a loss of 326,570 tons during October, against a loss of 425,664 tons in September. The showing is thus less unfavorable by 100,000 tons. Shipments may be estimated to have decreased about 43,000 tons a day; bookings increased about 1000 tons a day.

Actual shipping orders received by steel mills, including fresh orders and specifications against contracts—the Steel Corporation's report referring to contracts rather than to specifications—have been stationary in the past week, probably ending the long decrease and promising an early though possibly slight increase.

Steel-mill operations are averaging about 40% of capacity, and as bookings are at a lower rate the trend in production promises to continue downward, but the lowest point should be found very soon. General business prospects are regarded as decidedly improved. Some large mills are running at 35% or less, but others are doing better than 50%. Operations are lightest in rails, plates and shapes and heaviest in wire, sheets and tubular goods. There continues to be a heavy export demand for barb wire and to a lesser extent for nails.

While steel prices show a sagging rather than a firming up tendency, it is believed they are very close to bottom.

Pig Iron—Despite the extremely light production of merchant pig iron, stocks continue to accumulate at some of the furnaces. The foundries have very little business and the steel mills that use purchased pig iron are particularly poor consumers, as they are employing especially large percentages of scrap, both heavy melting steel and heavy cast scrap being available at little over $10, delivered Pittsburgh. Two sales of bessemer of 500 tons each are reported, at $13.75, Valley. Basic can be had at $12.50, Valley, though no sales are reported. It is possible that on a large lot $12.25 could be done. We quote: Bessemer, $13.75; basic, $12.50; No. 2 foundry and malleable, $12.75@13; gray forge, $12.50@12.75, at Valley furnaces. Prices delivered Pittsburgh are 95c. higher.

Steel—We quote the market largely nominal at $19 for billets and $19.50 for sheet bars, at maker's mill, Youngstown, prices at maker's mill, Pittsburgh, being about 50c higher. Rods are about $25.50, Pittsburgh.

COKE

Coke production of the Connellsville region for the week is reported by the "Courier" at 205,964 short tons; shipments, 207,004 tons. Shipments of Greensburg and Upper Connellsville districts, 29,042 tons.

Anthracite Shipments in October were 6,644,476 long tons, an increase of 306,282 tons over October, 1913. For the 10 months ended Oct. 31 the total shipments were 57,620,079 tons in 1913, and 56,712,057 tons in 1914; a decrease of 908,022 tons, or 1.6%, this year.

CHEMICALS

NEW YORK—Nov. 11

The general market is in about the same condition as for several weeks past.

Arsenic—There has been no change and quotations remain at about $3.75 per 100 lb., in a quiet market.

Copper Sulphate—Business is reported fairly steady. Quotations are a little lower, $4.25 per 100 lb. for carload lots, and $4.50 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is quiet. There is no change, prices holding about 1.87½c. per lb. for November and December; 1.90@1.92½c. per lb. for deliveries in January and later.

The war has seriously affected exports of nitrate from Chile. Shipments from Iquique in August were 27,100,669 quintals, against 57,019,988 quintals in July.

Potash Salts—One shipment of potash salts, about 4000 tons, has been received since the opening of the war. It is said this was divided between the two leading fertilizer companies. There is not much prospect for any additional supplies at present.

The Engineering and Mining Journal

VOLUME 98 NOVEMBER 21, 1914 NUMBER 21

St. Joseph Lead Co.'s Smelting Plant, Herculaneum, Mo.

SYNOPSIS—This smelting plant in southeastern Missouri treats lead concentrates in blast furnaces, the furnace charge being sintered on Dwight-Lloyd machines. The plant has been reconstructed during the last three years and now represents the highest development in sintering-and-blast-furnace treatment. The lead on the furnace charge amounts to about 40%, which is extremely high as compared with Western silver-lead practice.

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The St. Joseph Lead Co. about three years ago began the reconstruction of its smelting plant at Herculaneum, Mo., and after suffering an interruption from fire in June, 1913, which destroyed the sintering plant, has now brought its works up to a high standard of efficiency. It represents the highest development in this country in the sintering-and-blast-furnace treatment of lead concentrates.

General View of Smelting Works of St. Joseph Lead Co.—Looking North

Lead Concentrates Smelted in Blast Furnaces after Sintering

The materials treated are the lead concentrates from the company's mills at Bonne Terre, Leadwood, and Doe Run. Smelting these concentrates in blast furnaces is made commercially possible only by the use of Dwight-Lloyd sintering machines, practically the entire furnace charge passing over these machines, with the exception of the limestone and coke. Thus, the smelting plant consists essentially of a Dwight-Lloyd equipment for sintering the furnace stock and blast furnaces for smelting. There are no ore hearths, reverberatory roasting furnaces, and similar equipment of the early days. The Savelsberg roasting process, which was in use for a number of years at these works, has now been supplanted by Dwight-Lloyd straight-line sintering machines.

The low-grade lead matte produced is preroasted in a Holthoff and a Wedge furnace, their product being then sent to the sintering machines for incorporation in the furnace charge. The lead matte is roasted and resmelted until sufficiently high in copper to warrant concentration in one furnace in a special run, the product then being sold as copper matte. The lead is refined first by liquating to remove most of the impurities and then u steam kettles.

The principal fluxes used are limestone, sand and pyrites cinder; the last is obtained from various acid plants of the Mississippi Valley, while the limestone is quarried close by, and a quarry of nearly pure silica sand has been opened about three miles from the smelting plant.

Works on the Banks of the Mississippi

The Herculaneum Works is situated on the banks of the Mississippi River and is served by the Mississippi River & Bonne Terre Ry., which connects it to the St.

Louis, Iron Mountain & Southern at Riverside, two miles from Herculaneum and 30 miles from St. Louis. The lead concentrates from the company's mills are received at the plant in steel dump cars, which are sampled with a 4-ft. posthole auger, by drilling twenty-four 6-in. holes to the bottom of each car. The auger is withdrawn every few inches and some of the drillings are placed in a sample can. This method has been found to check with mechanical sampling and is much more easily accomplished.

The concentrates are dumped into bins in the mixer building, an effort being made to distribute them so as to accomplish a rough bedding. A conveyor leading to the mixing plant runs under these bins and the various ingredients of the charge are fed to it by screw feeders actuated by a double-cone drive, so that their speed may be readily adjusted. At regular intervals the man in charge of the conveyor receives the feed for a full minute in a box, and if the weight per minute varies from the amount specified the cone drive is adjusted until exactly the right amount is being fed. The conveyor passes in turn under the pyrites-cinder hopper, the roasted-matte hopper, the concentrate and the sand hoppers and receives the amount of each ingredient required. The material is sprayed with water before entering the mixing apparatus. The mixing plant consists of a revolving drum and Fernholtz clay pulverizers, the latter being specially designed for this work.

EIGHT DWIGHT-LLOYD SINTERING MACHINES

The sintering plant comprises eight Dwight-Lloyd straight-line machines, 42x264 in. Draft is induced for each two machines by a No. 110 Sirocco fan, which provides a suction of 5 or 6 in. of water. The sintering bed is about four inches thick and the speed is so regulated that it is about 12 min. in passing over the windbox. Fuel oil is used for ignition, with modified Hauck burners, the atomizing being done by steam or compressed air. The fans are operated by 75-hp. Electro Dynamic Interpole motors, direct connected, and about 1000 cu.ft. of free air per minute is drawn through the sintering bed of each machine. On account of the nature of the charge there is a great tendency for the grates to become clogged, and a man is employed continuously at each machine to clean the grates. The sinter is discharged into standard-gage cars for transfer to the blast-furnace bins.

The concentrates fed to the sintering machines contain from 65 to 71% Pb, 14% S, 3% SiO_2, 5% FeO, from 1 to 5% Zn, 0.5% Cu and from 3 to 5% lime and magnesia. Besides the concentrates, the sintering charge contains pyrites cinder, flue dust, sand and roasted matte. The sintered product usually contains from 45 to 50% Pb, 12 to 15% SiO_2, 17 to 21% FeO, 4 to 5% S, and from 1 to 5% lime and magnesia. The lead tenor of the sinter may not much exceed 50% without causing difficulties in roasting by reason of being too fusible. The gases from the sintering machines contain about 4% of sulphur dioxide.

The crushing of limestone and matte is done in a building 50x100 ft. The limestone is crushed in a No. 5 Gates gyratory crusher and raised by a bucket elevator to one of two bins that discharge into standard-gage cars outside the building. The matte is crushed by two Blake crushers and by two sets of Allis-Chalmers 14x36-in. rolls until it passes ¼ in. The crushed matte is delivered to the top of the roaster buildings by a belt conveyor. The crushing of the matte will be abandoned when arrangements are completed for granulation.

MATTE ROASTED IN HOLTHOFF AND WEDGE FURNACES

The matte is preroasted in one Holthoff single-hearth furnace and in one seven-hearth Wedge furnace. The Holthoff furnace is 36 ft. in diameter, and the annular hearth makes a revolution every 11 min. A gas producer in the center of the furnace furnishes heat through eight ports. Oil firing has been recently substituted for gas. This furnace handles about 40 tons of crushed matte per day, which is fed at the outside and discharged at the inside of the hearth. The sulphur content of the matte is reduced from 24% to about 12 per cent.

The Wedge furnace is 21 ft. 6 in. in diameter and is operated by a 25-hp. motor. The capacity is about 60 tons per day and the repairs are less than those on the other furnace, and the fuel economy is much greater. The two lower hearths of this furnace have been converted into firing hearths to increase the capacity. The preroasted matte is taken in standard-gage cars to bins serving the mixing plant.

LARGE BLAST FURNACES

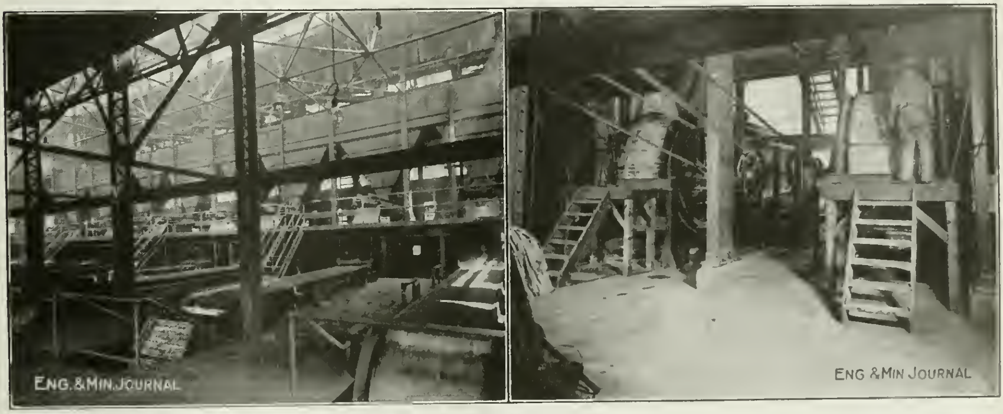
The St. Joseph Lead Co. does all its smelting in four blast furnaces, 42 in. wide and 192 in. long. The Herculaneum lead furnaces are the longest in the United States, except one furnace at Perth Amboy, N. J.; they are exceeded in hearth area, however, by the furnaces at Murray and by those at Tooele, Utah. Originally the Herculaneum furnaces were 160 in. long inside; eliminating the end bosh made the furnaces 16 ft. long. They are in all respects similar to Western furnaces. The tuyeres vary in diameter from 4 to 4½ in., are at 16-in. centers and are 15 in. above the slag line. The steel jackets are 6 ft. high, four being used on each side and one on each end.

A charge column of about 17 ft. is maintained, and the blast pressure varies between 24 and 34 oz. Air is taken from the bustle pipe for each side jacket by a 12-in. pipe, which serves three tuyeres. Blast is furnished by one No. 7 Roots blower and three Connersville blowers, two of 84 cu.ft. capacity and one of 68 cu.ft. capacity per revolution. The furnace tops are similar to those in the newer Western smelting works, the gases being drawn off below the feed floor.

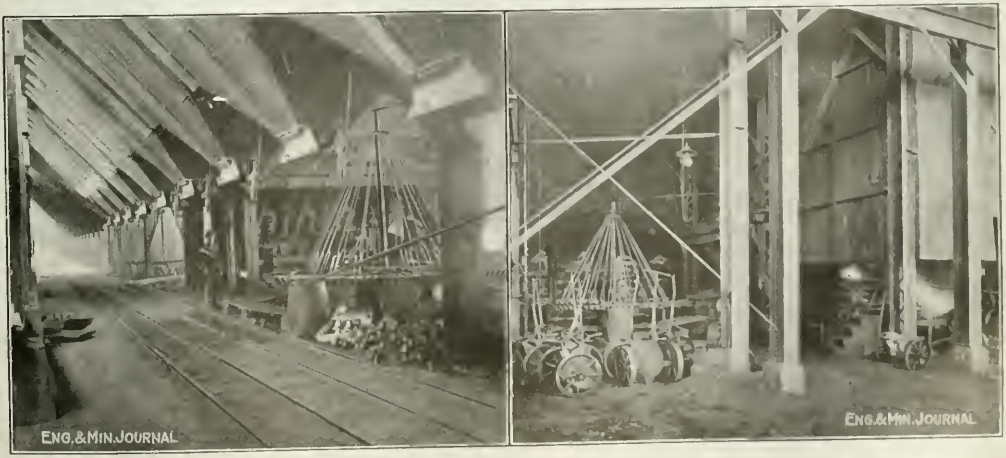
The furnace charge is made up in a charge car of the Pueblo type and is raised on an incline to the feed floor by an electric or steam hoist. The charge consists of 6000 lb. of sinter, 1000 lb. of slag shells, and the necessary limestone and coke, which latter amounts to about 12½% of the charge. In 1913, two charge pits were provided, one being used for sinter exclusively and the other for fuel and flux. This change has enabled the same crew of 18 men to make up 95 charges per 8-hr. shift against a previous maximum of fifty.

In tapping the furnaces at this plant, the tapper uses an unusually long rod, from 20 to 30 ft., and stands outside the zone of fume and sparks. The matte is still handled in hand pots, but this will shortly be supplanted by a mechanical-handling equipment using large bowls transferred by an electric overhead crane to a barrel-type storage furnace at the granulating plant. The matte usually runs about 3% copper, but this gradually increases to

View of Blast-Furnace Building and Feed Floor



Dwight-Lloyd Sintering Department



Two Views of the Tapping Floor at Herculaneum, Mo.

about 7.5% when the matte is set aside for concentration.

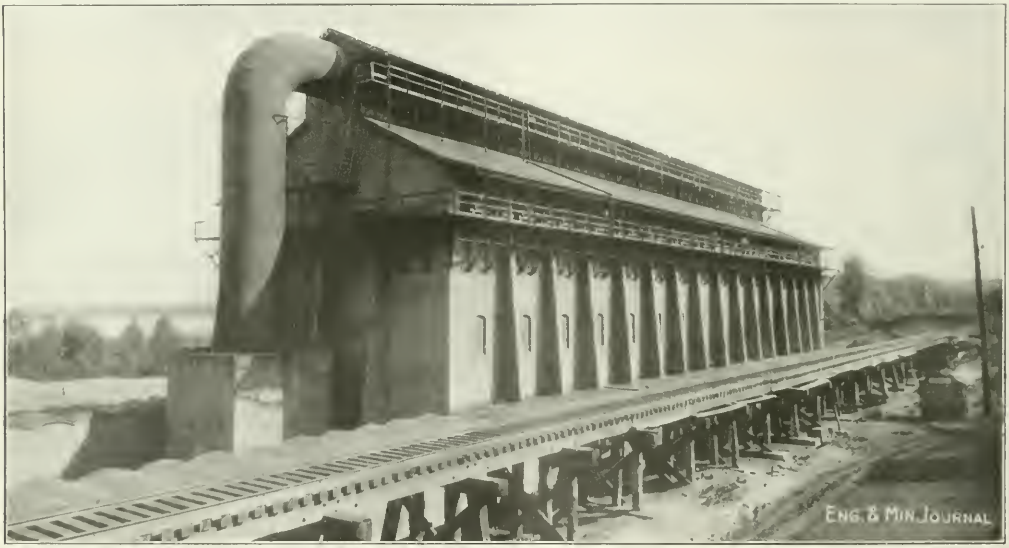
The slag from the forehearth flows into 27-cu.ft. one-piece slag pots, and is taken to the dump by electric locomotives; on returning, the pots are "shelled" directly into all-steel standard-gage railroad cars, which stand on a depressed track. The slag shells, which contain 4% lead, are sent to the blast-furnace bins.

The lead on the furnace charge is about 40%, which is extremely high as compared with the Western silver-lead practice. The coke formerly used was of inferior quality, but first-quality coke is now found to be cheapest in the end. A special coke track was installed last year, so that coke can now be unloaded from railroad cars directly into charging barrows.

As the composition of the sinter is known, it is fairly easy to control the composition of the slag. A typical analysis is: SiO_2, 33%; FeO, 36; CaO, 11.5; MgO, 4; Al_2O_3, 3; S, 2; Zn, 1; Pb (wet) 1.2%. It has not been found practical to make a high-lime slag, on account of the presence of magnesia. The slag is sampled every hour.

The four blast furnaces each develop an average capacity of 225 tons of charge per day and produce about 90 tons of lead, with a maximum of 300 tons of charge and a load production of 120 tons. The lead wells, provided with a pouring spout, are tapped directly to molds on a casting wheel. The rough lead pigs are trucked to the refinery siding, which contains four liquation furnaces. These have cast-iron shells and a water-cooled bridge wall and are fired with coal. From these furnaces the lead passes to 30-ton kettles, where after agitating with steam and skimming off the dross it is siphoned to a casting wheel on the floor below. There are two casting wheels, each serving two kettles. Cast-steel kettles are now used in place of the cast-iron kettles originally installed.

The "St. Joe" lead contains a little antimony, enough to make it of the class that formerly used to be known in the trade as "chemical" or "chemical hard" lead. During recent years, however, that designation has disappeared, and nowadays "St. Joe" lead is sold as an ordinary Missouri brand. Following the practice inaugurated by the St. Louis Smelting & Refining Co. at Collinsville, Ill., the St. Joseph Lead Co. is planning to put in a desilverizing plant to remove the small percentage of impurities contained in its ordinary product, and to produce a very high grade of desilverized lead the premium commonly paid for such lead and the small amount of silver that can be extracted from the ordinary lead making this an advisable thing to do. The company will thus, after Jan. 1, 1915 produce from 1000 to 2000 tons of desilverized soft lead per month, which will be marketed as the "Doe Run" brand. It is expected that this lead will contain from 99.98 to 99.99% Pb and practically no silver, copper, arsenic, or bismuth, and with only an insignificant amount of antimony.



Baghouse of St. Joseph Lead Co.—Looking South

Dust- and Fume-Collecting System

A new baghouse and flue system was erected in 1913 at an expense of $150,000 for filtering the gases from the blast and refinery furnaces. The dimensions of the baghouse building are 216x56½x50 ft. The thimble floor is 16 ft. above the ground and the filtering area above this is divided into four sections. There are 2196 bags, each 30 ft. long by 18 in. in diameter. Cotton bags having 18 threads to the inch are used, and no difficulty has arisen from the burning of the bags. The gases are sent through the baghouse by means of a fan 16 ft. in diameter; the impeller is 8 ft. 1 in. wide, and operating at 203 r.p.m. delivers 140,000 cu.ft. of gas under a head of 2 in. of water. The baghouse is equipped with mechanical-shaking devices, and it is now planned to handle the baghouse product with vacuum collectors. The fume assays about 71% lead.

About 900 ft. of flue precedes the baghouse; there is a 600-ft. section of steel balloon flue followed by a masonry flue having 13-in. walls and 5-ft. jack arches. A cyclone dust collector has been installed to handle the blast-furnace flue dust from the balloon flue. The dust is delivered into a conical bin and taken through a pug mill, where it is wet and delivered to the main mixer belt.

The Herculaneum works has the tallest lead stack in the United States; it is 350 ft. high by 20 ft. inside diameter, and rests on a concrete block 68 ft. square, which in turn is supported by concrete piles, the distance to bedrock necessitating this construction. The stack is protected from lightning by eight platinum-tipped rods which extend well up above the top of the stack and connect with the ground through two copper rods.

An unusual feature of this smelting works is a thaw house capable of holding eight 50-ton cars of concentrates. It is heated by coal, and is used only during a few weeks of winter, when the wet concentrates freeze in the cars and delay unloading. The heating apparatus is a coal furnace with 350 ft. of 48-in. pipe.

Interior of Lead Refinery of St. Joseph Lead Co., Herculaneum, Mo.

During the last two years the St. Joseph Lead Co. has expended about $250,000 in the reconstruction of its smelting plant at Herculaneum and when this campaign of reconstruction is finished, the plant will be representative of the best practice in this country, both in its smelting work and in the handling of materials.

The staff at Herculaneum is as follows: William Allen Smith, manager; H. P. Saunders, superintendent of construction; D. L. Cleaves, superintendent of roasting; J. N. Goddard, superintendent of smelting; R. T. Rolufs, superintendent of smelting; C. F. Setz, research chemist; A. B. Horton, chief clerk.

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Total Production of Coke in the United States in 1913, according to the U. S. Geological Survey, was 46,299,530 short tons; an increase of 2,315,931 tons over 1912. The quantity of coal used in the manufacture of coke in 1913 was 69,239,190 tons, showing 1.496 tons of coal used to one ton of coke made; conversely the coke production was 66.9% of the coal used at coke ovens.

The Proposed Bureau of Safety in the Department of Labor

By R. W. Raymond

Congress has at last adjourned, after the longest session in its history, without taking final action upon two mischievous bills, proposed in the interest of "organized labor," and pressed by the permanent "labor" lobby which Mr. Gompers and his associates maintain at Washington. Since Congress will not reassemble until early in December, there is reason to hope that its members will be, by that time, less susceptible to the threat of those who claim to represent that extremely vague power, the "labor-vote." A few weeks ago, we saw the spectacle of both parties making haste in competitive surrender to this secret organization, in the almost unanimous passage of a provision exempting the labor unions from the duties and penalties prescribed for other citizens or associations. Perhaps there will be less Congressional cowardice after election. But it is not the less important that good citizens should understand what is proposed and will continue to be urged by that lobby which never adjourns, and which has won already, through the weakness or indifference of politicians, numerous victories of special privilege and class legislation.

The two bills above mentioned, which are not by any means dead, but still dangerous, are No. 10,735 and No. 18,500 of the House of Representatives. The first is "An Act to Create a Bureau of Labor Safety in the Department of Labor." It passed the House Mar. 11, 1914, was read twice in the Senate the next day, and referred to the Committee on Education and Labor, from which committee it was favorably reported without amendment, July 27, and placed upon the calendar as No. 621. It will be seen that nothing remains but to pass it. But there is said to be "an arrangement" that the provisions of this bill shall be so amended as to avoid conflict with the work of the Bureau of Mines. If this report be true, it is strong evidence that the Senate had made up its mind to pass the bill—the stipulated amendment representing a compromise, as the alternative of a complete surrender.

The other bill (No. 18,500) is apparently the lash which was intended to drive Congress into the acceptance of the first. It is "An Act to Transfer the Bureau of Mines to the Department of Labor." It was introduced in the House Aug. 24, 1914, and referred to the Committee on Mines and Mining, which has not taken, as yet, any action upon it. And according to the talk at Washington, it is not expected that the committee will favorably report this bill. But the date of its introduction is significant, since it followed a brief consideration in the Senate of No. 10,735, which developed some opposition to that bill. The second bill, perhaps, scared the friends of the Bureau of Mines, and it is quite possible that they saw fit to consent to the "arrangement" by which the second bill should not be reported favorably, and the first bill should be allowed to pass, so amended as not to interfere with the Bureau of Mines. If this arrangement should be carried out, the Department of Labor will take charge of all investigations, etc., except those relating to safety in mines and metallurgical works, which shall continue to be conducted by the Bureau of Mines, in the Department of the Interior.

Yet this compromise is not advisable unless nothing better can be got. In the first place, it would not permanently protect the Bureau of Mines. In the second place, the Department of Labor is not a proper authority to direct inquiries of the kind here contemplated. By history and organization, it is a political department. Its head is, and will doubtless always be, a member of a labor union. That is what the Department was created for—to give "organized labor" a share in the government.

The Department of the Interior, on the other hand, contains several technical and scientific bureaus, which have been kept, thus far, measurably free from political interference. At all events, this has been the case with the Bureau of Mines, the admirable work of which has won the praise of the world. An important branch of that work has been the investigation of the conditions of health and safety in mining and metallurgical operations; and that investigation has shown clearly that one of the chief causes of the recent increase in mine accidents has been the lack of discipline among miners. This has developed itself especially since the beginning of this century, and is largely due to the spirit of lawlessness fostered by the miners' unions. In July, 1902, I wrote editorially:

> In mining—above all, in coal mining—there are special reasons, both of economy and of safety, for the enforcement of a rigid discipline. And the indispensable element of such discipline is the instant discharge of an employee who violates a salutary rule, whether the offense causes disaster or not. But for the past two or three years, at least, under the rule of Mr. Mitchell and his organization, it has been impracticable to discharge a man without incurring an instant strike and demand for his reinstatement. I do not say that on proof of clear violation of a rule recognized by the union as necessary, the discharge might not be ultimately approved. * * * But what seems to be inevitable is, that even if the justice of a discharge be ultimately acknowledged, the employer is first fined for it by a considerable loss of money through a strike, and when he is forgiven nobody makes good his loss. He is treated like the Western traveler who was mistaken for another man and shot on sight, and who received while dying the sincere apology of his murderer for the unintentional error. Moreover certain rules are not recognized by workmen as necessary

As an instance, I cited the notorious recklessness of coal miners as to smoking pipes underground, and their consequent disobedience to rules forbidding the opening of safety-lamps or the carrying of matches there. A similar case is presented by their resistance to all rules intended to prevent the creation of an unnecessary amount of dust by the excessive use of explosives. Moreover, all mine managers are aware that the principal obstacle to experimenting with new systems or apparatus for the promotion of either safety or efficiency is the resistance of the miners' unions.

In the anthracite regions, the situation in this respect is not so bad as it was in 1902, but in other coal-mining regions more completely dominated by "organized labor," it is worse.

Now the investigations of the Bureau of Mines have brought out something of the truth in this respect; and consequently "organized labor" would like to extend its power not only over legislation, but over the governmental inquiries intended to furnish a basis for legislation.

But the Bureau of Mines is too strongly intrenched in public favor to be a suitable point for a first and direct attack. And, after all, that is only a part of a much larger field in which technical associations are exposing the same evil. Hence the proposal of a Bureau of Safety in the Department of Labor. Let us hope that it will not be necessary, in order to save the Bureau of Mines, to put all other industries at the mercy of that thoroughly and hopelessly political executive department. Such inquiries, if they are to be prosecuted by the Government at all, should not be controlled by parties seeking other ends than the simple truth—still less by parties whom the truth may hurt. "Organized labor" should, of course, be fully heard for or against any legislation affecting its interests. In fact, it is both heard and felt, as nobody can deny. But it ought not to run a scientific bureau besides.

Manganese Ore in Brazil

U. S. Consul Frazer at Bahia, Brazil, writes that from the end of 1912 to date no manganese has been shipped from Bahia, as prices in foreign markets have not been high enough to make the working of the Bahia mines profitable. The only three in the state are the Pedras Prestas, Sape, and Onha; all are owned by the same company and situated about 20 miles from the town of Nazareth, on an estuary of the Bay of Bahia. The latter two mines named are connected with the Nazareth Railway by a narrow-gage line 5¼ miles long, over which the ore is hauled to the Nazareth Railway siding and dumped into railway cars, which carry it 14 miles to the town itself beside the bay. There it is put into sailing lighters and taken to the ship. From the other mine, Pedras Prestas, the ore is also taken to the Nazareth Railway by a narrow-gage line, down which the cars run by gravity, the empty trucks being hauled back to the mine by mules. It is stated that the ore contains 43 to 49% metallic manganese and would average about 45%, and that an average analysis would be: Metallic manganese, 45%; phosphorus, 0.016; silica, 3 to 4; iron, 3 to 6; moisture, 2 to 3%. The cost of mining, railway transportation, lighterage, export duties, etc., is given as $2.80 per ton.

The Law of Crushing--I

By H. Stadler*

SYNOPSIS—Much controversy among students of crushing operations has arisen over the selection of proper laws, the two principles being stated in those known as the laws of Rittinger and Kick. Rittinger's law states that the work of crushing varies as the surface exposed during crushing; Kick's law, that it varies as the ordinal numbers of any regular reduction scale at a constant ratio. Theoretical discussions of known laws of physics and mechanics tend to support the validity of Kick's law.

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All the methods suggested by various experts for the computation of crushing efficiency are based on crushing laws deduced, for the obvious reason of mathematical simplicity, from the dissection of a unit cube into smaller cubes. The functions of the cubes vary with their sizes according to simple algebraic relations and on each reduction in grade they are in exactly defined mathematical relations to one another, so that any intermediate value can readily be interpolated by calculation or graphically. It is then assumed that the average values of the functions of the irregularly shaped particles follow, during the operation of their reduction, the same laws as the theoretical cubes. By actual measurements it has been proved that this assumption is not only admissible and correct but also that it is followed with remarkable precision.

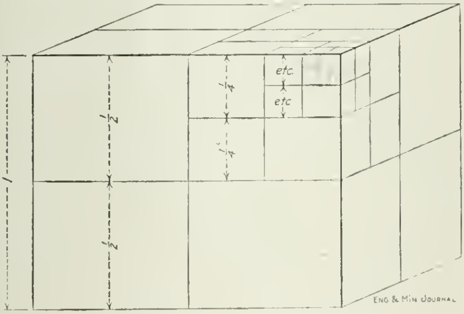

Fig. 1. Subdivision of Cube

Comparison of Crushing Laws

The crushing laws hitherto advanced by various investigators are stated, in abbreviated form, in the accompanying table in the two ways in which they can be read, according as the work done in crushing is meant to refer to the rupture of individual sizes or to the total work done in obtaining the final product from a unit mass. The given examples of the varying functions of the cubes, in accordance to which these laws are supposed to vary, refer to a regular reduction of the unit-cube at the assumed ratio 8, because at this ratio a clear conception is possible to the mind.

THE VARIOUS CRUSHING LAWS

CRUSHING LAW	The Energy required for causing the rupture of bodies of given sizes varies as:	Example for Reduction Ratio 1 : 8 No of Fractional Cubes 1 : 8 : 64 : etc
So called Rittinger's Law, applied by Dr. Caldecott and H. S. Pearce.	The squares of the diameters, or as the cross-section	1 : $\frac{1}{4}$: $\frac{1}{16}$: etc
Kick's Law, applied by H. Stadler	The cubes of the diameters, or, as the Volume or Weight	1 : $\frac{1}{8}$: $\frac{1}{64}$: etc
	The Total Work spent upon producing the final size from the unit body varies as:	
So called Rittinger's Law applied by Dr. Caldecott and H. S. Pearce[1].	The surfaces exposed during crushing, or, as the reciprocal of the diameters.	1 : 2 : 4 : etc
Klug and Taylor[2]	The square of the diameter of the original size divided by the square of the diameter of the final size.	
R. W. Chapman[3].	The number of meshes of the I. M. M. standard screens.	
Kick's Law[4], applied by H. Stadler[5].	The ordinal numbers of any regular reduction scale at a constant ratio.	1 : 1+1 : 1+1+1 : etc. 1 : 2 : 3 : etc.

(1) Journ. Chem. Met. and Min. Soc., S.A., Sept., 1906. (2) Journ. W. Aust. Chamber of Mines, Jan., 1906. (3) Proc. Aust. Inst. of Min. Eng., 1909. (4) F Kick-Gesetz der Proportionalen Widerstande, Leipzig, Arthur Felix, 1885. (5) Grading Analyses and Their Application, Trans. I. M. M., Vol. XIX, 1910-11.

It will be noticed from the table that the proportion of the work done to the factors which determine the laws of Messrs. Klug and Taylor and of Prof. R. W. Chapman is the same as that of the so called Rittinger's law. They are evolved on different bases, but actually they are all three identical. The only two laws left for further consideration are the so called Rittinger's law, which uses the reciprocal of the diameters (represented by the mesh apertures) as an index of the work done on each grade, and Kick's law using the ordinal number of the grades of a regular reduction scale by volume as the comparative representative of the work done.

Fallacy of Rittinger's Law

The load required to overcome the cohesive power of the molecules is, of course, measured by the area over which the separation has to be effected, or expressed in a more general form: External forces causing an analogous deformation of geometrically and technologically similar bodies vary as the square of their homologous dimensions. The complications arising from the deformation of the sectional area, its shape, time of action, etc., during the operation of separation are only of theoretical interest and for all practical purposes they do not affect the validity of this universally recognized law on which all our statical calculations are based. With the admission of this indisputable truth, the fallacy of the so called Rittinger's law is at once apparent, because "force" and "work done" cannot at the same time be proportional to the area of rupture. The advocates of the law cheerfully disregard the distance through which the force operates in doing work, and all the figures obtained by this law and the conclusions drawn from it are therefore incorrect.

If this conclusion, arrived at by theoretical considerations within the comprehension of any student of elementary physics, would require corroborative evidence of actual practical experience it can be produced without troubling much about figures. Many years ago [illegible] tive series of tests were made by Van Reytt to determine how nearly Rittinger's law holds good in practice, and the conclusions arrived at were "that the ratio of work done to increase the surface is fairly constant with coarse sizes, but with fine sizes the increase of surface is much more rapid than the work required to produce it." (Richards, "Ore Dressing.") In consequence of the enormously rapid progression in the exposure of surfaces with the increase of the fineness of the particles practically all the energy spent is represented in these finest grades only, and no credit is given for the hard work done in exposing fractures from coarse rock. Contrary to practical experience, the efficiency of stamps would increase with the fineness of the mesh on account of the larger percentage of fines produced, and conversely, rock breakers would give an exceedingly poor return for the amount of power consumed.

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THEORETICAL CONFIRMATION OF KICK'S LAW

The dominion of the imaginary law, which owed its passing existence to traditional thoughtlessness, having come to an end, it remains to give proof of the correctness. The only remaining crushing law, that of Prof. Kick, reads: "The energy required for producing analogous changes of configuration of geometrically similar bodies of equal technological state varies as the volumes or weights of these bodies."

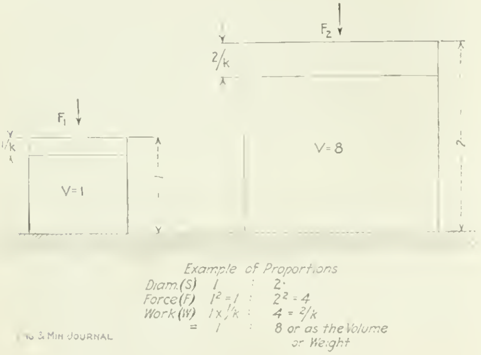

FIG. 2. PROPORTION COMPARISON

Reverting again to the crushing of cubes we saw that the load required to cause analogous deformation (here the ultimate value of breaking strength) is proportional to the cross-section and varies therefore for a cube of the edge (S) as S^2. The displacement of the force against the opposing stresses is obviously represented by the distance by which the body can be compressed or lengthened before reaching the breaking point. This deformation varies as the edges of the cubes, and the mechanical work done, measured by the product of force into deformation, varies therefore as $S^2 \times S = S^3$, or as the volume.

A more scientific theoretical proof, adduced by Prof. Kick, depends upon a presumption which though admissible and most probable, our present knowledge of matter unfortunately fails to prove. Several lines of thought entitle us to assume that the analogous deformation of geometrically and technologically similar bodies exerts, during the change on two particles in an analogous position, equal pressures and corresponding equal specific stresses. The probability in favor of this assumption is indeed very great, considering that the analogous particle-differentials in two geometrically similarly deformed bodies must move in each time-differential in the same—therefore parallel—direction. This fact conditions the acting of similar systems of forces in both cases. As the work required to produce the differentials of deformation of these particles, of equal volume-proportion as the original bodies, varies under the application of equal forces as the cubes of their homologous dimensions, or as their volumes (energy of shape), it follows that also the sums of the integrals of these energies, i.e., the total work done must vary as the volumes.

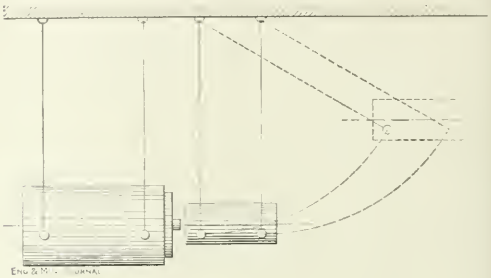

FIG. 3. BALLISTIC HAMMER

For deformations within the limits of elasticity an unobjectionable proof has also been given by Prof. F. Steiner.[1]

PRACTICAL EVIDENCE FOR KICK'S LAW

Experimentally it has been proved by Prof. Kick that the height of fall required to cause the rupture of spherical bodies of homogeneous constitution by impact on a rigid bottom plate is constant for each given material and quite independent of the size of the spheres. The work done is here expressed by the product of the weights into the height of fall, but as this "breaking height" has empirically been proved to be constant the work done is bound to vary as the weights or volumes. This demonstration is much more conclusive than the experiments executed with falling weights, because all the numerous sources of error of the latter are here eliminated with the exception of the vibration of the bottom, acting as anvil.

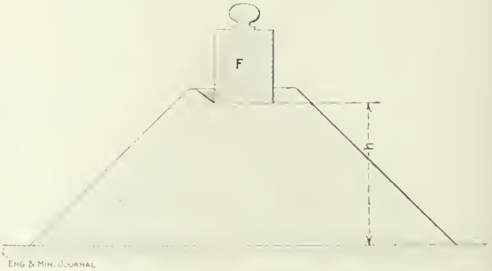

FIG. 4. SAND AS A BODY OF LOOSE TEXTURE

Of the potential energy measured by the product of weight into height of fall of the hammer only a portion is actually consumed by the test specimen and the rest is lost for the purpose of crushing. The varying fall velocities affect the amount of these losses to such an extent that impact tests are practically worthless if not carried out with a ballistic hammer or with a specially made impact machine, for instance that of I. Amsler-Laffon & Son, Schaffhausen, Switzerland, by which the energy consumed, together with the deformation produced during the whole operation, is automatically registered.

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[1] "Dingler's Polytech. Journal," 1884, Vol. 251.

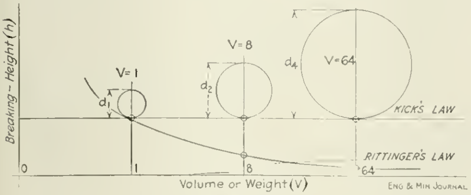

FIG. 5. COMPARISON OF LAWS

Similarly it is experimentally proved that in accordance with Kick's law the fracture of n spheres of a total weight of 1 kg. requires the same energy as one sphere of 1 kg. weight.

A rough but very intuitive demonstration can be made with cones of carefully heaped-up sands with equal angles of repose. It will be found that the products of the weights, placed on the top, by the distance to which they settle, are proportional to the volumes or weights of the heaps which have been deformed, or crushed if we consider them as bodies of extremely loose texture.

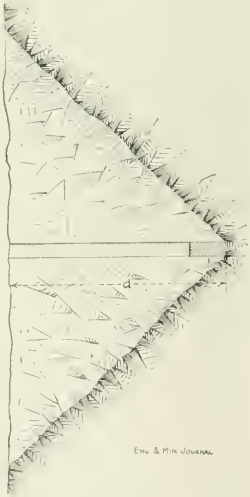

FIG. 6. VARIATION OF EXPLOSIVE CHARGE

The empirically ascertained constancy of the breaking height is corroborated by a mathematical proof with an *argumentum ad absurdum*. For this purpose we determine the height of fall h for the two laws, and in both cases we must have: Work W equal to the product of volume V by the height of fall h, or, $W = Vh$. According to the law adopted we have:

For Kick's Law		For Rittinger's Law
	$W \propto V$	$W \propto d^2$
Hence	$h\,V \propto V$	$Vh \propto d^2 \propto \sqrt[3]{V^2}$
	$h \propto \frac{V}{V} \propto 1$	$h \propto \frac{\sqrt[3]{V^2}}{V}$

In the case of Rittinger's law the plotting of the values results in a hyperbolic curve with the ordinates as asymptotes, and the conclusion would be that the breaking height decreases with the weight of the spheres. An infinitely large sphere would therefore burst at the breaking height zero, an obviously absurd conclusion. The eventual curve of the breaking height can never intercept the abscissa except in the case of $V = 0$, and the only possibility of the curve is therefore to be a straight line parallel to the abscissa.

All the formulas suggested for estimating the required charge of explosives in blasting are based on the over one-hundred-years-old rule of Lebrun that the explosive force of the charge must be proportional to the cube of the depth of the borehole, but as the volumes of the breaking cones, which for any given ore have equal vertex angles, vary as the cubes of their heights it follows that the work done in blasting varies as the volume of the broken rock. Actual experience accords with this practical rule which by the nature of the circumstances can only be an approximation. Kick's law holds good therefore even in the extreme case of the coarsest possible crushing, and at the other end governs also the elastic deformation of gases and liquids, though this application is of little practical value since the laws of Mariott and Poisson cover a much wider ground for gases. All branches of technology abound with examples of proofs of the correctness of Kick's law, or of applications of it—we may take it either way.

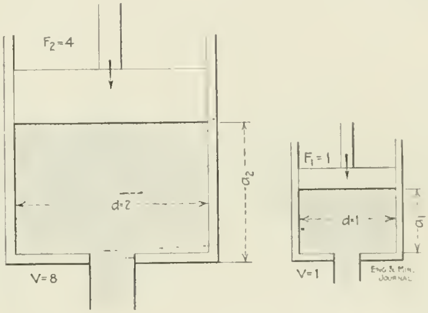

FIG. 7. ENERGY FOR DISCHARGING PLASTIC MATERIALS

LAW APPLIES TO ALL DEFORMATION OPERATIONS

It is well known that working machines cannot be built proportionate to the homologous dimensions of the working pieces, but these proportions can be determined by Kick's law. If for instance a new steam hammer is expected to perform analogous deformations on larger working pieces, the product of weight and height of fall of the hammer must be proportional to the weights or volumes of the working pieces.

The energy required to effect the discharge of plastic materials from geometrically similar vessels or cylinders (brick-making machines, etc.) under analogous working conditions is proportional to the volume of the masses or to the volume of the cylinders.

In punching of holes in steel sheets the hydraulic pressure varies as the square of the diameters and the relative time during which this pressure has to act under analogous working conditions, or the displacement of the piston varies as the thickness of the sheets. The work done, i.e., the product of pressure into displacement or water consumption, is therefore proportional to the volumes or weights of the rods if, according to the requirement of geometrical similarity, the proportion of the diameter to the thickness of the sheets is the same in both cases. In armor plates, where not the penetration but the resisting power is the standard, the cube of the thickness of the plates of the same material must vary as the kinetic energy of the projectiles which they have to stand. The proportionality of the cube of the thickness is here essential because the other dimensions of the plate are, for such great velocities, of no influence. (Bauschinger found and proved that for the effect of a load confined to a position of the area, chiefly only that portion which is directly exposed to the pressure, is responsible.)

All these examples picked up at random clearly demonstrate the universal validity of Kick's law and point out that the mass factor which plays such an important part in laws of physics, governs also the law of crushing. In face of this array of facts and proofs derived from the rudiments of mathematics and physics it requires a good deal of mental indolence to continue to uphold an obviously absurd theory which 30 years ago technological textbooks referred to in the words, "It was hitherto believed." Prof. Fr. Kick's works and experiments definitely closed the discussion on this old dispute.

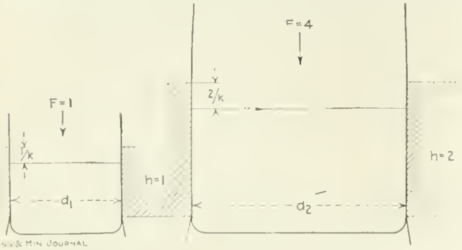

FIG. 8. VARIATION AS SQUARE OF DIAMETER

(To be continued)

Tramming Methods in the Copper Country*

Power tramming in the Copper Country is not at all common. It is difficult to keep the track in shape on account of the tendency of the ground to move, and it is difficult, also, in the case of a conglomerate at least to concentrate enough traffic on one level to justify the initial installation, while the crookedness of the amygdaloid formations interferes with the use there. Mules are used to a certain extent, for instance, in the Ahmeek mine, the Isle Royale and the Osceola branch of the Calumet & Hecla. Where long trams were necessary in the conglomerate drifts, the Calumet & Hecla has used rope haulage. The Quincy is using electric haulage. Nevertheless, the bulk of the tramming at present is done by hand.

Working with the trammers are "rock busters" and "block-holers." The duties of the rock buster are to scrape and push the broken material down the bottom of the stope where the slope is too flat for it to run. The block-holer, as his name implies, drills and breaks massive pieces of rock too thick to be handled in the cars. Where it is possible, chutes are used for loading, but in many cases the dip is too flat to permit this. It has been attempted to develop a mechanical loading device, but so far without success, the size being limited by the cramped space available underground and the weight being limited to that which it is possible to move about readily.

The accompanying table, showing the length of tram and the tonnage per man in the various mines of the Calumet & Hecla, is of interest.

TABLE OF AVERAGE TRAMMING DISTANCES AND TONS HANDLED PER MAN BETWEEN JAN. 1 and JUNE 30, 1913.

Name of Mine	Average Length of Tram, Feet	Tons Trammed per Man
Ahmeek	563	16.07
Allouez	753	12.86
C. & H. Osceola lode	582	19.48
C. & H. conglomerate	171	14.53
Centennial	900	13.98
Isle Royale	750	14.14
North Kearsage	702	13.36
South Kearsage	444	14.79
Osceola	850	12.71
Superior	480	18.27
Tamarack	508	12.12

The tramming is in general done on contract. The rate is graduated according to the length of tram. In one case, the minimum rate is 25c. and the maximum 70c. per car, according to the length of haul. Many of the men prefer the longer tram, because it means less filling of the cars, which is the more arduous labor. The contract system is more correctly described as a bonus system, since the men are paid the minimum whether they make it or not, and they are paid so much per car when the total runs above the minimum.

For the first six months of 1913, the trammers on the Osceola amygdaloid averaged $3.17 a day. These, however, were not all on contract. The 25% on contract during the same period averaged $3.40 per day.[1]

The trammer does the hard, back-breaking work and is the drudge of the mine. The bitterest complaints made before the committee were those made by trammers. The miners, however, are drawn in general from the trammers, so that the latter have always the hope of promotion.

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*Taken from testimony offered by James MacNaughton, manager of the Calumet & Hecla properties, before the Congressional Committee investigating the recent strike in the Copper Country.

[1] "Eng. and Min. Journ.," Aug. 1, 1914.

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Shannon Copper Co.

In the 16 months ended Dec. 31, 1913, the Shannon Copper Co., Clifton, Ariz., produced 18,793,724 lb. of copper, 3112 oz. of gold and 169,197 oz. of silver from 434,317 tons of ore. Of this ore, 361,084 tons came from the Shannon mine and 73,223 tons from its outside properties. The average price received for metals was 15.8696c. for copper and 60.683c. for silver. Miscellaneous earnings amounted to $3036 and the Shannon-Arizona R.R. earned $33,829 during the period. Development work totaled 13,600 ft. Experiments are being made to determine if a leaching process will be applicable to the mill tailings, of which there are now over a million tons averaging over 20 lb. of copper per ton; and semi-oxidized ore amounting to one or two million tons, averaging 2 to 2.5% copper. The report states that the cost of copper was 13.5c. per lb. for the period.

Modern American Rock Drills--VI

By L. O. Kellogg

SYNOPSIS—The Chicago Pneumatic Tool Co. builds a sloping machine with hollow ball valve and reverse telescope feed. The DA-21, a typical Sullivan stoper, uses an axial spool valve. The butterfly valve is applied to one of the Ingersoll-Rand stoping drills.

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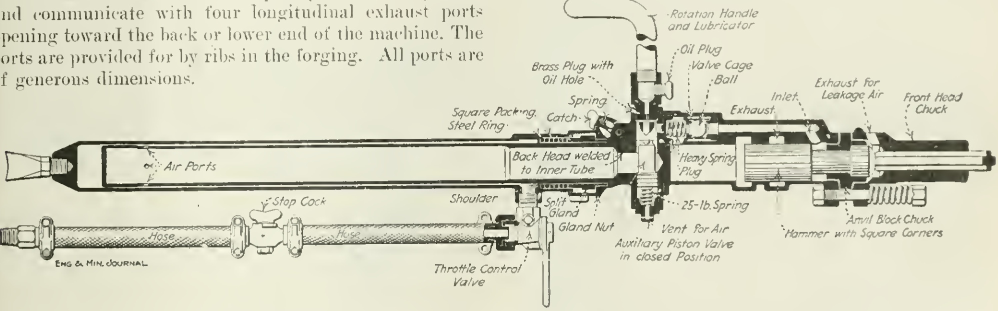
The Chicago Pneumatic Tool Co. builds a stoper which uses the ball-valve action described in detail as applied to the piston drill made by this company. The ball valve in the stoper operates in exactly the same way as in the piston machine, differing only in its size and in the manner of assembly. It weighs only one ounce and is 1 in. in diameter. The valve cage is set in a chamber formed on one side of the cylinder forging. It is held in position by a relatively heavy spring placed between the cage and a screw plug. The plug is screwed flush with the cylinder, so as not to interfere with the joint of the back head on the feed piston, and the heavy spring takes up possible discrepancies in fit. No motion of the spring is expected.

The exhaust of the cylinder takes place through the two annular slots shown: these completely circle the cylinder and communicate with four longitudinal exhaust ports opening toward the back or lower end of the machine. The ports are provided for by ribs in the forging. All ports are of generous dimensions.



Longitudinal Section, Ball-Valve Stoper Made by Chicago Pneumatic Tool Co.

The hammer is symmetrical and has square corners instead of beveled. It was found by experiment that a square corner, as giving much less opportunity for cuttings to lodge and wear the cylinder and hammer, was superior to one with beveled corners. Rock, chips and dust are bound to enter to a certain extent at the anvil block, and these tend to pack in the corners formed by a beveled-edge hammer and the cylinder walls; on the other hand, a square corner tends to sweep the cylinder clean. Another feature which makes it unlikely that any foreign substance could lodge between the piston and cylinder walls consists of the annular grooves for exhaust, which completely surround the piston and sweep its entire surface; this, together with the blast of air, which occurs when exhaust takes place, insures thorough cleaning of the cylinder.

The front head consists of a chuck piece broached to fit the steel and a bushing surrounding the anvil block, both being held to the cylinder by short through-bolts working against helical springs, which absorb the shock of the hammer should it operate with no steel in the chuck. The head is drilled with inclined holes, as usual, to permit the escape of cuttings which naturally fall upon the chuck from above and slip through between the steel and the chuck to the end next the anvil block.

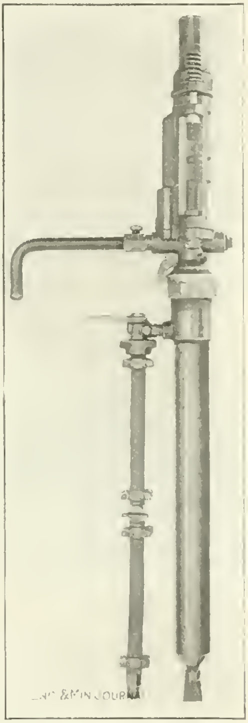
The telescope feed is of the reverse type. Air is admitted through a throttle constructed on the principle of a three-way valve. This admits air gradually by means of a flaring V-shaped annular notch in the plug. The supply of air to the machine is thereby increased slowly. The valve is provided with a small exhaust port, by which the air in the feed cylinder is allowed to exhaust to atmosphere when a run is completed. The air connection includes the two lengths of hose shown, with a stop-cock set between them, by which the air can be shut off when connecting or disconnecting the machine. The throttle is entirely distinct from the machine.

The air admitted to the throttle at first serves merely to extend the telescope feed. The lower end of the inner tube is enlarged slightly so as to have a guiding fit in the outer tube or cylinder and allow the air to pass below it and force it up in the cylinder. Just above the enlarged end are some radial ports which pass air to the inside of the inner tube and to the auxiliary valve just below the cylinder. This is a cylinder valve, held shut normally by a helical spring, which requires about 25 lb. of pressure to compress it. The air enters the valve chamber around the reduced section of the cylinder valve, passes to the left through longitudinal ports in the left-hand head of the valve, and creates pressure against the left face. When this pressure overcomes the pressure of the spring, the valve moves to the right and the inlet to the cylinder-valve chest is uncovered by the head of the piston valve. The air then enters the cylinder freely and the hammer reciprocates. The right end of the piston-valve chamber is closed with a plug containing a small port; this permits exhaust to the atmosphere and prevents pressure from building up on the right face of the valve, which would cause interference with proper operation. When the throttle valve is open only a little, static pressure is sufficient to extend the telescope feed, but while it may build up momentarily enough to open the auxiliary valve, the supply is not sufficient to maintain pressure and operate the drill. A light drilling stroke can be had by opening the throttle so as to give an air supply somewhere between that sufficient for merely extending the telescope feed and that required for full-speed drilling.

Two passages lead from the auxiliary-valve chamber to the chamber containing the operating valve. This is for the sake of symmetry and to keep the contour of the cylinder within the smallest possible dimensions.

The telescope feed is packed against air leakage by five rings of square packing fitting against a steel ring, which is supported on a shoulder projecting inward from the inside of the outer tube. A screwed ring or gland nut upon the end of the outer tube brings a split gland to bear against the packing. When the feed is extended as far as it should be, the radial ports near the bottom of the piston tube come opposite the packing rings, which shuts off the air supply to the drilling cylinder. The ring referred to above, which supports the packing, prevents the passage of the enlarged end, so that the outer tube cannot be blown off.

The gland nut at the top of the outer tube has a rim which is caught by a spring-actuated snap hook to keep the tube from running out by itself. The construction of the machine is unusual in that the inner tube, back head, and auxiliary-valve chest are all one piece; this is effected by electrically welding the back-head portion to the seamless tube of the telescope feed. Lubrication is obtained by using the rotating handle for an oil reservoir. The handle is screwed into a plug which is itself screwed into one end of the auxiliary valve chamber. In the end of the larger plug is fitted a small brass plug with a $\frac{1}{64}$-in. hole through which the oil enters the machine.



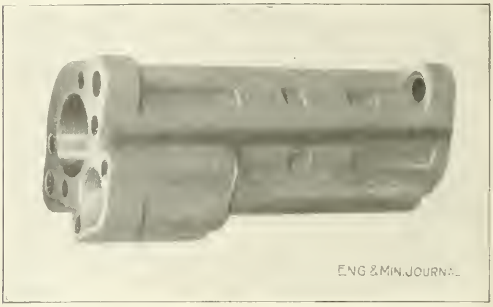
Chicago Pneumatic Tool Co. Ball-Valve Stoper

The machine weighs 70 lb., has a $2\frac{1}{8}$-in. cylinder and a 4-in. stroke. Its overall length closed is 51 in. and open 76 inches.

The Sullivan Drill

The Sullivan stoper is perhaps best exemplified by the model called DA-21, here illustrated. The drilling end consists of a cylinder which is itself the front head, of a back head, and of a valve box held between the other two by through bolts.

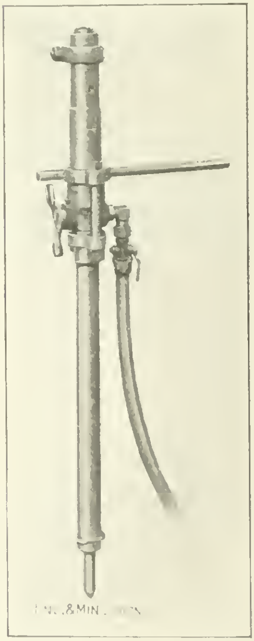
The valve is a [illegible] hollow, balanced spool valve. Its operation is too complicated to be followed through in detail here, particularly in view of the fact that the ports do not all lie in the same plane. The spools are of different diameter, so that by applying air pressure to their transverse surfaces in different combinations, differential pressure is obtained and the valve is thrown. The valve, like any spool valve, makes connection between the cylinder end and the exhaust and supply openings alternately. Ports in the walls of the cylinder afford communication between the valve chamber and the ends of the cylinder and between the exhaust and the ends of the cylinder. The alternate opening and closing of these ports by the hammer in its reciprocations results in the applications of air pressure to the spool valve, by which it is thrown. All exhaust from both ends of the cylinder is conducted to a port pointing toward the feed end of the machine. The valve has end seats as well as circumferential fit, in order to prevent leakage.



The Cylinder of the Chicago Pneumatic

The valve end of the piston is reduced in section and grooved. On the return stroke it enters the valve, and a certain amount of air is entrapped and is permitted to escape only slowly through the grooves. This retards and cushions the return stroke of the hammer.

The air is admitted through the hose connection, and is shut off and turned on by a stop cock on the hose line. The hose connection ends in a screen which strains out any dirt particles that might interfere with the action of the machine. The throttle valve of the machine distributes the air to the drilling end and to the feed end. In its several positions, four in number, it admits air: (1) To the feed cylinder alone; (2) to the feed cylinder and in small quantities to the drilling cylinder; (3) in full quantity to both for full-speed drilling; (4) shuts



Sullivan Stoper DA-21

off all air. The throttle has two handles, one on each side, to balance each other, thus preventing the throttle from falling out of the position in which it has been set.

In the end of the cylinder a chuck bushing is bolted by means of a key bolt and clamp. The head of the bolt is beveled on the inside and the beveled part seats in a recess in the bushing so that by loosening the bolt slightly the chuck is freed without taking out the bolt altogether.

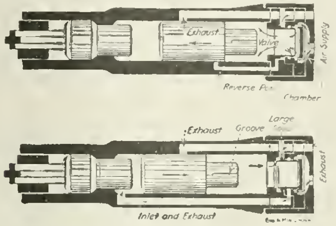
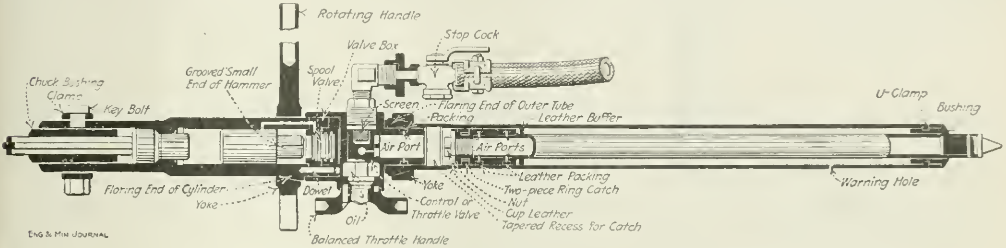
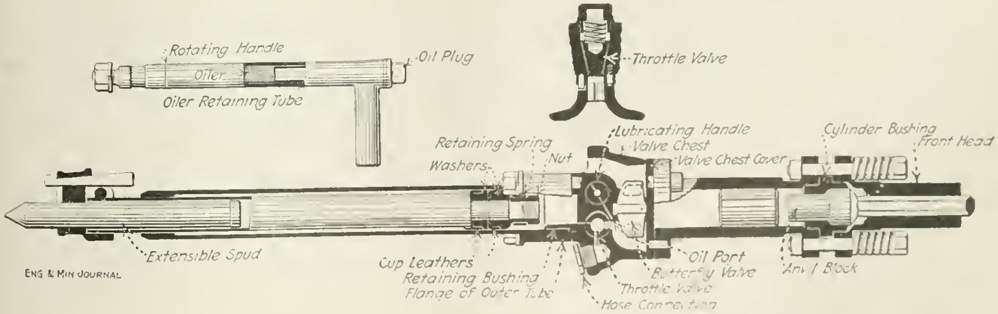


Diagram of the Sullivan DA-21 Valve Action



Longitudinal Section of the Sullivan DA-21 Stoper

Vent ports are drilled through the cylinder wall just ahead of the anvil block, to remove cuttings that may enter the nose bushing around the steel.



Longitudinal Section of Ingersoll-Rand Butterfly-Valve Stoper

The facing ends of the drilling and air-feed cylinders are flared slightly, and yokes bearing against these flares have lugs for insertion of the through bolts or side rods. The yoke on the drilling cylinder is extended on one side to form a rotating handle. A projection on the other side guards the operator's hand on the throttle handle. The back head containing the valves is joined to the cylinder by unsymmetrically placed dowels which prevent assembling in the wrong relation.

Lubrication is effected by an oil chamber surrounding the throttle valve; this admits a small quantity of oil to the machine whenever it is started. In the back head where it fits into the feed cylinder, an outside circumferential groove is cut and fitted with leather packing which is held against the feed cylinder by live air pressure applied through radial holes; this makes a tight joint.

The feed piston is kept tight in the cylinder by a cup leather held to the end with a nut and also by two packing leathers under air pressure arranged similarly to that just described.

In the feed-piston head there is also set a two-piece ring held out by a spring and having a beveled outer face; this is forced out into the tapered recess in the feed cylinder just below the back head and serves to lock the piston and prevent its slipping out except when air pressure is applied. A leather washer or buffer is inserted between the piston head and the feed-cylinder bushing at the bottom of the cylinder to take up any shock if the piston is driven out with full force by the machine falling away from the rock. In the feed-cylinder wall a small hole is drilled which is passed by the piston head just as the feed piston reaches the end of its stroke; the hole is then open to live-air pressure and the hissing of the escaping air acts as a warning to the operator.

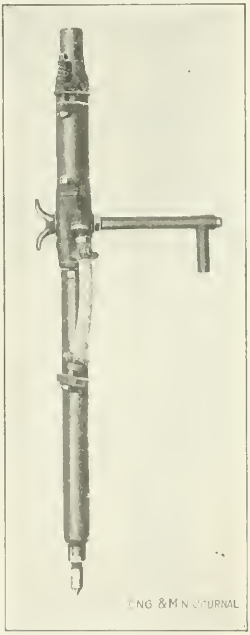
The end of the feed cylinder is closed with a bushing through which the inner tube works. The bushing is held in by a U-clamp, the ends of which are bent over into recesses in the outer tube and the plug.

The machine weighs 81 lb., has a 2-in. cylinder and about a 2-in. stroke. Its feed is 24 in. and its overall length when closed is 55 inches.

Ingersoll-Rand Butterfly Valve

The string of parts, as it may be called, of the Ingersoll-Rand butterfly-valve stoper, consists of the front head and the cylinder bolted together, the valve chest, and the feed cylinder, the valve chest being held between the drilling cylinder and the feed cylinder by through bolts. The hammer in this machine is symmetrical; the cylinder is flanged at the end, so as to furnish lugs for bolting, and is of sufficient thickness to permit boring longitudinal supply and exhaust air-passages in its shell.

The air is admitted through the hose-connection opening shown in the assembled longitudinal section drawing. Its admission and distribution are controlled by a throttle valve which is part of the machine. It is essentially a three-way cock; it has spring stops for four positions; in one, air is shut off altogether; in another it is admitted to the feed only; in a third it permits slow drilling, and in the fourth full-speed drilling. The upper part of the valve chest carries the butterfly valve, of which the action has been described. Four sets of air passages communicate with the cylinder ends, two for live air and two for exhaust. These consist of holes through the valve-chest cover registering with holes extending longitudinally through the cylinder shell, and radial holes into the cylinder connecting with the longitudinal holes. The cycle of reciprocation proceeds as described in the case of the butterfly-valve piston machine. The exhaust is all conducted to one outlet on the opposite side of the machine from the inlet.



Ingersoll-Rand Butterfly-Valve Stoper

The front head is held to the cylinder by two bolts working against helical springs; between the front head and the cylinder is a cylinder bushing in which the anvil block is held. The springs take up the shock of blows delivered on the anvil block when there is no steel in the chuck. The front end of the front head is the chuck. No bushing is used. Its cross-section depends on what cross-section of steel it is desired to use. As is the usual custom, ports, not shown in the drawing, are drilled in the front head to permit the escape of air leaking past the anvil block.

The telescope feed is of the ordinary type, the outer tube advancing with the drill as it feeds forward and the inner tube remaining stationary. This may be modified by attaching an extensible spud to the inner tube as shown in the longitudinal section. The outer tube is flanged at its upper end to permit bolting to the valve chest. The piston carries two washers and cup leathers on its upper end, which are held on by a nut. The air pressure forces these leathers out against the inner wall of the outer tube, making a tight joint. The lower part of the nut is surrounded by a friction spring. Inside the end of the outer tube there is a bushing with a flaring lower end. When the inner tube is run in, the friction spring is gripped by this bushing and the tube is prevented from running out. The lower end of the outer tube is a sufficiently close fit over the inner tube to act as a guide.

Lubrication is effected by means of a device in the turning handle. The handle is hollow, and part of its length is filled with a porous plug composed chiefly of fine copper screen rolled to a cylinder. The rest of the handle acts as an oil chamber and is closed with a screw plug. The handle near its inner end communicates with the air supply through a very small port. The pulsations of air set up conditions of pressure and exhaust alternately, and draw the oil through the plug and the small port to the valve chest and thus to the cylinder. Means are provided to exhaust any pressure in the handle after the air is shut off, without drawing all the oil out of the chamber. The plug acts as a retarder and as a filter. The air inlet furnished for this machine consists of one short length of hose without an intermediate stop-cock.

The diameter of the cylinder is 2 in.; the length of stroke is 4 in.; the length of feed is 22 in.; the overall closed length of the machine is 55½ in. when the ordinary feed without extensible spud is used; and the weight of the machine is 81 lb.

(To be continued)

Ancient Metallurgy in Egypt

Prof. W. M. Flinders Petrie visited Manchester, Eng. a short time ago and addressed members of the Egyptian and Oriental Society on "Metals in Ancient Egypt." He gave an outline of what we knew "for certain" of the use of the different metals in ancient Egypt. Copper, he said, was used throughout all the periods of civilization. When the Egyptians had scarcely any pottery and no weaving, when men were buried in goat-skins, the latter were fastened with copper pins. Gold did not come in earlier than silver and lead—in the second prehistoric period. Practically, gold did not appear throughout the whole of the first period of prehistoric civilization. In the royal tombs they found copper much used, including copper wire. Sheets of copper were cut into narrow strips, and these were then treated with the hammer. Bronze, Prof. Petrie pointed out, became much later the chief material used, but copper was always used for some purposes, as for domestic vessels.

In the second prehistoric period, gold, silver and lead came in all together. During the first and second dynasties there was a percentage of silver in what appeared to be the gold used to the amount of 13 to 19, showing that electrum was the standard material and not gold. Leaf gold in Egypt was not beaten out so thin as ours. Silver, it appeared, was on the whole scarce. Lead in the 18th dynasty came in in large quantities, and then became very common. Pure tin was not found before the 18th dynasty, and therefore the bronze found before that time was probably produced by the simultaneous reduction of copper and tin ores together. Arsenic was used as a hardening material from an early period. The common use of iron, Prof. Petrie said, began about 1200 B. C. Antimony was practically unknown in early Egypt, and zinc was not found till Roman times. In the course of his address, Prof. Flinders Petrie suggested the various localities from which the different metals found in Egypt were derived.—*Manchester Guardian.*

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The Opl System of Making Sulphuric Acid

K. Opl, in *Chemiker Zeitung*, 1914, XXXVIII, pp. 8-9, describes his tower system for the manufacture of sulphuric acid as carried out by the Oesterreichischen Sodafabrik, in Hruschau, Austria.

The system comprises six towers, through which the sulphurous gases are drawn by means of a suction fan, a coke filter at the end of the series serving to retain sulphuric-acid mist. The first tower is sprayed with the nitrous-vitriol of the sixth tower, the second tower with that of the fifth, and the third with that of the fourth. Water is introduced into towers 2, 3 and 4 by means of atomizers operating in the roofs. For complete denitration, the acid overflowing from the towers 2 to 6 is reconducted over the first tower. The passage of the acid to and from the towers is effected by emulsifying the liquid with compressed air, the light froth which is produced rising to the required height and reacting rapidly owing to the large surface of liquor exposed. The reaction space is only one-tenth of that required by the chamber system, and the time required for the production of tower acid is only 20 minutes as against four to six hours in the case of chamber acid. For making sulphuric acid of 60° B. (sp.gr. 1.71), the consumption of nitric acid of 36° B. (sp.gr. 1.332) is 0.88% of such acid.

In *Chemiker Zeitung*, XXXVIII, p. 966, G. Schliebs states that the essentials of sulphuric-acid manufacture are: (1) The intimate mixture of the gases; (2) the dissipation of the heat of reaction without the adoption of special measures; and (3) the production of desired differences of temperature within the reaction space. These requirements are fulfilled in the chamber process, but are lacking in the ordinary tower process. By placing behind each tower an acid separator, capable of circulating the gases back to the tower, he claims that all the shortcomings of the tower system may be surmounted and advantages acquired as regards control and efficiency and also economy of nitric oxide.

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Mineral Production of Western Australia, 1913

The mineral output of Western Australia for 1913 was as follows, the items being arranged in order of descending value: Gold, 1,314,043 oz. (£5,581,701); coal, 313,818 long tons (£153,614); copper ore, ingots and matte, 4421 long tons; tin ore and ingots, 484; lead ore, 3169 long tons; silver, 188,020 oz.; all else valued at £3873.

Gadolinite appears as an article of commerce in the Pilabara goldfield report.

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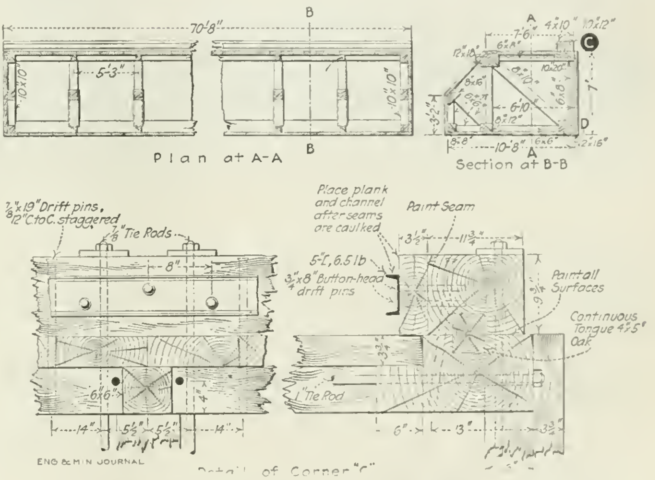
Placing Pontoons on a California Dredge

By W. H. Wright*

Natoma No. 7 dredge of the Natomas Consolidated of California, in the Folsom field of the American River district, was finished June 14, 1913. It was built by the Yuba Construction Co., is all of steel, and has a bucket capacity of 9 cu.ft. The hull is 9 ft. 6 in. deep, 46 ft. 6 in. wide and 131 ft. 8 in. long. The dredge can dig to 55 ft. below the water line, and 613 hp. is required to operate.



Details of Pontoon Construction

After completion the dredge was found to have only a 6-in. freeboard at the bow and also a decided port list. To correct these faults, two pontoons, each 7 ft. deep, 10 ft. 8 in. wide, and 70 ft. 8 in. long, were constructed and placed one on each side of the hull. The length of the pontoons was divided by the center line of the upper tumbler into two sections of 31 ft. 11 in. and 38 ft. 9 in. long, the longer section being aft of this line.

When completed the pontoons were towed alongside and sunk to the proper depth, 18 tons of ballast being necessary to effect this. They were lashed to the hull by 1½-in. wire rope fitted with turnbuckles to take up the slack. The water was then pumped out and the ballast removed. Before starting to place the pontoons all weight possible was removed from the dredge by taking off the stacker ladder and spuds and lowering the digging ladder to the bottom. The pontoons were placed in December, 1913, and have proved entirely satisfactory. The flotation was increased 15 in. and the list to the port side corrected.

In the illustrations above are shown a plan of the pontoon, a section of it, and details of the unique construction of the corner *C*. The channel iron was placed at this point to catch the outer row of rivets of the bottom plates of the hull. A tongue of oak, 4x5 in., was placed in this corner to add strength to the joint. With the exception of this oak Douglas fir was used throughout and the whole covered with a ⅜-in. layer of Tallon compound. The placing of the pontoons along the sides of the hull made it necessary to extend the suctions of all pumps. This was done by means of long-radius, special cast-iron ells. As a serious leak in either pontoon would prove disastrous to the dredge, the suctions of the 6-in. fire pump and the 10-in. low-pressure pump were connected with the pontoons. This work was designed and constructed under the direction of George W. Elliott, engineer, of Natomas Consolidated, Natoma, California.

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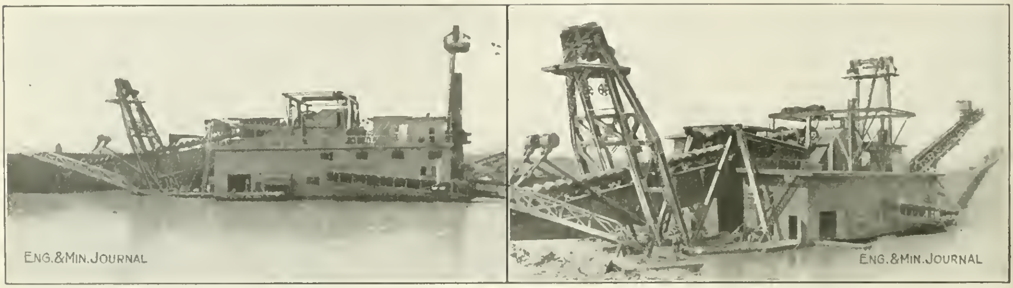
*Mining engineer, 408 Foxcroft Bldg., San Francisco, Calif.



Two Views of Natoma No. 7 Dredge on Which Pontoons Were Placed

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Northwestern Iron Co.'s Gröndal Plant, Mayville, Wis.

Special Correspondence

The Northwestern Iron Co. operates two blast furnaces at Mayville, Wis., in which chiefly local ores are used. Before installing a briquetting plant, the furnace plant was commercially unsuccessful. The local Clinton ore runs about 46% in iron, with 0.035% sulphur. Exposed to the air, it falls apart in fine powder and therefore used to produce a large quantity of flue dust in the furnaces. Scaffoldings with subsequent slips and explosions were also a frequent occurrence, seriously interfering with the furnace operations.

A Gröndal briquetting plant was erected during 1914. It consists of four kilns, 195 ft. long, and 6 ft. 6 in. wide. The ore briquettes well, making firm, strong briquettes, with an iron content of 56% and 0.014% sulphur, a great improvement over the crude ore in the iron and sulphur contents. The present production is 70 to 100 tons of briquettes per day per kiln. Coke gas is at present used as fuel.

The use of the briquettes has been beneficial to the furnace operations. A mixture of 60% of briquettes and 40% of Lake ore, instead of 60% of crude Mayville ore and 40% of Lake ore, showed a reduction in coke consumption of 200 lb. per ton of pig iron, while the production of iron has been increased by 30 to 40 tons per day. The quantity of flue dust has been greatly reduced; what is made is sintered by the Greenawalt process.

Nevada Consolidated Copper Co.

Report of the Nevada Consolidated Copper Co. for the third quarter of 1914 shows a production of 11,258,421 lb. of copper; 5,477,313 lb. produced in July, 3,062,637 lb. in August and 2,718,471 lb. in September. During the quarter, 599,126 tons of ore, averaging 1.52% copper, were milled, of which 96% came from the Veteran mine. In addition, 14,322 tons of Giroux ore were milled.

Cost per pound of copper produced, including Steptoe plant depreciation and all charges except ore extinguishment, and after crediting miscellaneous earnings, was 9.59c. per lb. Earnings are based on a selling price of 12.486c. per lb. At the end of the quarter, 21,150,319 lb. of copper were on hand and in transit, including sold and unsold.

Credit to undivided profits for the quarter was $258,214, after setting aside $106,978 for depreciation and $57,502 for ore extinguishment.

On Aug. 6 the decision was made to reduce operations to a 50% basis. On Sept. 8 the directors decided to defer payment of the dividend for the third quarter.

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International Nickel Co.

According to its report for year ended Mar. 31, 1914, the International Nickel Co., New York, has capital stock outstanding to the amount of $46,914,100, of this $8,912,000 is preferred stock. The net profits for the year after deducting expenses, depreciation, exhaustion of minerals, and all other charges were $1,792,664. This profit was accounted for in the following manner: Earnings from all properties after deducting manufacturing and selling expenses and ordinary repairs and maintenance, $6,452,758; other income, $114,028; total income, $6,566,786. Deductions from total income were: Administration and head-office expenses, including taxes, $437,812, and depreciation of plants, $636,915; mineral exhaustion, $687,395, and foreign companies not included, $12,000. Dividends amounting to $1,337,906 were paid, of which $534,756 were on preferred stock. Current assets amount to $7,384,564 over current liabilities. In addition to the depreciation charged in the profit and loss statement, $369,920 was written off surplus account for deferred charges for development and diamond drilling at Mar. 31, 1914.

Details of Practical Mining

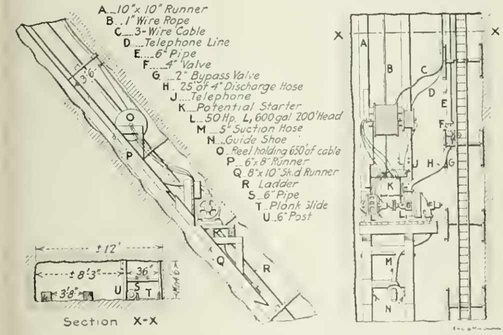
Unwatering Shaft with Horizontal Turbine Pumps

By L. C. Moore*

The Dexter mine seven miles west of Ishpeming, Mich., was shut down in 1896 and the pumps were pulled. In the spring of 1914 the Cleveland-Cliffs company, now in control, decided to unwater it for exploration purposes.

The shaft is 12 ft. long and 3½ ft. in minimum width and dips at an angle of 54°. It is approximately 600 ft. deep on the incline and has eight levels. Most of the water enters on the second or 200-ft. level, but streams were encountered also on the third and seventh levels.

The pumping equipment when the job was completed consisted of one 200-ft. head, 600-gal. per min. turbine pump and two 100-ft. head, 300-gal. turbine pumps, with motors, starting boxes, etc., complete. The motors were 50-hp., 2200-volt, 60-cycle machines, interchangeable to make the outfit more flexible. The shaft pump was mounted on a skid, as shown in the accompanying illustration, while the lead-covered cable reel was mounted on a lighter skid just above the pump. The smaller reel shown contains the duplex telephone wire, one telephone being placed on the skid and one in the engine house. All communication and signaling were carried on with the telephone.



Layout of Pump in Shaft Arranged for Lowering

Pumping operations started May 3 and the mine was completely unwatered on July 17. When the 200-ft. level was reached the 600-gal. pump was set off, a 300-gal. pump installed in its place and the work in the shaft completed with the latter. The third pump was installed on the third level to take care of the shaft water when the shaft pump got beyond its head and could not throw to the surface. The incoming water amounts to approximately 400 gal. per min.

Storms made some trouble; one break-down of the transmission line caused an eight-hour delay and a drowned pump. This happened on a Thursday, but by the next Monday the pump was recovered and the motor dried out and back in commission again.

The advantages of the system lay in the ease with which the pumps handled the water with a variation in head from 50 ft. to 200 ft.; the low head room required; the light foundations needed for satisfactory operation; the quick changes that could be made in position; and the reliability of the turbine pumps under all conditions.

Wire Rope for Dredging*

In a dredging rope, subjected to heavy bending stresses, it is important not only that the wires should be tough but that they should be as fine in diameter as is practicable with due regard to other conditions. The construction of dredging ropes therefore is such as to result in a rope with finer wires, and one which will bend more readily than the construction used when rope of the same diameter is not subjected to bends, or when the bends have a much greater radius than is practicable in dredging.

A study of this problem in its different phases has resulted in the development of dredging ropes of what may be regarded as standard construction. There are three standard designs: one a rope with six strands of 19 wires each; one with eight strands of 19 wires each and the other with six strands of 37 wires each. The 8x19 rope is used more for steam shovels than dredges. In addition to the above constructions, wire rope made of six strands with 61 wires in each strand is used. This construction is not adapted to the smaller sizes of dredging rope.

All dredging ropes have a hemp core, around which the wires are twisted. When it is necessary to use rope of very large diameter it is customary to make the center an independent wire rope. This is a rope of standard construction with the usual hemp center. Around it are twisted the strands that make the larger rope in just the same manner that strands ordinarily are twisted around a hemp core. The wire rope used on the dredges in the Culebra cut was of this construction. The center is a wire rope $1\frac{1}{8}$ in. in diameter, composed of strands of 19 wires each and a hemp core. Around this wire rope six strands of 37 wires each were twisted, the whole making a wire rope $3\frac{1}{4}$ in. in diameter. This is not only the largest dredging rope ever made, but the largest wire rope ever run over sheaves.

The successful operation of a dredging rope does not depend solely on the fitness of the rope to the conditions of use, although this is a factor of prime importance. If the rope is to serve satisfactorily it must be given reasonable care and attention. It is well to remember that a wire rope is a machine; the numerous wires form the parts, and these parts must work together without unnecessary friction or loss of energy.

Wire-rope failures are usually due to one of the following causes: heavy abrasion, over-strain, and the [illegible] or corrosion. The appearance of the rope will indicate if failure is due to any one of these causes.

---

*Assistant master mechanic, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

*[illegible] article by C. C. Sunderland in the "Excavating Engineer," November, 1914.

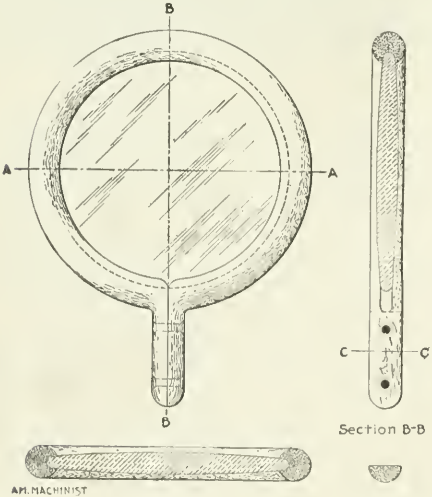
If the wires wear thin in a short time, the rope has been subjected to undue abrasion; if the wires are worn but little and are broken off squarely, sticking out all over the rope, it has suffered either from unduly severe bending stresses or over-strain; while if the wires are pitted and rusty, there has been a lack of proper lubrication.

The most common of all causes of wire falling short of the service expected is lack of proper lubrication. The lubricant should not only penetrate to the hemp center and thoroughly saturate it, but it should also coat thoroughly the inside wires. The lubricant while doing this should have sufficient consistency to cling to the rope and not to drop off and leave it practically dry after a few days.

⁂

Protecting Rim for Reading Glass

A protecting rim for a magnifying glass is shown in the accompanying illustration from the *American Machinist*. It is made of ¼-in. round leather belting grooved to fit the edge of the lens. It is stated that a glass thus rimmed can be dropped from any reasonable height without breaking. The idea may contain suggestions for the mine surveyor.



Round-Leather Frame Applied to Magnifying Glass

⁂

Tunnel and Level Ventilation

Ventilation of underground workings is a problem that may be solved in many ways, the elected method depending on a number of existing conditions. The ventilation of workings reached through long tunnels, however, can probably be accomplished by no simpler means than that employed in one of the older Mexican mines. This mine was worked through a tunnel over a mile long. To establish a system of ventilation for reaching the workings inside, a decided channel was cut in the floor of the tunnel, and this channel was covered with flat stone, or *loza*, set in cement. In this way the water conduit was made to serve also as an airway. The water flow assisted in drawing out the air. Issuing from the tunnel the water conduit was connected with a length of nearly vertical pipe down which the water ran, acting as an aspirator and setting up a good circulation of air in the mine.

⁂

Portable Set of Level Maps

By Charles H. Scheuer*

At the Fayal mine in the Mesabi range, the Oliver Iron Mining Co. has for some time been remining old caves; it was found that the ordinary methods of mapping used in this region were inadequate. I therefore devised a new set of maps, made on a good quality of waterproofed tracing paper put up in book form and inclosed in a suitable holder so as to be conveniently carried into the mine.

I obtained the idea of using such a book from the engineering department of the Fowler Estate, at Eveleth, but for our office I had the maps made slightly larger. Credit should be given to the Fowler Estate engineers as originators.

The general arrangement of the sheet used is shown in Fig. 2; it is 8½x11 in. over all. The coördinate lines are so drawn that for a scale of 1 in. to 50 ft. there is a ¼-in. margin with a ¾-in. binding edge on the left.

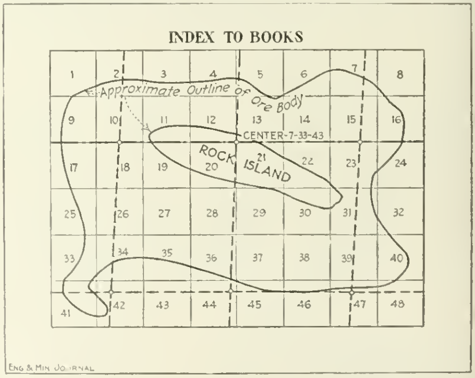


Fig. 1. Index Sheet Showing Block Numbers

The mine is divided into blocks as shown in Fig. 1, each block being 400 ft. north and south by 500 ft. east and west. For each block there is a set of these sheets, each sheet representing a sublevel; a top sheet shows the surface features, as in Fig. 3. On the margins of the sheets, as shown in Fig. 2 and 3, are given the numbers of the adjacent blocks. The number of the block itself is placed on each sheet at some convenient point, together with the number or letter of the sub it represents, as in Fig. 2. The top or surface sheet bears merely the block number.

"Sterling" tracing vellum sold by the E. Dietzgen Co. has been found satisfactory for this work during a period of three years. The coördinate lines are drawn in red to contrast with the workings, which are shown in black.

Elevations can be shown on the various subs and levels in colored ink and are so shown by us in red. Brown ink is used for general information. Green ink fades to a muddy brown on the paper used and is unsuitable.

---

*Chief engineer, Fayal district, Oliver Iron Mining Co., Eveleth, Minn.

The set of sheets for each block is bound at the left by rivets. This allows of tracing on the sheets from the sublevel office maps. The covers used are H. Niedecken Co.'s aluminum loose-sheet holders.

On Fig. 2 the old workings are shown in dash line, and the mined area as traced from the old maps is crosshatched. In place of crosshatching we have tried tinting the mine area with diluted drawing inks, with good results. Colored inks may be used to differentiate between old and new workings and give better results than the dash lines.

It is not to be supposed that this method of mapping is generally adaptable. Other and simpler methods are quite sufficient under many conditions. A composite map serves the purpose well in a regular orebody with a regular system of development, but in rocky orebodies where the workings are necessarily irregular, both as to grade of the drifts and as to alignment, these transparencies are at times almost indispensable. It is true that the books are not so convenient to handle and mining captains may at first object to them on this score, but the fact that they have found favor in spite of this objection is evidence that they are worthy of consideration.

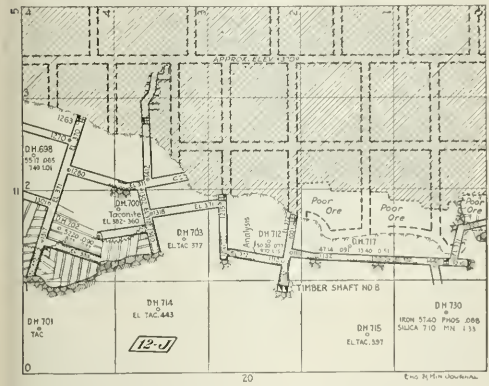


FIG. 2. ONE OF THE UNDERGROUND SHEETS

In case an old mine is to be redeveloped they are especially useful in that both new and old workings may be shown in detail, together with the elevations of each. The surface map on the top sheets keeps before the operator the relative position of roads, buildings, ditches and other surface features. Water accumulates in ponds in the caves, making mining dangerous, and by means of the book it is easy to tell where such ponds are with reference to the working place so that they may be drained before work is begun beneath.

Drill-hole information is put on the several sheets. The elevation of top of rock is placed on the sheet for the sublevel in which rock is obtained. The analysis of the ore at each sub or level as shown in raise or drill hole is placed opposite the position of the drill hole on each sheet, as in Fig. 2. By means of a pencil outline the pillars may be shown on each sub and level. In fact an almost unlimited amount of detail may be added without causing confusion.

All of this leads to a more intelligent operation of the mine. Information is valuable only as it can be used to save money and to do this it must be at hand at the proper moment. In mining this is peculiarly important since each pillar presents a different problem, especially in an irregular orebody, and there is always one best method of extraction. Lacking the information which would lead to the adoption of this best method, money is expended which would otherwise increase the net profit but which can never be retrieved, since that pillar of ore is gone.

So far I have considered the advantages merely from the standpoint of the operating men. It may appear to the engineer that this system would entail a large additional amount of work. Aside from making the book in the first place, the additional time required is small, and if the work be done by a man who studies the changes in conditions week by week with a view of assisting in the operations the time is well spent. In fact I find that one is made more observing in the examination of the working places by using the books underground. Occurences of rock, sand or caved material in backs, sides or bottoms of drifts are more carefully noted. Often when studying a place it occurs to one that information here or there will be of great value in the future, and it is gathered before the opportunity is gone.

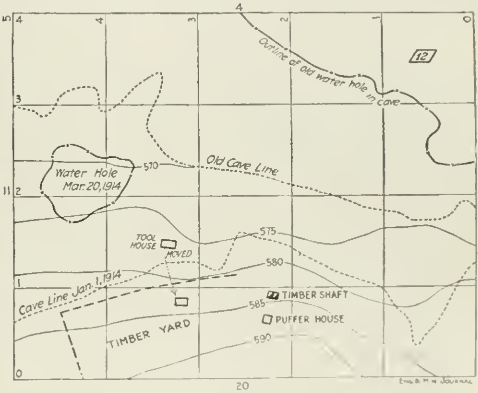


FIG. 3. A SURFACE SHEET

When some improvement is proposed in a complicated layout, the books will make the matter clear to anyone, a thing impossible with the ordinary composite map when the person examining it is unfamiliar with the mine. In such cases, which arise frequently in old mines or rocky ones, the books save the time of making numerous special maps.

The maps are brought up weekly by tracing from the originals in the office, and any observations the captain or his assistant may make in the books from time to time are noted. In this way the management keeps closely in touch with the details of operations, while all the information is available for the mine captain.

Where a layout is made for a new orebody the work is planned in pencil in the books from drill-hole information. Later, as more information is gathered in the course of development and changes become necessary, these can easily be made. In this manner the engineers' complete layout of the mine in continually subject to analysis and comparison with conditions as they arise, an arrangement that will lead to the elimination of many mistakes.

⁂

Standard Pipe Threads

The threads, as produced in the Briggs system, which is the standard for pipe threading, are shown in the accompanying illustration presented in *Power* for Nov. 3, 1914. The taper employed in the Briggs system has an inclination of 1 in. to 32 to the axis, therefore the total taper is 1 in. to 16 in., i.e., ¾ in. to the foot or $\frac{1}{16}$ in. to 1 in. The angle of the thread is 60° and its depth four-fifths of the pitch.

The first five threads *F* may be regarded as perfect at top and bottom. Back of these are two threads with perfect bottoms but flat tops; behind these are the imperfect ones produced by the chamfer of the die.

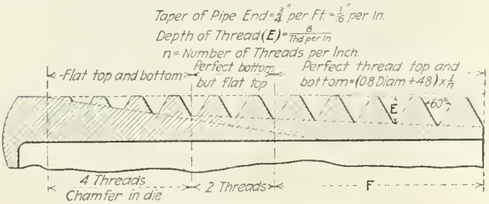
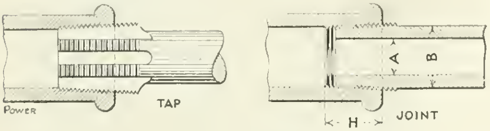

Taper of Pipe End = $\frac{3}{4}''$ per Ft. = $\frac{1}{16}''$ per In.
Depth of Thread (E) = $\frac{.8}{\text{Thd per In}}$
n = Number of Threads per Inch.
Flat top and bottom
Perfect bottom but flat top
Perfect thread top and bottom = (0.8 Diam + 4.8) x $\frac{1}{n}$
E
60°
4 Threads
Chamfer in die
2 Threads
F

FIG. 1. LONGITUDINAL SECTION OF BRIGGS PIPE THREAD



BRIGGS' STANDARD PIPE THREAD

PIPE THREADS

Diameter	Threads per Inch	Diameter of Drill
⅛	27	21/64
¼	18	29/64
⅜	18	19/32
½	14	23/32
¾	14	15/16
1	11½	1 7/16
1¼	11½	1 15/32
1½	11½	1 23/32
2	11½	2 3/16
2½	8	2 11/16
3 to 10 inc.	8	

It can be readily seen by the foregoing how necessary it is to have the pipe and fitting match, so that the full, perfect threads in each will register with the other. A thread made up more or less than the normal full length of the die will not result in a perfect joint.

⁂

Why Shovel Gears Wear Out

Not long ago, a steam-shovel manufacturer received a complaint from a contractor who was working a shovel in heavy rock, says the *Excavating Engineer*. The shipper shaft bearings apparently would not line up. They were rebabbitted again and again and trammed with the greatest care. One thrusting gear and pinion persisted in jumping. The boxes were condemned and returned to the manufacturer. An expert was immediately dispatched from the factory. He discovered that there had been some heavy blasting close to the shovel.

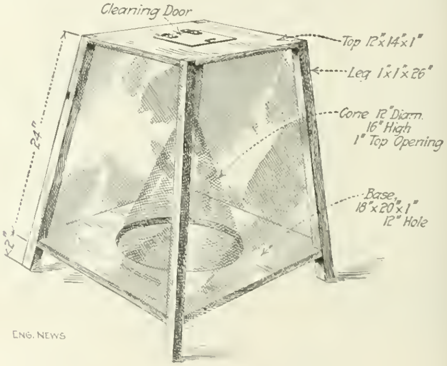
Instead of swinging the dipper to the shot, it was swung away, thus exposing the thrusting gear. The exposed gear was covered with fine stone at every shot; some of this stone had also lodged in between the teeth. Here it became encrusted. Consequently, this gear wore out much more rapidly than the one on the opposite end of the shaft. This was the source of the whole trouble. The lesson is simple. It is far safer to make two or three small shots instead of one large one. When a large one is necessary, back up the shovel. When this is not necessary, take every precaution to protect the machinery. One precaution is, as shown, swing the dipper to the blast insetead of away from it.

⁂

Fly Trap for the Camp

Sanitation in a mining camp in its early stages—and in its later—is frequently neglected. This is especially true of the isolated mine.

The most serious foe of the health of the camp is the fly. Latrines should be screened so as to minimize the possibility of fly-transmitted infection therefrom. Manure should be hauled away daily and garbage kept covered. The accompanying illustration shows a fly trap recommended by a writer in *Engineering News* for use around construction camps. A few of these set around the camp are of great assistance in keeping down the number of flies. They should be emptied frequently, the trapped flies being stunned by dashing gasoline or distillate into the cage and then shaken out and burned.


Cleaning Door
Top 12"x14"x1"
Leg 1"x1"x26"
Cone 12" Diam. 16" High 1" Top Opening
Base, 18"x20"x1" 12" Hole
24"
2"
ENG. NEWS

SERVICEABLE FLY TRAP

⁂

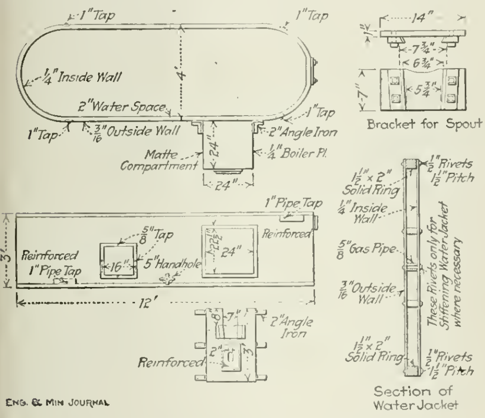
An Investigation of the Strength and Durability of Wire Rope has been made by Prof. G. Benoit at the technical high school at Karlsruhe, Germany, and as far as completed, as reported in "Glückauf," is substantially as follows: The experiments were made with a patented cast-steel wire, 1mm. (0.0394 in.) diameter, which showed a strength of 247,000 to 255,000lb. per sq. in., with 227,000lb. per sq. in. guaranteed. The wire was tested singly, and also twisted to a strand of seven wires, 3.1mm. (0.1221 in.) diameter, there being six steel wires and a core of a softer wire of a strength of about 122,000lb. per sq. in. This rope withstood a pull of 1770lb. The soft core did not break, but stretched considerably. Three of the strands were then combined to a rope of 6.8mm. (0.2679 in.) diameter and five to a rope of 8.5mm. (0.3349 in.) diameter, the latter with a hemp core. The wires and rope swere bent over a pulley though an angle of about 90 deg. at the rate of 1000 turns per hour, the turn meaning the bending of the wire from the straight and then back to the straight again. The stress to which the wire under test was generally subjected was 11,200lb. per sq.in. The single wires stood 198,710 bends; the twisted strand had one or two wires broken after 44,800 and 47,190 bends. The first experiment was carried on with a pulley 6⅞ in. diameter, and a larger pulley was then substituted, 7⅛ in diameter. On this the single wire stood 122,000 to 200,000 bends the twisted strand showed breaks in three wires after 40,860 bends. The cable of three ropes had one wire broken after 22,860 bends, and is said to have been practically done for after 36,440 bends. The five-rope wire began to fail after 35,000 bends, and was given up after 40,000 bends The conclusion so far seem to indicate that twisting leaves considerable strains in the wire rope.

Details of Milling and Smelting

Continuous-Flow Forehearths at Ladysmith, B. C.

The continuous-flow water-cooled forehearths at the Ladysmith smelting plant of the Tyee Copper Co. are larger than most continuous-flow forehearths. The Tyee company ceased to operate the plant in 1911, but it was maintained in good order and for a period was under lease to the Ptarmigan Mines, Ltd., of Vancouver Island.

There are two blast furnaces at this works, one 42x120 in. and the other 48x160 in. The forehearths are an adaptation of the old Orford type of settler and were designed by W. J. Watson; they differ from the ordinary continuous-flow settler in that the matte-separating compartment is outside the main settler. It is possible to remove this for repairs without shutting down the furnace, as ordinary tapping jackets, one on each side, are provided for use in such an emergency.



WATSON CONTINUOUS FLOW FOREHEARTH

When the Tyee Copper Co. was operating the plant, it treated a barytic copper ore. The slag in 1910 carried 23.7% BaO, 10% Al_2O_3, and 7.4% ZnO, and had a specific gravity of 3.66. In 1906 the slag had a specific gravity of 3.487 and the matte at this time had a specific gravity of 4.232, thus leaving a difference of only 0.745. Notwithstanding this small difference, the slag is reported as carrying only 0.37% copper.

The accompanying drawing shows the construction of the forehearth for the smaller furnace and was taken from the report of Alfred W. G. Wilson[1]. The forehearth for the smaller furnace is 4 ft. wide, 12 ft. long and 3 ft. deep; for the larger furnace, 6 ft. 2 in. wide, 14 ft. long and 4 ft. 6 in. in depth. The smaller settler has a 2-in. water space and the larger one a 3-in. water space; the fire sheets are of $\frac{1}{4}$-in. and $\frac{3}{8}$-in. steel, respectively, and the outside plates are of $\frac{3}{16}$-in. and $\frac{1}{4}$-in. steel. The matte compartment is approximately 2 ft. square and is lined with 8 in. of firebrick. The opening between the settler and the matte pocket is 22x24 in., but in operation this space is closed with chrome brick except for a connecting channel, 6 in. square, at the bottom. The level of the matte may be controlled by adjusting the height of the slag outlet; to increase the flow of matte a ball of clay is pressed into the slag spout, and to reduce it the outlet is lowered. As far as possible, the depth of the matte in the settler is maintained at 10 in. When a sufficient amount of matte is being made the flow is continuous, but it is stated that the matte flow can be operated intermittently, at intervals of an hour or so when necessary. Among the advantages claimed for the continuous forehearth are that a much cleaner slag is obtained, a tapper is not needed, the element of danger to the men while tapping is removed, and there is a reduction in the wear and tear on the matte pots.

⁂

Pig Iron for Copper Precipitation*

When iron is mentioned for copper precipitation, no one in this country seems to consider anything but scrap iron as available for this purpose. It takes but a small amount of investigation, however, to find that pig iron is not prohibitive in cost at almost any point in the United States not remote from the railroad. It is reported that pig iron can be delivered on the Pacific coast from China or India at a cost of \$10 to \$12 per ton.

The use of ordinary pig iron requires long launders and more or less handling of the iron to effect complete precipitation of the copper. Of course, the rapidity of precipitation depends upon the surface exposed, so I granulated the pig iron I used. This can be done best by shattering a small stream of molten iron with a jet of steam, and then cooling in a stream of water. The product was very hard and compact, and most of it was in the form of shot or pear-shaped drops. It contained 93.5% iron.

Sponge iron from calcines, or even from iron ore, is attacked inside and out by the copper solutions, and each particle, large or small, is soon a mass of cement copper. Granulated iron is attacked only on the surface, and unless agitated continually during precipitation, it soon cements together into a solid mass which retards further action.

To overcome this difficulty, I made a tube mill out of an iron pipe 10 ft. long and 20 in. in diameter. It was fitted with 6-in. openings at each end for the admission and discharge of solution. It was filled to these openings with granulated iron and revolved at the rate of 12 r.p.m. The solution going into this tube mill was a neutralized lixivium from leaching the oxidized ores. It contained: Cu, 1.64%; Fe, 0.31%; free acid, trace.

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[1] "The Copper Smelting Industries of Canada," Mines Branch, Canadian Department of Mines.

*Excerpt from the paper by Stuart Croasdale, read at the Utah meeting of the A. I. M. E.

It was passed through at different rates of speed to get the precipitating capacity of the mill. The results obtained from the solution passing out of the mill were as follows:

Rate, Gallons per Minute	4	6	7	10	12
Cu, per cent.	none	none	none	0.06	0.09
Fe, per cent.	.....	.....	1.98	1.88	1.84
Free acid, per cent.	.....	.....	trace	trace	trace
Iron (100 per cent.) pounds consumed per pound copper precipitated	.....	.....	1.00	0.97	0.97
Granulated iron, pounds consumed per pound copper precipitated	.....	.....	1.07	1.04	1.04

The copper precipitate contained 73.6% copper. In a previous experiment, it contained 86.8% copper. By this method of precipitation, the iron remained in the mill, always bright and clean, while the precipitated copper passed out with the neutral solution, from which it settled rapidly and could be removed by decantation. The operation is continuous. As seen by these results, the consumption of iron need not exceed 1 lb. for each pound of copper precipitated, provided the solutions are neutralized before precipitation.

In a large plant, these mills should be made longer and of less diameter than an ordinary tube mill. The shell should be made of copper and lined with silex to prevent abrasion. The galvanic current set up by the copper and iron would hasten the precipitation.

⁂

Size of Centrifugal-Pump Motors

In reply to the criticism that "manufacturers sell pumps to be connected to certain types of motors, and when electrical troubles come up, they are glad to refer them to the maker of the motor, but are little interested in securing and tabulating for future use the nature of the trouble and the remedy," E. C. Wayne, of the Goulds Manufacturing Co., says, in *Power*, Oct. 27, 1914, that "the pump manufacturer is often called upon to assume the account for both the pump and the motor, and we believe that the majority of pump manufacturers pay prompt attention to complaints in regard to motors driving their apparatus and that the motor manufacturers in turn, when such complaints are put up to them, are only too glad to investigate.

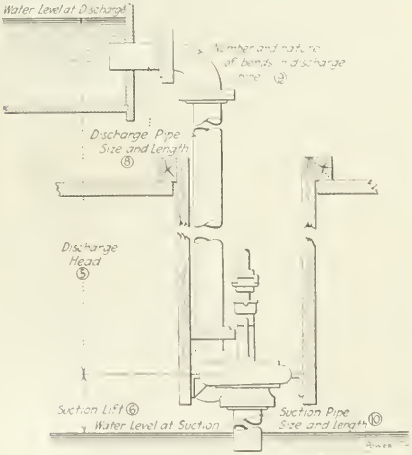

Water Level at Discharge
Number and nature of bends in discharge pipe ⑨
Discharge Pipe Size and Length ⑧
Discharge Head ⑤
Suction Lift ⑥
Water Level at Suction
Suction Pipe Size and Length ⑩
Power

Fig. 1. Measurements for Vertical Pump

"The various motor companies do a large resale business with pump builders, and naturally have to give good service. One particular reason why the motor builders like to sell their apparatus to pump builders is that the latter usually exert great care in seeing that the proper motor is applied for the conditions under which the pump is to operate.

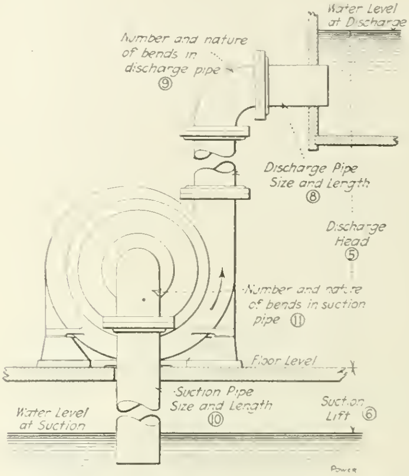

Water Level at Discharge
Number and nature of bends in discharge pipe ⑨
Discharge Pipe Size and Length ⑧
Discharge Head ⑤
Number and nature of bends in suction pipe ⑪
Floor Level
Suction Pipe Size and Length ⑩
Suction Lift ⑥
Water Level at Suction
Power

Fig. 2. Measurements for Horizontal Pump

"It is our practice to have the purchaser fill out the 'Centrifugal Pump Data Sheet,' herewith shown, before we start actual construction, provided the pump is to be directly connected to an electric motor. This enables us to check carefully the total head against which the pump is to operate."

CENTRIFUGAL PUMP DATA SHEET

Shop Order No...........

1 Capacity of pump.........U. S. gallons per minute.

2. Character of fluid... ...salt, fresh, clean or dirty.... .

3. Temperature of the liquid.....°F. Specific gravity.....

4. If solid matter is contained state size and character of largest pieces ....

5. Discharge head.... ft. (This is the vertical distance from the floor level of the pump to the point at which the water is discharged.)

6. Suction lift............ft. (This is the vertical distance from the floor level of the pump down to the level of water in pit from which it is pumped.) (See No. 7.)

7. Suction head ... .ft. (Sometimes the pump is placed so that the water will flow to it and in that case the pressure at the inlet to the pump must be given. Question No. 6 may then be omitted.)

8 Discharge pipe diameter....... .. .length..... . ...

9. Number of bends in discharge pipe..............State whether elbows are 45 or 90 degrees............and of long or short radius ....

10. Suction pipe diameter... ....length.............

11 Number of turns in suction pipe................State whether elbows are 45 or 90 degrees...........and if long or short radius...............................

Signed.........................

Date..................... Address.........................

Referring to the greater power required, due to increase of head caused by pipe friction, Mr. Wayne points out that the question of speed required for this greater head is likewise important in the case of a centrifugal pump.

⁂

Granulated Slag Is Used at certain metallurgical works for the covering of furnaces and flues wherein it is desired to retain heat. It is cleaner than ashes or sand, and because of its porosity is superior as a nonconductor of heat.

NEW PUBLICATIONS

MODERN TUNNELING: WITH REFERENCE TO MINE AND WATER-SUPPLY TUNNELS—By David W. Brunton and John A. Davis. 6x9 in., pp. 450, illus.; $3.50. John Wiley & Sons, New York.

MINERAL RESOURCES OF ALASKA. REPORT ON PROGRESS OF INVESTIGATIONS IN 1913—By Alfred H. Brooks and Others. Pp. 424, illus. Bull. 592, U. S. Geological Survey, Washington, D. C.

GOLD FIELDS OF NOVA SCOTIA—By W. Malcolm. Compiled Largely from the Results of Investigations by E. R. Faribault. 6½x9¾, pp. 331, illus. Memoir No. 20-E, Canada Department of Mines, Geological Survey Branch, Ottawa.

DETAILS OF CYANIDE PRACTICE—By Herbert A. Megraw. 6x9¼ in., pp. 215, illus.; $2. McGraw-Hill Book Co., Inc., New York.

A discussion of the methods followed at the principal cyanide mills of the United States, from information gathered during a tour undertaken for the "Engineering and Mining Journal."

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES (FOR BUYERS AND SELLERS).—7¾x10½ in., pp. 1596; $10. S. E. Hendricks Co., Inc., New York.

The present volume is the twenty-third edition of this work, which is brought up to date and published annually. As is generally known, it gives complete classified lists of manufacturers in the various industries. The same general arrangement has been followed and no special changes or increase in size are noted. A detailed index, covering 138 pages, adds to the value of this work.

ENGINEERING GEOLOGY—By Heinrich Ries and Thomas L. Watson. 6x9¼ in., pp. 672, illus.; $4. John Wiley & Sons, Inc., New York.

After extended experience in teaching engineering students, more especially civil engineers, the authors have brought together the materials of greatest importance for this group in the present admirably printed and illustrated work. Rocks are described at length, alike as regards their varieties and their forms in nature. Rivers and underground waters; landslides; wave-action; lakes and glacial deposits complete the general portion. These topics are followed by building stone; limes, cement and plaster; clay and clay products; coals; petroleum, natural gas and other hydrocarbons; road foundations and road materials; ore deposits. Each topic is treated in a careful and interesting way and with concluding bibliographies. A vast amount of valuable matter is rendered easily accessible in a condensed form, while much that receives attention in ordinary textbooks is cut out. Stratigraphical and historical geology receives at the close but two pages with little more than the names of the periods and epochs. The teacher who uses the work will need to amplify this portion for his classes. A list of the active state geological surveys concludes the book.

⁂

Treatment of Zinc Chloride Residues

According to the 59th annual report of the British Alkali Inspector (abstr. in *Journ. Soc. Chem. Ind.*) renewed attention has been paid to the arresting of fume produced in the condensation of zinc extracted from "residues" containing zinc chloride or zinc and ammonium chlorides. Opportunity was afforded for studying working conditions at three works where zinc "ashes" (containing volatile chloride) were in use for spelter making, and tables are given showing the relative fume-arresting efficiency of various types of "prolong," both as regards the weights of fume collected and its chemical composition. The prolongs consist of iron tubes, divided by a bridge into body and end portions; they are attached to certain selected receivers as soon as the "steaming stage" is over, so that the escaping fumes pass through them before being discharged into the air. The condensed fume collected is composed essentially of zinc chloride and metallic zinc or zinc oxide, and consists of fine dust mixed with "granular" matter (richest in chlorides) and "massive" metal in the form of shot and irregular particles; the weights accumulating in the body and end portions of the prolongs were determined separately and the proportion of zinc and zinc chloride ascertained.

Analysis of the material skimmed at the first tapping showed a composition in respect of chlorine content very similar to that of the fume, but it was contaminated with a large amount of ash and finely divided breeze carried forward from the retorts. The return of fume and skimmings, without treatment, to the furnace with a subsequent charge, as commonly practiced, was found to involve an increase of about 25% in the volatile chlorine content of the charge, which could readily be prevented by washing the fume and skimmings with cold water. Washing gave a residue very suitable for admixture with a fresh charge and prevented loss of zinc chloride and unnecessary escape of noxious gases, but it is pointed out that in all cases the combustible gases leaving the prolongs should, if possible, be burned.

A study of the effect of "breezing-up" receivers showed that when properly worked and carefully fired, a furnace with breezed-up receivers should discharge no more fume than escapes when clay nozzles are in use. Preliminary experiments on the weight of spelter obtained did not support the view advanced by some zinc makers that clay nozzles are less efficient than breeze stoppers in preventing loss of zinc.

⁂

The Financial Position of Great Britain

In an address to the Investment Bankers' Association at Philadelphia, Nov. 13, Sir George Paish said in part:

> The supply of banking money in London will, I am convinced, be as great as ever, but it will be obvious that the supply of capital in England cannot be as great as ever—at any rate not for outside purposes.
>
> We calculate that the savings of the British nation are close to £400,000,000 a year. Last year we placed half those savings in foreign countries. We are now engaged in the greatest war the country ever has had to fight, and it will be obvious that we shall need our savings to pay for that war.
>
> I am hopeful, indeed I have strong hopes, that we shall be able to pay for that war out of our growing savings, and will not have to encroach upon our capital With the British nation carrying on its business as usual there is no reason why its income should not be maintained, and if its income is maintained it will have the savings and the money with which to pay for this great war out of its income
>
> This matter, I know, is of importance to this side, as there is a great deal of anxiety lest we in England should be compelled to send you back a large amount of your securities I do not think there is any serious danger of this I think the utmost extent of the danger is that we may not be prepared to renew short notes of various kinds, railway notes, New York city notes, and others.

⁂

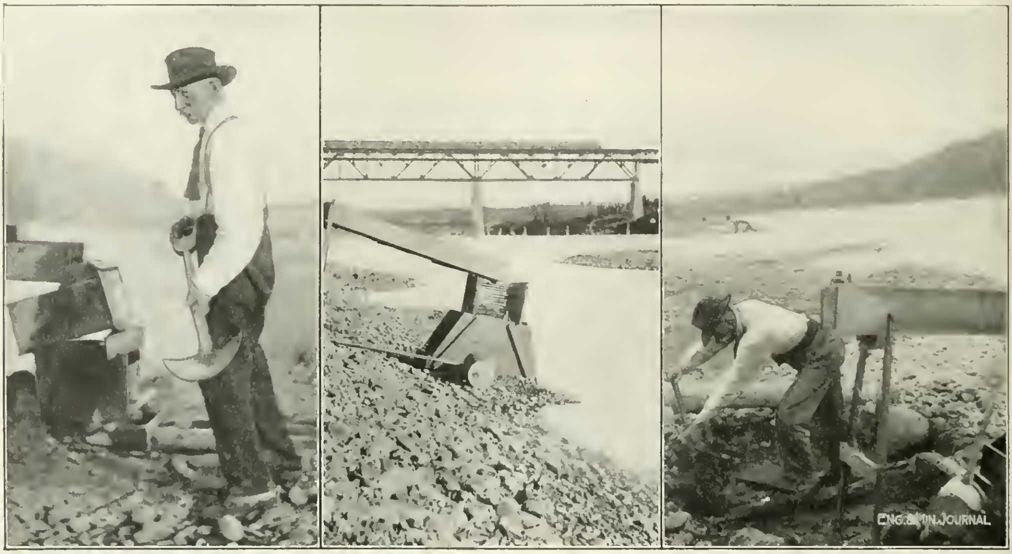
Southern Aluminium Suspends Operations

The war has made it so difficult for the Southern Aluminium Co. to obtain funds that it has discontinued its construction work. The work was well along: the powerhouse was nearly up; 35,000 cu.yd. or more of concrete had been laid on the big dam; the electrode factory was nearly completed, and work had begun on the purifying plant.

⁂

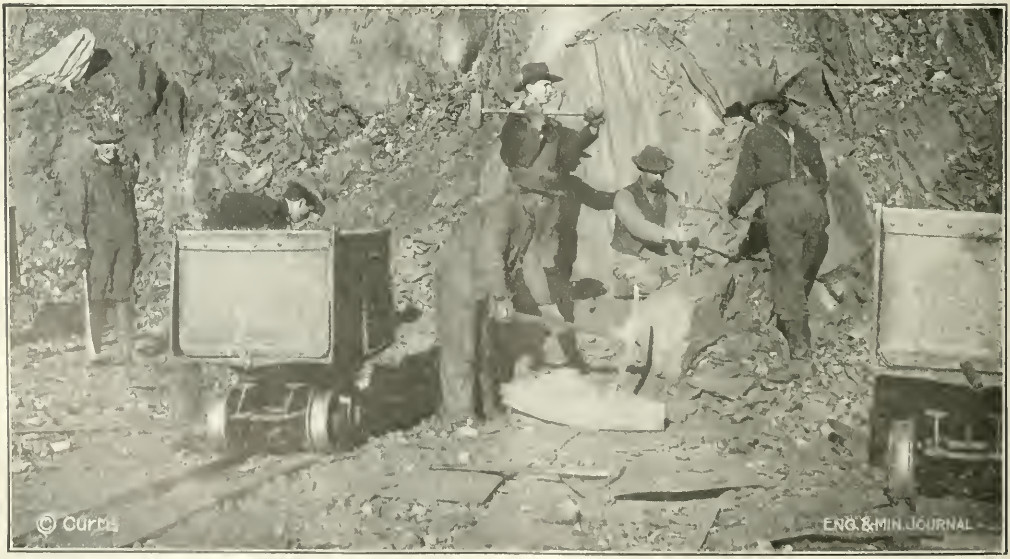
Mica Production in the United States in 1913 amounted to 1,700,677 lb. of rough trimmed and cut mica, and [illegible] tons of scrap mica, according to the U S Geological Survey Only muscovite (potash) mica is mined in the United States, North Carolina being the chief producer

Photographs from the Field

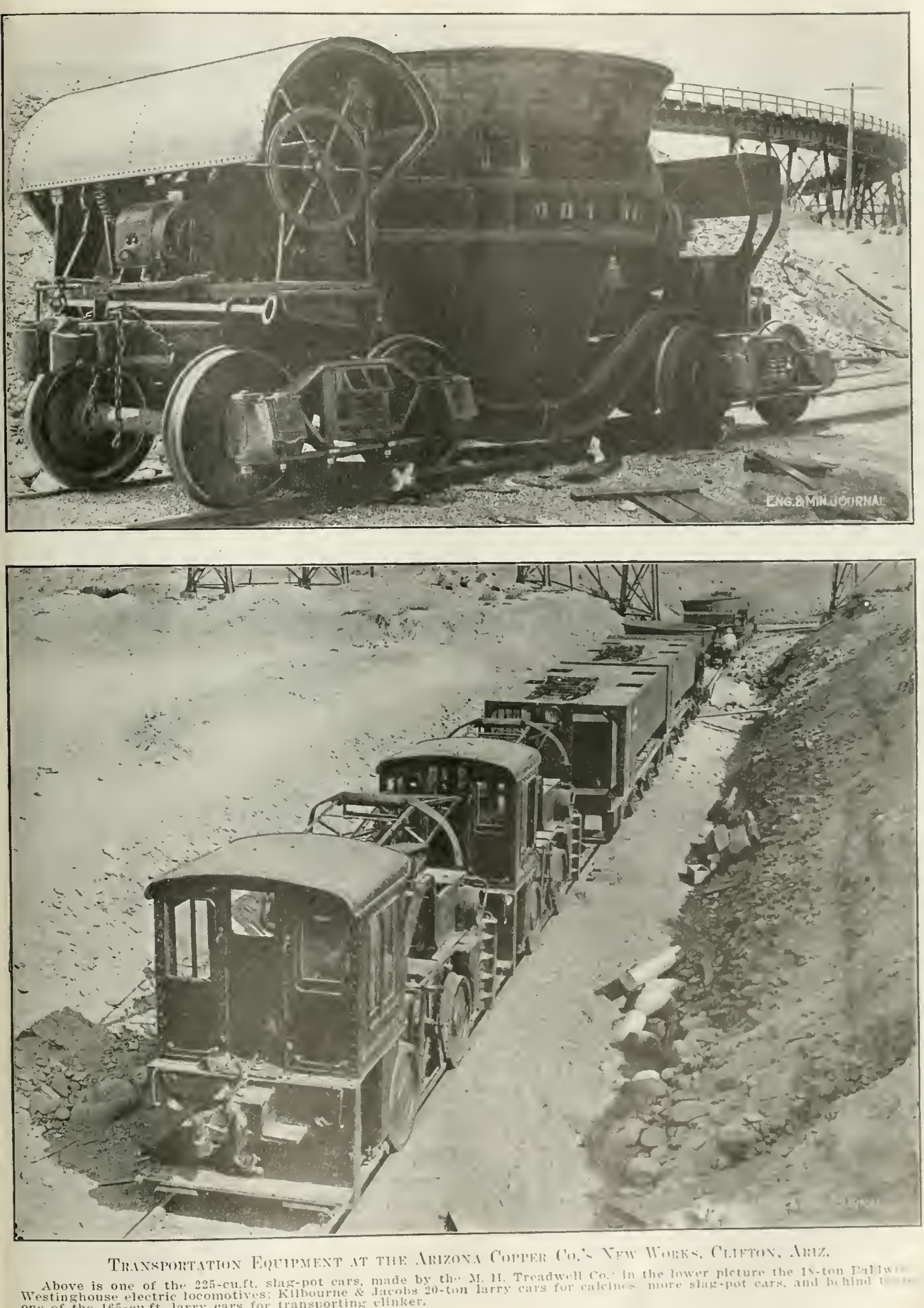


WASHING GRAVEL FOR GOLD IN THE SASKATCHEWAN RIVER AT EDMONTON, ALBERTA, CANADA

About 600 men are operating grizzlies and earning $1.50 to $2 per day. Unemployment, on account of the war, has stimulated the work.



OPENCUT MINING AT THE HOMESTAKE, S. D.



TRANSPORTATION EQUIPMENT AT THE ARIZONA COPPER CO.'S NEW WORKS, CLIFTON, ARIZ.

Above is one of the 225-cu.ft. slag-pot cars, made by the M. H. Treadwell Co.; in the lower picture the 18-ton Baldw Westinghouse electric locomotives; Kilbourne & Jacobs 20-ton larry cars for calcines, more slag-pot cars, and behind t one of the 165-cu.ft. larry cars for transporting clinker.

International Engineering Congress

A circular from the Committee of Management refers to a report recently circulated to the effect that the International Engineering Congress was to be abandoned, and states that this is not correct, but that the Congress will be held in San Francisco as scheduled, from Sept. 20 to 25, 1915. In view of the conditions now prevailing in Europe the governing bodies of the five national societies under whose auspices the Congress is to be held have recently given careful consideration to the feasibility of holding the Congress and to the probability of its success, with the result that each body has unanimously confirmed its original pledge to support the Congress. The Committee of Management is actively proceeding with arrangements, which are now well advanced, for meetings on the scheduled dates and for the publication of the transactions.

The Committee of Management is in receipt of a sufficient number of communications from various foreign countries throughout the world, including those located within the war zone, to indicate that a large majority of the papers originally requested for presentation at the sessions of the Congress and publication in its transactions will be handed in on time, and that the Congress will be truly international in character.

The general fee for membership in the Congress is $5, which will entitle the member to receive the index volume and any single volume of the transactions he may select, together with the right of participation in all the general activities and privileges of the Congress. W. A. Cattell, Foxcroft Building, San Francisco, is secretary of the Committee of Management.

⁂

Additional Contraband of War

Additional schedules of contraband of war have been issued by the British government, according to the *Mining Journal*. The chief lines of interest to the mineral industry are the following:

Absolute Contraband—Sulphuric acid, armor plate, hematite ore and pig iron, iron pyrites, nickel ore and nickel, chrome ore and ferro-chrome, unwrought copper, lead (pig, sheet or pipe), aluminum, ferrosilicon, barb wire and cutters, mineral oils and motor spirit (lubricating oils excepted).

Conditional Contraband—Gold and silver coin or bullion, fuel other than mineral oils, lubricants, explosives (not specially prepared for war), sulphur, glycerin.

⁂

Ray Consolidated Copper Co.

Report of the Ray Consolidated Copper Co. for the third quarter of 1914 shows production of 12,475,153 lb. of copper from concentrating ores, which was produced 6,008,061 lb. in July, 3,229,401 lb. in August, and 3,237,691 lb. in September. In addition, 161,032 lb. was produced from ores shipped to smelters.

On account of unsettled conditions, production was reduced one-half in August, so that the ore milled for the quarter was 516,734 dry tons, averaging 1.61% copper. Mill recovery was 67.47%. Milling costs were 15.85c. per ton. Mining and coarse crushing cost 57.681c. per ton, of which 2.814 was for coarse crushing.

Average cost per pound of net copper was 8.849c. per lb., after allowing for smelter losses and applying the dividends of the Ray & Gila Valley R.R., but no other miscellaneous income, to credit of cost. Combined cost of net copper from both milling and shipping ore was 8.883c. per lb. This includes all operating and general charges, as well as 12½c. per ton of ore milled, which is applied to retirement of mine-development costs.

Underground developments for the quarter amounted to 10,626 feet.

No dividend was paid for the third quarter. Net surplus, over bond interest, was $420,922. Earnings were based on copper at 12.4858c. per lb. The amount on hand and in transit, sold and unsold, at the end of the quarter was 24,405,739 lb. Reductions in cost, both at mine and mill, have been obtained.

⁂

New Source of Potassium Salts

Under the name of "salino potassico," the Italian distilleries have put a mixture of alkaline salts on the market which are extracted by distillation from the residues of fermented beet molasses, in the Dubrunfaut process. These residues, when suitably concentrated, are calcined, the composition of the ash obtained being as follows: K_2O, 47.20% ; Na_2O, 9.35% ; MgO, 0.50% ; $FeAlO_3$, 0.55% ; CO_2, 23.80% ; SO_3, 3.80% ; P_2O_5, 0.28% ; Cl, 8.32% ; H_2S, 0.15% ; carbon and sand, 1.0%. Thus it is a similar product to that called "schlempekohle," the annual production of which is 25,000 to 30,000 metric tons. Its value depends upon a high percentage of potassium carbonate.—*L'Industria.*

⁂

Gas Power Plants

R. H. Fernald, in *Journ. of Franklin Institute*, 1914, pp. 161-179, says that the total horsepower of gas-producer power plants in the United States was 160,000 in 1911, of which 80,000 was obtained from bituminous coal, 70,000 from anthracite and 10,000 from lignite. The cost of producer-gas installations is about equal to that of reciprocating steam engines; the cost of maintenance is only about one-half, while the economy has been shown in several cases to be two to three times as great; the heat losses in typical steam and gas plants given are:

	Steam Plant	Gas Plant
Heat lost in ashes	2.00	1.10
Heat lost in radiation and cooling	4.60	18.60
Heat lost in smoke	24.60	...
Heat lost in radiation and friction	3.30	4.30
Heat lost in exhaust	53.50	23.70
Heat lost in jacket water	...	33.50
Heat lost in auxiliaries	7.30	...
Total losses in entire plant	95.30	81.20
Net efficiency of plant	4.70	18.20

⁂

Crushing at the McIntyre Mill

In the article on "Cyanide Development at Porcupine, Ont. II," in the JOURNAL of Sept. 12, 1914, it was said that the ore feed to the Hardinge ball mill had been crushed to about ½-in. ring. This was officially stated by the company. Later information, however, shows that while the former practice was in accordance with that procedure, subsequent developments showed that the ball mill did better work on coarser feed, the mixture now containing 6.81% of +1½-in. and 16.62% of +1-in. material.

Correspondence and Discussion

Solubility of Sulphides in Cyanide Solutions

In his article on continuous counter-current decantation in the JOURNAL of Oct. 17, Herbert A. Megraw makes the following statement:

"Sulphide ores may, and usually do, require previous concentration, but it is nevertheless true that by grinding a sulphide fine enough, its values are very likely to be given up in about the same time required in the ordinary slimes treatments. To do this, however, sulphide slimes should be reground until they are in an exceedingly fine state of subdivision. In such case they may go through counter-current treatment along with ordinary slimes and have the metals satisfactorily extracted. Sulphides are, of course, governed by the same general laws as ores, so that what has already been said as to dissolution in the decantation circuit applies to them as well."

The qualifying phrase, that a sulphide's metals are "very likely" to be given up, saves this statement from being incorrect. And still it is so broad that it seems likely to lead to a misconception.

The solubility of the values in sulphide minerals depends upon the nature of the values and also upon that of the sulphides. It seems that gold may be recovered from almost any sulphide mineral by prolonged grinding and treatment, but silver only in exceptional cases. While at the Natividad mine in Oaxaca recently, I conducted a series of experiments on concentrates to determine that very point.

The concentrates consisted chiefly of clean galena and pyrite with a small proportion of blende and chalcopyrite. The galena and pyrite were so clean and bright that they could be taken off the Wilfleys in well defined and separate ribbons. The product of the tables carried from 8 to 10 kg. of silver and about 300 grams gold.

Experiments on these concentrates consisted of charging one kilo into an experimental tube mill with two liters of freshly made cyanide solution and grinding continuously for from one to three weeks, taking a sample of both the pulp and solution daily. In the course of several repetitions with solutions of various strengths and other modifications the following conclusions were reached.

The content of gold in the washed pulp fell rapidly at first, then more gradually until about the fourth day, when it had been reduced to from 3 to 15 grams. After that, even to the end of three weeks, neither the pulp nor the solution showed any further extraction of gold.

Nearly 50% of the total silver dissolved during the first 24 hr. After that it continued in a decreasing ratio until the fifth or sixth day, after which all effect of the treatment ceased. The residue, even after weeks of grinding in solution, never contained less than two kilos of silver and frequently as much as three kilos. Air agitation at intervals had no effect on the results.

Wet desulphurizing had no effect upon the silver extraction of the concentrates. Previous experiments had shown that this reduction treatment increased the extraction on mill pulp to 85 and 90%, the normal extraction with straight cyaniding being only 40 and 50%. Wet desulphurizing had no effect on the solution of gold in slime or concentrates.

These results seem to show that the gold is all in the metallic state whether associated with the slime minerals or with the sulphides; that the ruby silver minerals, easily visible in the ore, do not enter into the concentrates, but are immediately reduced to powder under the stamps; and that the silver in the concentrates occurs in some form or forms not soluble in cyanide solution even when preceded by a reduction treatment.

It is interesting to find in Mr. Megraw's articles that cyanide men are beginning to doubt the value of air and air agitation as a cure-all. A few of my experiments are illuminating on that point. A kilogram of the sulphide ore from below water level was ground dry in a hermetically sealed tube mill. Sodium-hydrate solution and aluminum plates were then introduced and the mill set in motion until a considerable internal pressure, due to hydrogen, developed. Finally, the cover was removed just long enough to remove the aluminum plates and introduce a weighed quantity of sodium cyanide. The mill, tightly closed and containing a few pebbles to affect a mild agitation, was kept in motion for another 24 hr. This procedure, in which air and oxidation were carefully excluded, gave as high extraction as agitation with air pressure.

I have followed the articles on cyaniding by Mr. Megraw with great interest. My interest, at least, is increased by his manner of dealing with first principles. He does not constantly exalt the importance of any particular detail, or of some particular machine. It is pleasant to observe in the development of the process the steady movement toward more simple arrangement and more simple apparatus. The multiplication of complicated machines, each guaranteed to increase the extraction, seems to have ceased. Perhaps some day the cyanide man will not be expected to spend 18 hr. a day with a monkey wrench in his hand. When that time arrives he may be allowed to devote his time to his real business.

A. VAN ZWALUWENBURG.

Mexico, Oct. 29, 1914.

*

Solubility of the gold or silver contained in sulphides has been discussed by cyanide operators for many years. Mr. Van Zwaluwenburg's objection to my statement that sulphides will usually give up their contained metal to cyanide solution if the mineral is ground fine enough is not surprising, but I am still of the opinion that my original statement is essentially true. The usual sulphide encountered in Mexican silver-bearing ores will give up its silver to cyanide solutions when the mineral is sufficiently fine, a fact which has been demonstrated by experiments at many places. At Guanajuato, Pachuca, Potosi, and many other camps, fine grinding has been found sufficient to insure high-percentage extractions on concentrates. Fine grinding in such cases may mean much finer than

—200-mesh size. The —200-mesh material often has to be reground, but in view of the friability of the sulphides the operation is not particularly difficult.

It is undoubtedly true that there do exist silver minerals which are not amenable to this treatment. Some of the lead-silver compounds belong to this class. The number of these compounds, however, is small in comparison to those which are amenable to cyanide treatment. As to the economy of such methods, I have said nothing. With some ores profits may be obtained, and with others there may be none. Each one presents a special problem which must be worked out in its own merits. The chemical fact that the silver in sulphides may be dissolved by fine grinding and ordinary cyaniding methods, however, remains. Attention may be called to the discussion by G. H. Clevenger on "Mill and Practice of the Nipissing Mining Co., Ltd.," in *Bull. of A. I. M. E.*, July, 1914, in which the opinion is indicated that fine grinding of heavy silver minerals is advisable.

As to Mr. Van Zwaluwenburg's remarks on the necessity of air as an aid to cyaniding, his opinion is becoming general. In some cases air or oxygen will aid in shortening the time of treatment. In a few cases it will increase the ultimate recovery, but in many cases it has no effect.

I heartily agree with Mr. Van Zwaluwenburg's final comment. When the cyanide director is permitted to be a technical director, rather than a roustabout, more of our puzzling problems will be solved.

H. A. Megraw.

New York, Nov. 7, 1914.

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Ventilation of the Anaconda Mines

On reading the editorial in the Journal of Oct. 10, 1914, on mine ventilation by mechanical means and the reference to Butte, it appears that the writer was not posted on what the Anaconda Copper Mining Co. is doing in mechanical ventilation in its mines.

Up to about eight years ago there was not much attention given to mechanical ventilation. The depths of the mines were not great, and with the great number of shafts besides those used for hoisting which were sunk by independent companies in former years and which were also necessitated by the topography of the camp, "natural ventilation" controlled by doors and canvas curtains was all that was necessary. Due to the increasing depth and the enormous quantity of timber used in the safe methods of mining, the temperature of the mine workings became a great deal higher. It is generally conceded by miners from all parts of the world that no company surpasses the Anaconda in the safety of its mining methods. The company then started to devise the best methods of improving conditions and different types and sizes of fans were brought into use.

At present there are 22 hoisting shafts of the Anaconda company, which vary from 600 to 3100 ft. in depth. Besides these, each mine, with one or two exceptions, has three shafts used exclusively as air shafts and some of the larger mines also have shafts that are used for handling timber, waste for filling stopes, etc. These air shafts are being continually sunk or raised to aid in ventilation.

The following table gives the type and number of fans used, their capacity and the power consumed in operating them. The fans installed on surface are placed over shafts that are used exclusively as air shafts.

Besides the fans here listed, there are a great many small ones used as blowers; these fans are connected to galvanized-iron pipes from 12 to 18 in. in diameter which carry air to the drifts, crosscuts and stopes. Canvas piping is used to carry air to the faces of the drifts, being supported by ropes tied to the timbers. These canvas pipes are carried back from the face when blasting and hence are more practicable than galvanized piping.

THE ANACONDA FANS

Mine	Fan	No. of Fans	Installation	Cu.Ft. per Min.	Motor Hp.
Anaconda	Amer. Blower No. 100	1	Surface	110,000	150
Anaconda	Sirocco No. 4	2	Underground	9,820	20
Neversweat	Sirocco No. 11	1	Surface.......	53,600	75
Neversweat	Sirocco No. 4	2	Underground	9,820	20
High Ore	Sirocco No. 11	2	Surface	53,600	75
High Ore	Sirocco No. 6	3	Underground	19,500	30
High Ore	Sirocco No. 4	5	Underground	9,820	20
High Ore	Sirocco No. 3½	3	Underground	6,620	10
High Ore	Venture No. 6	2	Underground	....	
Diamond	Sirocco No. 13	1	Surface	83,500	100
Diamond	Sirocco No. 11	1	Surface	60,000	75
Diamond	Sirocco No. 4	1	Underground	9,820	20
Diamond	Sirocco No. 3½	1	Underground	6,620	10
Gray Rock	Sirocco No. 11	1	Surface	53,600	75
Gray Rock	Sirocco No. 3½	1	Underground	6,620	10
Mountain Con.	Sirocco No. 13	1	Surface	83,500	100
Mountain Con.	Sirocco No. 4	2	Underground	9,820	20
Mountain Con.	Sirocco No. 3½	2	Underground	6,620	10
Mountain Con.	Sirocco No. 2½	1	Underground	3,636	7½
Steward	Sirocco No. 11	1	Surface	60,000	75
Steward	Sirocco No. 4	1	Underground	9,820	20
Steward	Sirocco No. 3½	1	Underground	6,620	10
Steward	Sturtevant	1	Surface	85,000	100
Original	Sirocco No. 11	2	Surface	60,000	75
Original	Sirocco No. 2½	2	Underground	3,636	7½
Original	Sirocco No. 5	1	Underground	.....	
Original	Sturtevant	1	Surface	85,000	100
Belmont	Sirocco No. 2½	4	Underground	3,636	7½
Nettie	Sirocco No. 2½	1	Surface	3,636	7½
Leonard	Sirocco No. 15	2	Surface	100,000	150
Leonard	Sirocco, mill type	3	Underground	9,820	20
Leonard	Buffalo	1	Underground	30,000	40
West Colusa	Sirocco No. 15	1	Surface	100,000	150
Mountain View	Sirocco No. 15	1	Surface	100,000	150
Mountain View	Buffalo	1	Surface	30,000	50
Pennsylvania	Buffalo	2	Underground	30,000	75
Pennsylvania	Sirocco No. 6	2	Underground	19,500	30
Berkeley	Sirocco No. 6	1	Underground	19,500	30
Mountain View	Sirocco No. 6	3	Underground	19,500	30
East Colusa	Buffalo	1	Surface	30,000	75
Ella	Sirocco No. 6	1	Surface	19,500	30
Tramway	Amer. Blower	1	Surface	110,000	150
Tramway	Sirocco No. 15	1	Surface	100,000	150
Tramway	Conoidal	1	Underground	60,000	50
Tramway	Conoidal	1	Underground	75,000	100
Tramway	Sirocco No. 4	2	Underground	9,820	20
Tramway	Sirocco No. 2½	1	Underground	3,636	7½

Total number of fans, 74.
Total horsepower used, 2921.2.
Total capacity, 2,170,108 cu.ft. per min. From surface, 1,380,936 cu.ft. per min.

It has been found from experience that it is much more efficient to use exhaust fans than pressure fans, but conditions will not allow the use of them in this way in all places. All surface fans are exhausters, however. One of many instances of efficient work done by a fan was on the 2800-ft. level of the Steward mine. A crosscut was being driven from the shaft to the main vein, the distance being 868 ft. After the crosscut was in about 200 ft. a No. 4 Sirocco exhaust fan was installed at the station, the pump compartment of the shaft being lined with 1-in. boards; 18-in. galvanized-iron pipe was connected to the fan carried to the crosscut and also from the fan to the pump compartment of the shaft. The air was carried to the level above, where it went through an air course to an air shaft. Before the fan was installed the temperature in the breast of the crosscut was 90° F., this was lowered to 75° F., and the place was made comfortable to work in.

In general the work done by fans all through the mines has been satisfactory, although no doubt there will be ways and means found to improve results right along.

J. J. Carrigan, Safety Engineer.
Anaconda Copper Mining Co.

Butte, Mont., Nov. 2, 1914.

Editorials

Alcoholic Liquor and Mining

At the last election two important mining states, viz., Arizona and Colorado, went "dry." This was no great ground for surprise, the incompatibility of whisky with efficient work in mining having long been recognized. Indeed, mine operators in Arizona, Colorado and Montana have lately been emphatic in deploring the evil tendency of the saloon upon the economics of the industry, especially in increasing liability to personal accidents and decreasing working efficiency. The direct waste of resources, the absence of thrift and the high cost of policing are further results to the community that may be traced to alcohol in a more or less degree, chiefly more.

John V. N. Dorr, a distinguished mining and metallurgical engineer, has furnished, in a letter to the *Evening Post,* some concrete evidence as to how this question is now regarded in Colorado, quoting from a communication received from a large machinery house in Denver as follows:

> It was indeed remarkable to find how strong the various coal-mining companies were in favor of prohibition after having had a year of it under the federal authorities, who enforced the laws and made the coal-mining camps absolutely dry. It was reported a couple of weeks ago that the Colorado Fuel & Iron Co. had announced to its employees that it was in favor of having the state go dry, and we have talked to a great many operators who called at our office, and, one and all, they have agreed that the men were doing about 15% better work per dollar of wages paid to them and that their families were in much better condition than when liquor was sold. On election day and the day before it, the coal companies had a great many of their men out on the street talking prohibition, and I don't think I ever heard a better argument down the line in favor of it, simply on account of the better work that surrounded them.

This evidence is exactly in line with the experience in the manufacturing cities of Massachusetts, nearly all of which for several years have been "dry" under the local-option law of that state. It has been found there that by reduction of alcoholic drinking the efficiency of the labor is higher, that there is less work for the police and magistrates to do and that the local merchants suffer fewer bad debts.

The national prohibition movement was started largely on moral and sentimental grounds. Lately it has been advancing on economic grounds. The combination of the moral and economic will make it irresistible. The cause has been further promoted by the decree as a military measure of prohibition in Russia, where vodka has been a national curse. If the new rule be continued indefinitely in Russia, the economic benefit to that country may be sufficient to pay its share of the colossal cost of the war.

* * *

Montana Shows Its Independence

When we went to press last week, the vote on the Montana workmen's compensation law looked so close that it seemed likely that a recount would be necessary. Subsequent returns, coming in from the remote counties, proved to be against the proposed law and when the vote was all in it was found that there was a majority of more than 4000 against it. Montana thus fell into line with other states in the recent election in defeating legislative proposals directed against one class of people in the interest of another class. This encouragement with respect to the public welfare of this country is one of the contributory factors in the optimism that has lately been growing. Legislatures may be frightened by the threats of labor unions into passing measures which the people with collective good sense defeat. The recent demonstrations of this may relieve legislators from one bondage of fear.

* * *

Some Comments on Copper Affairs

The Copper Producers' Association has made no report of copper production and stocks since last July. During the interval the officers of the association have not even made any compilation of figures for the private information of the members. Indeed, the members have not turned in their individual reports. Nor have the producers informally exchanged information with each other. In short, conditions have been exactly as they were before this statistical association was organized.

Our own opinion, based on information received from the principal refiners, is that the present stock of refined copper is less than is commonly supposed, whatever may be the accumulation of blister copper. Ever since Aug. 1 there have been regular deliveries of copper on old contracts, while the deliveries for export have been surprisingly large until lately; and in the latter part of October there developed a rather large volume of new business, which was checked but momentarily by the British seizures. Consumption has, in fact, been increasing in this country, especially in the brass business. On the other hand, the refiners did not wait to work up all the blister copper in transit to them on Aug. 1, but in several important instances inaugurated curtailment right away.

The net result is that some of the refiners are at present holding materially less stock of refined copper than on Aug. 1, while in one case where there was an increase during the three months things are now probably beginning to go the other way.

As to whether the Copper Producers' Association will ever resume the publication of its monthly statistical reports, or will put them on a different basis, or will simply fade away, nobody yet knows. The purpose of the producers, especially the stabilizing of the market by the communication of prompt and exact information, was defeated, partly by popular ignorance of the industrial conditions, partly by inherent difficulties. Whenever a bad report was published, advantage was taken of it to depress the market. When things turned in favor of the producers and there was a good report, the newspapers and the public charged that the figures were doctored or else said with Cassandran forebodings that "Last month may have been good, but just wait for this month's figures; they'll not be good," etc. Thus with the producers it was nearly always a case of "Heads I lose, tails you win."

It may be that the Copper Producers' Association will at some time resume its statistics in the old way, but we doubt it. It may be that it will make a quarterly, semi-annual or annual statement. Or it may pass out of existence. Whatever may be done will be in the far-away future. At present there is not even any discussion of it.

Mines and Military Operations

We are not going to join the ranks of the military critics, whose essays adorn the pages of the metropolitan dailies, even if they do not always enlighten us. But we are going to venture the prediction that the Russians will direct a powerful attack upon those parts of Silesia and Galicia adjacent to the "Dreikaiserliche Ecke," where Germany, Austria and Russia join, for there are some great mines of coal, zinc, lead and iron, of which the Russians are probably in great need. Their own zinc mines of Olkusz and their important coal mines of the Dombrowa basin lie in this district, as do also their zinc smelteries at Bendzin and Dombrowa, which are the only producers of spelter in the empire. This district has been in German or Austrian hands ever since the beginning of the war, and Russia has been obliged to obtain her spelter from foreign countries, including the United States. Her deprivation of the Dombrowa coal mines has also been troublesome, the Donetz region being her only other source of supply, and it has been apparently insufficient. Anyway, the European papers have been reporting a serious scarcity of coal in Russia and poor chances of getting large quantities from England in the present condition of navigation.

Now, however, the Russian advance has reached this corner of Poland, and Russia is in a position to strike for the recovery of her own mines, if she has not already done so. A few miles further west she can seize, if she be strong enough, the great zinc, lead, coal and iron mines of Silesia, the zinc smelteries around Beuthen and Kattowitz, the lead smelteries at Rosdzin and Tarnowitz, and the iron and steel works at Königshütte, sulphuric-acid works, sheet-zinc rolling mills and many other kinds of useful factories. If successful, she will have all the zinc and lead she needs and will no longer have to buy them in New York. She will get coal, which is even more important; and with her own supply of copper and petroleum, will be in a comfortable position with regard to metals and minerals. Therefore, a violent attack in this direction is to be anticipated.

Other important mines of this region are the famous salt mines of Wieliczka and Bochnia, a few miles east of Cracow, in Galicia. The important petroleum fields of Galicia, which are near Drohobycz, have been in Russian possession for some time back.

Adirondack Gold Again

A correspondent in California writes us about a person who is circulating in that region, fishing for suckers with an Adirondack gold-mining hook. He has some reputable persons nibbling, says our correspondent. This particular fisher pretends to have an amalgamator which saves more gold than the fire assay shows. (The same old story which may be traced back to the green-gold myth, which we have analyzed in previous critiques.) This new wizard pretends to do the trick by fine-grinding and electricity. He claims to have extracted $6.50 per ton from Adirondack material, out of which Ricketts & Banks never got over $3.50. (We do not believe that Ricketts & Banks ever got $3.50 out of one ton—2000 lb.—of Adirondack material, anyhow.) Our correspondent suggests that we ought to issue a warning against this new faker. The present remarks must suffice. We have lost interest in Adirondack gold swindles. After the exposures that have been made by us, by the New York Geological Survey and by others, we are of the opinion that anybody who puts money into an Adirondack "gold mine" ought to lose it. Or rather, we should say, that any promoter of an Adirondack "gold mine" ought to be apprehended by the authorities on sight.

Trading with South America

One of our valued correspondents in Chile, an engineer who has been a resident of that country for several years and has been engaged in business there, writes us as follows: "If you Americans want business here, begin by buying the products of the country. Each of the South American republics has an urgent need—not for merchandise, but for someone to buy its products. Chile has nitrate of soda, copper and silver; Peru has copper, cotton and rubber; Bolivia has tin and rubber; and so with all of the countries, each one has products to sell before purchases can be made, or before even back debts can be paid. Everything in Chile is now on a strictly cash basis, so this would be an excellent time for Americans to appear. There are also many possibilities of obtaining interest in industries of the country, and this applies particularly to Chile. However, there is going to be a lot of disappointment for American manufacturers, if the advertisements we see are to be taken as a guide to the present opinion among them. Tell them to buy nitrate if they want business in Chile." This is advice that is founded on common sense. Unfortunately, we have already more copper and cotton than we know what to do with, wherefore we are not likely to buy them from Peru and Chile, but we need tin, rubber and sodium nitrate.

*

We hear from Colorado that the smelters there are getting more ore than they were four months ago. The explanation of this is that while the shipments of some of the larger companies have decreased, those by leasers and tributers have increased. When the Rocky Mountain miner loses his job and cannot obtain another one, he gets a lease somewhere and digs on his own account. If he can't get $3 a day in wages from some corporation, he is glad to earn $1.50 a day while being his own boss. Similar occurrences have frequently been noted in the Joplin district, Missouri, where it is notorious that in times of adversity and the closing of company-owned mines, the production of the district has been maintained by the aggregate of small outputs of little mines worked by three men with a windlass.

BY THE WAY

In these days of frantic appeals of "buy a bale of cotton," "why not buy a ton of copper" and "please buy a carload of coal," there is great consolation to be derived from the cheering thought that Uncle Sam is still doing business at the old stand and is paying the same old $20.67 per oz. for the real stuff. Sell a gold brick.

* * *

Marshall Field stated these 12 things to remember: (1) The value of time. (2) The success of perseverance. (3) The pleasure of working. (4) The dignity of simplicity. (5) The worth of character. (6) The power of kindness. (7) The influence of example. (8) The obligation of duty. (9) The wisdom of economy. (10) The virtue of patience. (11) The improvement of talent. (12) The joy of originating.

* * *

An extra large blast was fired at Copper Flat by the Nevada Consolidated, the cost of which is said to have been $10,000. Twelve holes ranging from 65 to 125 ft. deep, had been drilled back from the face of the bank on the Westphalia and Liberty claims, the average separating distance being about 100 ft. They were loaded with 58,050 lb. of explosives, mostly dynamite, and all fired together. The amount loosened by the blast was estimated at about 200,000 cu.yd.

* * *

The refineries of the Union Sulphur Co. of New York, at Marseilles and Cette, France, were recently in danger of French seizure and destruction, and the State Department at Washington was asked to make representations to the French government for the protection of the two plants. In 1909, the Union Sulphur Co., finding production from its Louisiana deposits more than ample for domestic consumption, decided to sell some of its sulphur abroad. Accordingly it established at Marseilles and Cette the Raffineries Internationales de Soufre. While the owners are Americans, a German named Herman Hoechel was placed in the position of managing director, and another German named Zeise was his assistant. At the outbreak of the European War the Germans fled to their own country, but their previous direction of the works gave rise to French suspicion that the concern was German. After repeated warnings of the U. S. Consul at Marseilles, our Government finally took the matter in hand and satisfactory assurances of neutral ownership were presented to the French government.

* * *

B. C. Forbes in the *American* gives this poem in prose and lesson in economics:

WHO AM I?

——I am the foundation of all business.

I am the fount of all prosperity.

I am the parent, most times, of genius.

I am the salt that gives life its savor.

I have laid the foundation of every fortune in America, from Rockfeller's down.

I must be loved before I can bestow my greatest blessings and achieve my greatest ends. Loved, I make life sweet and purposeful and fruitful.

I can do more to advance a youth than his own parents, be they ever so rich.

Fools hate me; wise men love me.

I am represented in every loaf of bread that comes from the oven, in every train that crosses the Continent, in every ship that steams over the ocean, in every newspaper that comes from the press.

I am the mother of democracy.

All progress springs from me.

The man who is bad friends with me can never get very far—and stay there.

The man who is good friends with me, who is not afraid of me, can go—who can tell how far?

Who am I?

What am I?

I AM WORK.

* * *

Some consideration of Mr. Forbes' teachings is recommended to the members of the American Federation of Labor, who made an effort at the recent convention in Philadelphia to start an agitation for a six-hour work-day in all organized trades. The United Brotherhood of Carpenters wanted the convention to exert its weight to establish the six-hour day in all trades, upon the ground that the eight-hour day is enervating and excessive.

* * *

At the same convention there was a vigorous expression of the demand of the turbulent element in union labor that troops should be barred by law from upholding the civil authorities in disorders growing out of strikes. They would also disarm the courts. There was an angry protest against the right exercised by mining companies and other large employers to protect their own property with armed guards. Those parts of the Clayton act which make unionized workers a privileged class, immune from prosecution for acts made criminal when plain ordinary citizens are guilty of them were naturally extolled. As to this the New York *Sun* remarks that there is a distinctive spirit grown up in the labor organizations which affects all their ideas and relations and determines their opinions on every question and their relation to every public man. The spirit is that of class supremacy. Everything is measured and tested by its effect on labor interests. If it promotes and pampers the labor caste it is excellent; if it does not obviously hamper or delimit laborism it is tolerable; if it tends in any way to place the worker on the same plane of competition as other men or to curb his sweet will in any way it is anathema.

* * *

Shivers which run up and down certain spines whenever possible reopening of the Stock Exchange is discussed, remarks the writer of "Wall Street Paragraphs," in the New York *Evening Post*, may be causeless. He illustrates his point by telling a variation of an old mining story which is always good in any form. These shivers, he says, are much like those of the Welsh coal miner who one night, walking home in the dark, stumbled into an abandoned pit. As he fell he clutched a beam, and with the strength given men in a desperate place, held on. Suspended by his fingertips over the black hole, he tried to peer into its depth. He could see nothing. Then he looked up: how far off the stars had suddenly retreated! His frightened mind pictured how much further they would retreat if he should let go the beam. Shivers chased up and down his spine as his fingers began to numb. Minutes passed. He calculated the time it would take for his mangled body to reach the bottom of the shaft. He pictured the faces of his mates when they found him in the morning. More shivers agitated his spine. More minutes passed. At last he could hold on no longer. He let go. He fell 12 in. He had been hanging over a shallow hole in the ground.

PERSONALS

Quincy A. Shaw, president of the Calumet & Hecla Mining Co., arrived in Calumet, Mich., Nov. 11, from Boston.

David S. Ross, of Milwaukee, Wis., organizer and first president of the Twin Buttes Mining Co., was recently at Tucson, Ariz., at a meeting of the directors.

Ralph S. Rainsford, until recently manager of the Argonaut mine, in California, was married Nov. 9, to Marguerite Le Breton, at Washington, D. C. Their home will be in Detroit.

B. R. Hatcher, of Hatcher & Carpenter, Tucson, Ariz., recently returned from an extensive trip through the northern part of Arizona, and reports activity among the small gold producers.

W. R. Bolley, for the last seven years connected with the Copper Range Consolidated Co. in varying capacities, but more recently as superintendent of the Baltic mine, has resigned.

Captain William McDermott, formerly of the United Verde, has just returned to Tucson, Ariz., from a business trip to Butte, Mont., where he visited most of the reduction plants of the district.

H. Harris has resigned his position with the Tasmanian Smelting Co., as general manager, and is now in London in charge of the works of H. J. Enthoven & Sons, Ltd., Upper Ordnance Wharf, Rotherhithe.

Arthur E. Woolsey, who for the last three years has been in India, engaged in starting the Tata Iron & Steel Co. plant at Sakehi, is returning home and is expected to arrive in New York about the middle of November.

The Japanese Mine Owners' Association will make an exhibit at the Panama-Pacific Exposition, which will be prepared under the direction of Dr. Wada and Dr. M. Otagawa of the Ashio copper mines at Shimotsuke, Japan, and will be in charge of their expert, Mr. Furikawa.

H. W. Turner writes us from Siberia that he is on his way to the United States by way of Petrograd, Norway and London. He has been engaged for a long time in geological work in the western foothills of the Altai Mountains. Mr. Turner expects to be in New York in November or December.

James Douglas has resigned from the Greene-Consolidated Copper Co. and affiliated concerns, both as general manager and vice-president. George Kingdon, who has been in charge of mining operations, has been made general superintendent of the Greene properties. No general manager will be appointed at present.

Albert Mendelsohn, for the last two years mining engineer at the Champion mine of the Copper Range Consolidated Co., has been appointed superintendent of the Baltic mine of that company, succeeding W. R. Bolley, resigned. Before his connection with the Copper Range, Mr. Mendelsohn was engineer at the Superior mine. He is a graduate of the Columbia School of Mines.

John Treadwell, one of the discoverers of what is now the Alaska Treadwell gold mine, has filed a petition in bankruptcy in New York, giving liabilities of $2,391,660, with assets of uncertain value. The principal creditor is the California Safe Deposit & Trust Company, by Frank J. Symmes, receiver, with a claim of approximately $2,000,000. Treadwell holds stocks in numerous mining companies, the value of which is unknown.

Henry M. Howe wrote a communication that was published in the "Tribune" this week, urging that the United States ought not to remain neutral in the Great War, but ought in self interest to join the Allies. J. R. Finlay some time ago advocated the cause of Germany, in a letter in the "Evening Post," on economic grounds. These are only two of the well known engineers who have figured in the forums of the press.

Charles M. Schwab, of the Bethlehem Steel Co., who has been in London on business concerning contracts for war material, says: "I hope before a great many years to write an autobiography and I trust that when I do so I can tell the full story of the last three weeks." In private conversation Mr. Schwab is said to have made the remark that "Lord Kitchener is the best president the United States Steel Corporation ever missed."

Dr. Robert Olson and Dr. Joseph Bolton, of the Public Health Service, Washington, are making a sanitary survey of the Minnesota iron ranges. This work is being done at the request of the Committee on Industrial Relations of the House of Representatives. The survey has to do with housing conditions, ventilation systems, first-aid work and kindred welfare subjects. Work of a similar character has just been completed in the Copper Country.

John E. Sweet, president Straight Line Engine Co., Syracuse, N. Y., is to be awarded the John Fritz Medal this year, probably on the evening of Dec. 2, in the Engineering Societies Bldg., New York. The medal is awarded annually by four national engineering societies, for notable scientific or industrial achievements. Previous awards have been made to Lord Kelvin, George Westinghouse, Alexander Graham Bell, Thomas A. Edison, Charles T. Porter, Alfred Noble, Sir William H. White and Capt. Robert W. Hunt.

J. A. L. Waddell and John Lyle Harrington announce the dissolution of the firm of Waddell & Harrington, Kansas City, Mo. The firm's business will be conducted as usual till the conclusion of its affairs in July, 1915, except that it is accepting no new commissions. Dr. Waddell will give his attention to special engineering and financial matters and to important advisory work. Mr. Harrington will be joined by the firm's associate engineers, E. E. Howard and Louis R. Ash, in the establishment of the firm of Harrington, Howard & Ash.

OBITUARY

W. S. Hermany, constructing engineer with the Bethlehem Steel Co., died at Bethlehem, Penn., Nov. 7, from typhoid fever. He had direct charge of the erecting of the plant which the company is building at New Castle, Del., for the manufacture of fuses and projectiles.

William Sauntry committed suicide at the Ryan Hotel, St. Paul, Minn., Nov. 10. No reason for this act could be assigned. Mr. Sauntry had some valuable lumber interests on the Mesabi range in Minnesota, and some of his lands were later found to contain iron ore. On one of these tracts was opened the Sauntry-Alpena mine, which bears his name. It is one of the largest pits on the range, its estimated production for 1913 having been 1,600,000 tons. The mine is operated by the Oliver Iron Mining Co. under lease.

Hon. William Templeman, formerly minister of mines for Canada and proprietor of the "Victoria Times," died at Victoria, B. C., Nov. 15, aged 70 years. He was born at Pakenham, Ont., and was for many years engaged in journalism at Almonte, Ont. Removing to Victoria in 1884, he became connected with the "Victoria Times," of which he subsequently became editor and proprietor. He took an active part in politics on the Liberal side and was called to the Senate in 1897, remaining a member of that house until 1906, when he was elected to the House of Commons for Victoria, and was appointed minister of inland revenue. The year following he became minister of mines, being the first to hold that position. He remained a member of the Laurier administration until it was defeated in 1911. Mr. Templeman had always taken a keen interest in the mining industry, and his knowledge of its requirements was brought to bear in the organization of his department, which he was enabled to place on a satisfactory basis. In 1909 he was appointed a member of the Canadian Conservation Commission.

SOCIETIES

American Institute of Mining Engineers—The annual meeting of the Columbia Section will be held at the Spokane Hotel, Spokane, Wash., Nov. 20. The evening program will be: Dinner at 6.30 p.m. Business session at 8 p.m.; annual reports, election of officers, paper by Prof. F. M. Handy, "Notes on the Economic Geology of Eastern Washington;" discussion.

Mackay School of Mines—This school of the University of Nevada, at Reno, will give a four-weeks course in prospecting, in February, 1915. Lectures on prospecting, excavation of earth and rock, geology, assaying and mining law, and laboratory exercises in mineralogy, assaying, gas engines and first aid to injured will be given. Course open to all residents of Nevada; fee of $5 will be charged to cover in part cost of supplies. The State Mining Laboratory, at the Mackay School, makes free analyses for Nevada prospectors.

Western Society of Engineers—At a meeting of the society, held in Chicago, Nov. 9, L. S. Marsh read a paper on "High Explosives." Mr. Marsh is a member of the Corps of Engineers, Illinois National Guard, also a member of the American

Chemical Society, and is an authority on the subject. His talk included a short history of the discovery and development of explosives, and a description of the methods of manufacture of the better known varieties of both explosives and detonators. He dwelt at some length on their use in engineering, also the proper handling and figuring of charges. The lecture was illustrated with lantern slides and a few experiments, and led to considerable discussion.

Teknik Club—The regular monthly dinner meeting of this club was held at the Shirley Hotel, Denver, Nov. 12. Dr. S. C. Lind, of the Bureau of Mines, described the methods of analysis for radium and the relative advantages of each. The importance of the ratio between radium and uranium in an ore was discussed and the interesting possibility was pointed out that a dependence on this ratio might be unsafe in connection with the purchase of radium ores due to the possibility of mixing uranium ores, from which the bulk of the radium has been removed, with the radium bearing ores offered for sale, which would result in an erroneously high report of radium content. The fact was announced that in the determination of small quantities of radium in ores the practice in the United States is farther advanced than in Europe. Mr. W. G. Swart presented a discussion of several interesting mathematical curiosities and fallacies. Mr. H. J. Baron discussed present conditions in Mexico.

Colorado Scientific Society—The 307th regular meeting of this society was held in the State Museum Building, in Denver, Nov. 7, Richard A. Parker presiding. O. F. Heizer read a paper on "The Milling Practice at the Argo Mill, Idaho Springs, Colorado." The Argo Mill is unique in that it treats custom ores by cyanidation and operates successfully on a feed from some 15 different mines which ship varying quantities of ores of varying composition. Preliminary announcement was made of the course of lectures to be delivered before this society on the subject of cosmic physics, by Dr. Lucien I. Blake.

INDUSTRIAL NEWS

The Hyatt Roller Bearing Co. announces the resignation of John A. Schroeder, formerly general sales manager of that company. His successor has not yet been appointed.

The Abbott Ball Co., Hartford, Conn., annouoces that it is now prepared to furnish all sizes of bearing balls from 3/8 in. to ½ in. in diameter, and will later be in a position to furnish all other sizes.

Floyd F. Woods has been appointed sales manager for the Epping-Carpenter Pump Co., of Pittsburgh, Penn. Mr. Woods takes the place of R. Bowen, who is no longer connected with the company.

Probably the greatest record of hoisting-engine production made by any one concern is that of the Lidgerwood Manufacturing Co., New York, which have built more than 37 000 steam and electric hoists during the 40 odd years that it has been in business.

TRADE CATALOGS

Link-Belt Co., Chicago, Ill., Book No. 124. Steel Chains and Sprecket Wheels. 40 pp., illus., 6x9 inches.

T. H. Proske, Denver, Colo., Catalog. The Imperial Drill Sharpening Machine. 16 pp., illus., 7x5 inches.

✓ Smooth-On Manufacturing Co., Jersey City, N. J. Catalog. Smooth-On for Foundry Men. 8 pp., 3x6 inches.

Western Electric Co., New York, N. Y. Boletin S 1. Cuadros Conmutadores Pequeños de Magneto. 16 pp., illus., 10½x8 inches.

Quigley Furnace & Foundry Co., New York, N. Y., Bull., No. 6. Overfired Accurate Temperature Heat Treating Furnaces. 4 pp., illus., 11x8½ inches.

Johnson & Johnson, New Brunswick, N. J. Catalog, No. 110. "First Aid" Cabinets for Mines, Railroad Shops, Factories, etc. 16 pp., illus. 6x8½ inches.

✓ Goldschmidt Thermit Co., 90 West St., New York, N. Y. Catalog, Thermit Insert Fully Welded Rail Joint. 8 pp. Illus. 9x4½ in. Catalog. The Thermit Process of Pipe Welding. 24 pp. Illus. 9x6 inches.

✓ Ingersoll-Rand Co., 11 Broadway, New York, N. Y. Form No. 3024. Ingersoll-Rogler Valves for Air Compressing Cylinders. 28 pp., illus., 6x9 in. Form No. 3030. Class Elt-1 Ingersoll-Rogler Air Compressors. 20 pp., illus., 6x10 inches.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

AMALGAMATOR. Gustav R. Bauer, Oceanpark, Calif. (U. S. No. 1,114,573; Oct. 20, 1914.)

BLASTING—Miner's Blasting-Box. Joseph Beeneck, Nanticoke, Penn. (U. S. No. 1,114,096; Oct. 20, 1914.)

BRIQUETTES—Improvements in the Maoufacture of Briquettes from Iron Ore and Flue Dust. M. Frieberger, Berlin, Germany. (Brit. No. 15,919 of 1913.)

CHROMIUM ALLOYS—Improved Manufacture of Chromium and High Percentage Alloys Thereof. C. A. Keller, Paris, France. (Brit. No. 23,566 of 1913.)

CLASSIFICATION—Process and Apparatus for Sizing or Classifying Comminuted Materials. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Tex. (U. S. No. 1,114,-935; Oct. 27, 1914.)

CONCENTRATION—Support for Concentrating Apparatus. William F. Deister, Fort Wayne, Ind., assignor to Deister Machine Co., Fort Wayne, Ind. (U. S. No. 13,816; Oct. 27, 1914.)

CONCENTRATOR—Coal Washer and Ore Concentrator. Alonzo C. Campbell, Asheville, N. C. (U. S. No. 1,113,876; Oct. 13, 1914.)

CONCENTRATOR. Harvey W. Bailey, Portland, Ore., assignor to Harvey Bailey, Portland, Ore. (U. S. No. 1,111,687; Sept. 22, 1914.)

CONCENTRATOR. William A. Butchart, Denver, Colo. (U. S. No. 1,111,992; Sept. 29, 1914.)

CONCENTRATOR—Sluice and Ore Concentrator. Clarence Slocum Richardson, Los Angeles, Calif. (U. S. No. 1,110,824; Sept. 15, 1914.)

COPPER EXTRACTION—Chemical Concentration of Metals. Charles S. Bradley, New York, N. Y. (U. S. No. 1,114,-726; Oct. 27, 1914.)

CRUSHING—Apparatus for Grinding Ores and Other Materials. Harry W. Hardinge, New York, N. Y., assignor to Hardinge Conical Mill Co., New York, N. Y. (U. S. No. 1,115,531, Nov. 3, 1914.)

CYANIDING—Filter Leaf. Newton A. Burgess, New York, N. Y., assignor to Butters Patent Vacuum Filter Co. (U. S. No. 1,114,224; Oct 20, 1914.)

DRILL—Rock Drill. Daniel S. Waugh, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,114,949; Oct. 27, 1914.)

DRILL BIT. Arthur L. Edwards, Lewiston, Mont. (U. S. No. 1,113,968; Oct. 20, 1914.)

DRILLING MACHINE. Mather W. Sherwood, Franklin, Penn., assignor to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S. No. 1,116,138; and 1,116,139; Nov. 3, 1914.)

DRILLS — Apparatus for Lubricating Pneumatic Drills. Vincent J. O'Brien and George A. Oliver, Denver, Colo., assignors to The Standard Rock Drill Co., Denver, Colo. (U. S. No. 1,114,641; Oct. 20, 1914.)

ELECTRIC FURNACE for Melting and Refining Metals. James H. Gray, New York, N. Y. (U. S. No. 1,113,778; Oct. 13, 1914.)

ELECTROLYTE for Use in Electro-Metallurgy. Nicholas Henri Marie Dekker, Paris, France. (U. S. No. 1,113,456; Oct. 13, 1914.)

FURNACE-PORT COOLING SYSTEM. Frank E. Parks, Pueblo, Colo. (U. S. No. 1,113,245; Oct. 13, 1914.)

LAMP—Acetylene-Gas Lamp. Frederic E. Baldwin, New York, N. Y. (U. S. No. 1,115,157; Oct. 27, 1914.)

LAMP—Miner's Acetylene-Gas Lamp. Walter Harrison, Dewmaine, Ill. (U. S. No. 1,113,621; Oct. 13, 1914.)

LAMP—Miner's Acetylene Lamp. Joseph A. Wester, West Frankfort, Ill. (U. S. No. 1,114,208; Oct. 30, 1914.)

LEACHING - SOLUTION - HEATING SYSTEM. Frederick Laist, Anaconda, Mont. (U. S. No. 1,115,689, Nov 3, 1914.)

MANGANESE—Method of Heating Ores in Two Chambers or Retorts Arranged Behind Each Other. Ernst Menne, Creuzthal, Germany. (U. S. No. 1,114,502; Oct. 20, 1914.)

MANGANESE STEEL—Manufacture of Manganese Steel. William Campbell, New York, N. Y., John H. Hall, High Bridge, N. J., and Henry M. Howe, Bedford Station, N. Y., assignors to Taylor-Wharton Iron & Steel Co. (U. S. No. 1,113,-539; Oct. 13, 1914.)

MINE-CAR - DOOR FASTENER. Emanuel H. Owens, Moosic, Penn. (U. S. No. 1,114,510; Oct. 20, 1914.)

MUFFLE FURNACE. Edward Curran, Cardiff, Wales. (U. S. No. 1,114,587; Oct. 20, 1914.)

PRECIPITATION—Improvements in the Precipitation of Metals from Solutions of Their Salts and Apparatus Therefor. G. Jacquier, Johannesburg, Transvaal. (Brit. No. 17,790 of 1913.)

PUMPING—Method and Apparatus for Pumping Liquids. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. Nos. 1,114,108 and 1,114,109; Oct. 20, 1914.)

REFRACTORY LINING MATERIAL. James R. Campbell, Scottdale, Penn. (U. S. No. 1,114,446; Oct. 20, 1914.)

REFRACTORY ORES—Treatment of Refractory Ores. John Foye, Henry Egan Moore and Robert Boyle, Johannesburg, Transvaal, assignors to Refractory Ores, Ltd., Johannesburg, Transvaal. (U. S. No. 1,113,[illegible]23; Oct. 13, 1914.)

ROASTING—Process of Roasting Ores. Frederick Laist, Anaconda, Mont. (U. S. No. 1,114,372; Oct. 20, 1914.)

SCREEN or Separator. Thomas Leggett Sturtevant, Qu[illegible] and Thomas Joseph Sturtevant, Wellesley, Mass., a[illegible] Sturtevant Mill Co. (U. S. No. 1,111,064; Oct. 2[illegible], 1914.)

Editorial Correspondence

SAN FRANCISCO—Nov. 11

Dredging put Sacramento County in third place among the gold-producing counties of California in 1913. Its total production was $2,503,633. There is little quartz mining and only a small production from ordinary placer digging. In 1913 there were 12 dredges operating in the county, compared with 11 in 1912 and 10 in 1911. Ten of the dredges operating in 1913 were owned by Natomas Consolidated, one by the Ashburton company and one by the Union Dredging Co. The Ashburton closed down at the end of the year, having worked out the field. The Union did not operate full time, nor did the 10 Natomas boats, owing to necessary repairs. Sacramento County had not been classed as a gold producer after the pioneer days until dredging operations were instituted.

Mine-Rescue and first-aid training in connection with the model mine at the exposition has been definitely arranged by the U. S. Bureau of Mines. The features of practical instruction and demonstration will be in charge of George Steidle and A. A. Krogdahl. Mr. Steidle will have charge of the several exhibits, which will be similar to those in mine-rescue car No. 5, of which he has for some time been in charge; Mr. Krogdahl will give instruction in first-aid training, and will serve also as mine foreman of the model mine. This mine and the exhibits accompanying it will be constructed jointly by the Bureau of Mines, mine operators and mining-machinery men. The work and the exhibition will be under the general supervision of Dr. Frederick Cottrell, Dr. Irving C. Allen and H. M. Wolflin.

State Inspection of mines in California is provided for in a bill which State Senator E. S. Birdsall may present in the next legislature. Senator Birdsall proposes the creation of a bureau of mine inspection to consist of a chief inspector, at a salary of $6000, and four deputy inspectors at $2500 or $3000 per year each. The inspection of metal mines in California, as in all metal-mining states, is so serious a business that when undertaken by the Industrial Accident Commission it was deemed wise to practice the closest economy until a system conformable to effective laws and suggestive of new legislation, could be worked out, and to take the whole scheme of mine inspection entirely out of politics. The commission had a problem on its hands, which it undertook to solve by coöperating with the U. S. Bureau of Mines. It obtained as inspector, H. M. Wolflin, mining engineer and a California citizen, suggested by the Bureau of Mines. The Bureau pays one-half of his salary and expenses, and the state pays one-half. The inspection conducted by the commission has been along advisory lines rather than mandatory. There is no inspection law in California. There are a few disconnected and inadequate laws on the books, which have to do with the safety of miners. Some of the later of these have rendered obsolete some of the older ones, but mine operators and owners have not taken the trouble to see that obsolete laws were repealed. The mine inspector who would undertake to enforce these dead laws would find his task difficult. The most that could be done in the way of mine inspection in California, under the present laws, was just what has been done, the investigation of conditions and the suggestion of improvement. No California inspector with four or any other number of deputies, in the absence of a definite, adequate and satisfactory inspection law, could accomplish anything more. The present inspector has visited nearly all of the large producing mines in the state, and many of the smaller ones. A record of the situation and conditions of mine operation in 90% of the mining districts of the state is in the hands of the California Industrial Accident Commission and the U. S. Bureau of Mines. Senator Birdsall's bill evidently contemplates taking the duties of mine inspection out of the hands of the Industrial Commission. If that be desirable, it would be best achieved by allowing the matter to rest as it is, until such time as the California Metal Producers Association can take it under consideration. [The "Journal" strongly advocates the employment of sufficient high-salaried inspectors to obtain adequate inspection. But such inspectors would be useless without an adequate inspection law, which California does not possess. Let the law come first.—Editor.]

DENVER—Nov. 12

The Prohibition against Mill-site locations on the part of the General Land Office is objected to by the Denver Chamber of Commerce. The directors of the chamber ordered a protest made to the Department of the Interior against the ruling which applies to land withdrawn by the Government as power-site reserves. Ernest Morris brought the matter to the attention of the board and considerable time was spent investigating it thoroughly before taking action. The views of the directors have been communicated to Secretary Lane and the Colorado congressmen, as well as to the other officials of the department. In addition, letters have been addressed to the governors of Western states, asking their coöperation in the matter. The directors contend:

(1) The Federal Government has caused withdrawals for power-site reserves to be made upon a very extensive scale throughout the mining regions of the West. (2) Mill sites are a recognized practical necessity to the successful and profitable operation of metalliferous mining lodes, and especially where the ore is low grade it is an economic necessity to treat or reduce the same at or near the place of production, which can only be properly done upon mill-site locations. (3) The decision of the commissioner, of the General Land Office is against both the letter and spirit of the mining laws of the United States, and will tend to seriously obstruct and embarrass the metalliferous mining industry of the United States and prevent the proper development of the metalliferous mining resources of this country.

BUTTE—Nov. 12

The Compensation Law was defeated, it is now known, by upwards of 4000 majority.

Martial Law is at an end in Silver Bow County. By order of Governor Stewart, dated Nov. 7, the proclamation issued Sept. 1, declaring the county under martial law, was revoked. The order went into effect Nov. 12, and the military forces of the state, numbering 700 in the beginning and 160 in the end, were withdrawn from Butte. Not a shot was fired by the troops during their 10 weeks of stay and no serious encounter took place between the troops and civilians, a remarkable fact when compared with events in other districts where the militia has been called in to maintain order.

Now that the military regime is a thing of the past, one naturally asks: What good did it do, and what will be its effect on future events? The business cost the state not less than $125,000. What did the state get in return for this outlay? Well, it may be said that primarily it was not planned to accomplish a definite task, nor to solve a definite problem, but rather to prevent consummation of the threats of violence made daily by agitators, threats that, if carried into effect, would in the end have cost the state and Butte much more than the military occupation did, to say nothing of the loss of life and bloodshed invariably following in the wake of mob rule. That martial law was justified and necessary under the existing conditions, is admitted by most fair-minded citizens. It is more than likely that but for the presence of a large armed force, the bands of I. W. W. headed for Butte, would have found it easy and profitable to congregate there and join their forces with the mob leaders and their adherents for the perpetration of violence. The prompt arrest of the mob leaders, the elimination of the street-corner orators who were loudly preaching violence, the closing of the saloons and the strict enforcement of city ordinances, without any doubt prevented the execution of destructive measures planned by the leaders.

The military regime demonstrated to the lawless elements that the patience of the law-abiding citizen is not unlimited and that any sustained efforts on the part of the advocates of direct action to obtain their objects will not be tolerated in a peaceful community. It has also resulted in a warning to county and city authorities that incompetence and neglect of duty on their part will result in their prompt removal.

The differences between the rival unions can probably never be adjusted. This practically means the end of unionism among the miners of Butte, a fact that is welcomed by a large percentage of honest and industrious workers who are satisfied with existing conditions and realize that in normal times there is no other center of industry where the laborer is treated better and receives higher wags than he does in Butte. These men are only too willing to work wherever they can.

The mining companies have made extensive preparations to assure protection to their properties. They have built high board-fences all around their mines and provided them with electrical devices by which trespassing of unauthorized persons will be announced to those in charge of the respective properties. Walking delegates and other unwelcome meddlers will in the future be kept out.

SALT LAKE CITY—Nov. 12

Copper Shipments to neutral ports are a matter of concern to the Salt Lake commercial club which has sent a telegram and resolutions to Secretary Bryan urging that the United States take the necessary steps to have such shipments permitted. The resolution is signed by 17 prominent smelting, mining, and railroad officials. It points out that if Utah is unable to ship copper the industries concerned with its production will not be able to continue operations, that thousands of persons will be thrown out of employment, and that a population of 412,000 will be affected. There are about 16,560 persons directly engaged in the mining, milling, and smelting of lead and copper ores, and there are not less than 50,000 people directly dependent upon those so engaged. In addition to this there are not less than 20,000 persons indirectly dependent on the industry for their livelihoods. In 1913 $17,000,000 in wages was paid out to those engaged in the mining milling, and smelting industry of Utah; $4,400,000 was paid in railroad freights; material and supplies valued at $10,000,000 were purchased; and more than $600,000 was paid out in taxes. Sixty per cent. of all this was expended by those engaged in mining, milling and smelting copper ores. If the inability to ship copper to foreign countries continues, the copper producing industries will be entirely stopped in Utah, throwing many more thousands out of employment and causing widespread disaster to the state.

SILVER CITY—Nov. 12

A Correction is necessary in the account of the Burro Mountain experimental flotation plant, published recently. It now appears that the Towne separator makes a product only of about the same grade as that made by the Minerals Separation unit, earlier installed.

SEATTLE—Nov. 11

Production figures for the placer districts can now be approximated Nome reports a production of about $3,000,000. Fairbanks production, it is estimated, will be about $500,000 less than for 1913, due to both decreased placer and decreased lode production. The receipts at the First National Bank up to Aug. 1 were $300,000 less than at the same period a year ago, but the late season may have been partly responsible for this. Placer production for 1914 is estimated at $2,600,000; quartz, $215,000.

The Ruby district is just now attracting the most attention of any of the newer camps in the Yukon drainage. Hitherto most of the ground worked has been comparatively low grade, but during the past season rich pay was found on several claims, notably on Windy Bench, where one operator alone is said to have won a profit of $125,000. The known pay area has also been enlarged through important discoveries on new creeks. Operations have been handicapped and the production held down by the lack of suitable roads for transporting heavy machinery. It is probable that the 1914 production will pass the million mark.

The Circle district production will be in the neighborhood of $250,000 according to conservative estimates. Conditions there, especially on Mammoth, Mastodon and Eagle Creeks, are better than ever before. Almost all of the hydraulic plants were able to work until Sept. 16 although there were a few compelled to close five days earlier. Practically all summer there was plenty of water, and continuous work was possible. The Berry interests during the winter will erect a new dredge the material for which was landed on the beach near Circle early in the season. James Hamil will superintend the work, remaining in all winter.

The Chisana output has now been pretty definitely determined, since sluicing has ceased. The estimates give a total for the season of $251,000 divided as follows: Bonanza Creek, $140,000; Little Eldorado, $77,500; Skookum, $24,000; Gold Run, $1500; Big Eldorado, $6000; Coarse Money, $1000; all others, $1000. There were about 11 outfits working on Bonanza Creek, three on Little Eldorado, one on Skookum, three on Gold Run, one on Coarse Money and two on Big Eldorado. Much prospecting on the benches will be done this winter. About 125 persons are remaining in the camp. The Government has provided a winter mail service from McCarthy and all mail from Dawson will be routed via Skagway, Cordova and McCarthy.

From the Willow Creek District, the 1914 yield of gold is conservatively estimated at $400,000, and this will be increased to $1,000,000 in 1915 according to the most authoritative reports obtainable. This gold field north and east of Knik, Alaska, officially known as the Knik mining and recording district, was first opened about eight years ago by E. H. and W. E. Barthoff and Bob Hatcher. Sixteen claims on Fishook Creek were incorporated in the group now held by the Alaska Free Gold Mining Co., which was organized by the Barthoff brothers and others. William Martin has just returned from that district and brought out with him $130,000 in gold bullion, most of the season's cleanup. He sent out $30,000 earlier in the season. Mr. Martin now holds the lease to the Alaska Free Gold property. This, together with the Gold Bullion, the Mable, the Independent and the Rosenthal properties, which have undergone considerable development work this year, are expected to make up the $1,000,000 yield prophesied for 1915.

The Nelchina district is condemned by most of those who left after the freeze-up. Many prospectors still have faith, however, and much work will be done during the winter. Only one-third of the ground is permanently frozen and prospecting is difficult, since in the absence of machinery a shaft must be abandoned as soon as thawed ground and the inevitable water are struck.

The Broad Pass region and nearby territory will eventually develop into an important district in the opinion of the most conservative Alaskans. There is no justification, however, for a stampede. In fact when the recent glowing reports were circulated the lessons of the Chisana stampede were still fresh in the minds of Alaskans and the reports were as heavily discounted as those of any other "sourdough." Consequently there was nothing approaching a stampede, though the number of prospectors going into the district increased considerably. The general opinion among mining men in the Territory is that the Susitna Valley, including the Broad Pass and Knik districts, is one of most promising fields in the North for the quartz prospector. The same type of schist exists there as at Dawson, Fairbanks, Ruby, and other placer camps of the North. Intrusive rocks of much the same kind as those found in the older camps are also found there. Furthermore, the slate that carries many of the gold veins of Prince William Sound and other southern Alaska districts, occurs at Broad Pass. Geologically, therefore, the area is one of great promise. Huge gold-bearing lodes have been known for years in the nearby Bonnifield country. It is inferred from evidence afforded by prospecting done on Kantishna and from geological considerations that the ores will be complex and base, with antimony predominating among metallic minerals. Assayers who have seen specimens from the district report, however, that the ores are probably amenable to cyanidation. Quigley, on Kantishna, as noted in the news columns of the "Journal" last spring, has done considerable prospecting on a vein of antimonial silver-lead ore assaying $7 in gold and about 100 oz. of silver to the ton The antimony content is thought to be too low to interfere seriously with the precious metal extraction.

TONOPAH—Nov. 11

Recent Fires in Tonopah and Goldfield were of incendiary origin and the responsibility for them has been traced to members of the I. W. W., it is stated. Five members of this organization were arrested at Thorne in Mineral County, while trying to escape on a freight train, were placed in jail at Hawthorne and were later removed to Goldfield for safe keeping. One of them, after their conversation had been recorded by means of a dictograph, confessed to starting the fires and implicated two of his companions. Both fires, that of the Nevada Theater, in Tonopah, Oct. 29, and that of the hoist house of the Yellow Tiger Co. in Goldfield, Nov. 4, he stated, were started by means of yellow phosphorus.

LEAD—Nov. 13

Production of bullion in South Dakota, according to the report of the state mine inspector for the year ended Nov. 1, 1914, amounted to $7,325,710. This represents the recovery from 1,987,088 tons of ore treated. Individual productions were as follows:

	Tons	Value
Homestake . . .	1,787,000	$6,046,000.00
Golden Reward	51,355	369,182.78
Trojan .	79,626	[illegible] 229.80
Wasp No. 2	148,680	229,390.00
Mogul .	21,770	111,248.24
Bismarck	65,630	88,910.06
Reliance	27,659	69,[illegible]
Deadwood-Standard .	4,000	[illegible]
Placer		[illegible]
Miscellaneous	5,768	19[illegible]

Under miscellaneous are included the productions of the Otho, Monarch, Limelight, First National, Deadwood-Hidelberg and Ironsides. Other minerals produced included mica, gypsum, tungsten ore, lithia ore, lead and beryl. The production for the year shows a decrease in value from 1913 but an increase in tonnage. A total of 3040 men were employed; four fatal and ten serious accidents occurred during the year.

CHICAGO—Nov. 14

Cuyuna Manganese ores continue a matter of interest and their availability for the direct manufacture of alloys is warmly debated. In a recent issue of the "Journal" mention was made of the furnace of the American Manganese Co. at Dunbar, Penn. This company, it will be remembered, in the spring of 1914, absorbed the Cuyuna-Duluth and the Cuyuna-Mille-Lacs mines at Ironton, Minn., and now these mines are shipping to the Dunbar furnace. These two mines contain some high manganese ore, but the manganese is pockety and shipments of a given analysis cannot be guaranteed. If the phosphorus and silica could be brought down to the proper percentage, the ore might be used as a manganiferous ore, or even a manganese ore. At present, however, the manganese is worth merely its equivalent in iron units. The question of a manganese supply in this country is becoming important, and especially so to the manufacturers of dry batteries. Some of the latter are directing experimental work on American ores; they formerly secured their manganese from the Caucasus, but this supply is, of course, shut off. It is understood that the situation for some is serious, since there is but a small supply of the imported ore on hand. It is hoped that before long the famous old Crimora mine in Virginia will again be marketing a large tonnage.

ISHPEMING—Nov. 14

The Iron-Mining Outlook for 1915 is as uncertain as the outcome of the war, on which it will largely depend. Mining men are wasting no time in making predictions, for they frankly acknowledge there is nothing to guide them. But they are not without hope that the gradual stabilizing of finance, as well as of business, will define the limits in which they can operate and will, on the whole, make 1915 a better year than that now drawing to a close. They note the gradual improvement of tone in Eastern financial centers, and they believe it carries fair promise for the future.

DULUTH—Nov. 14

Dry Towns will be the rule over most of the Minnesota iron country henceforth as the result of a supreme court decision, whereby much of the northern part of the state is declared to be Indian country, and subject to the provisions of a certain Indian treaty of 1855. All saloons in upward of 60 towns in an area embracing practically all of the Cuyuna range and a large part of the Mesabi, including on the latter, Hibbing, Chisholm, Coleraine, Grand Rapids and Nashwauk, will be closed Nov. 30, unless additional threatened litigation ensues. Mine operators generally express the belief that the change will result in raising the standard of employees and reducing the percentage of floaters.

Cuyuna Range operations are progressing steadily despite the poor market for ore. The E. J. Longyear Co. continues drilling, on the Crow Wing County poor farm. Hole No. 7 showed 50 ft. of ore, and a number of previous holes have shown ore, but the great depth of surface, about 250 ft., will militate against mining operations. Drilling continues because the company agreed to drill nine holes in consideration of the option given. At the Wilcox mine of the Canadian-Cuyuna Ore Co., the electrical pumping equipment is being put into service, although little water is encountered. The Brainerd-Cuyuna shaft has reached 62 ft and is going down slowly; 400 gal. of water per min. is being raised by three small pumps. The Croft concrete drop-shaft in Crosby is down 65 ft., with about 40 ft. still to go to the ledge. Operations here are being rushed. Shipping to the docks still continues from the Armour No. 2, Thompson, Cuyuna-Mille Lacs and Cuyuna-Duluth, the former two shipping daily production and the latter two shipping stockpiles. With normal trade conditions, the 1915 season should see at least a dozen shipping mines on the Cuyuna range, as against seven this season. The Soo Line has completed grading from Crosby to Ironton, and rails are now being laid. This gives both Crosby and Ironton service from the Soo and the N. P. Practically no other railroad construction is going on, although the Soo is at work securing right-of-way for a connecting line from its branch at Manganese to a point on the Rowe mine spur near Riverton.

HOUGHTON—Nov. 14

The Close of Navigation on Lake Superior will see the smelter warehouses and docks of the Copper Country fairly well cleared of copper. The largest cargo of copper ever taken from the district left recently on the "North Star" of the Mutual Transit line. It came to 9,000,000 lb. with a value even at 11c. of close to a million dollars. It was consigned to Buffalo and included metal from all of the docks of the district, 3200 tons from the Calumet & Hecla docks at Hubbell, 500 tons from Dollar Bay, a smaller quantity from the Quincy dock and some from the Copper Range. While it is known that all of the metal being shipped by water has not yet been sold, it is cheaper to store it at Buffalo for reshipment than to keep it here during the winter and have to pay railway freight rates later in case of a domestic or foreign sale.

Construction Work in the Copper Country is being resumed. On Nov. 10, a crew of erectors from the American Bridge Co. arrived at Hubbell, Mich., to put up the steelwork on the new regrinding plant at the Tamarack mill. The same day three cars of steel arrived and work on the skeleton of the plant will start immediately. It is expected that this part of the work will require from two to four weeks. The foundation for the plant was built some time ago. This resumption should revive the spirits of those who see no cause for hope in the present copper situation. This mill is a plant for re-treating the sands previously discarded as waste. It is significant that the Calumet & Hecla should push the work on this plant now and it indicates a policy that might be followed with advantage by many producers that have been contemplating improvements or changes in equipment. A large manufacturer of mining and milling machinery recently remarked that never before in his long experience in the business was it possible to obtain machinery at such ridiculously low prices as at present. This is undoubtedly true. Many manufacturers are quoting prices actually below the cost of production, and it is not exaggerating to say that it would probably be possible now to equip an entire mill at 65% of the ordinary cost.

Animosity Toward the Congressional Subcommittee which investigated the late strike is being shown by miners, foremen and superintendents, as well as by the business interests of the Michigan Copper Country. Congress has adjourned and this committee has not even made a report of its findings. At the time Congress ordered the investigation the strike was about over and three-quarters of the men were back at work. Generally normal conditions were resuming. The strikers were convinced that they had been duped by the Federation agitators. The order for the Congressional investigation was accompanied by statements of the labor leaders that the President himself had ordered it and that if the companies did not turn the situation over to the Federation the Government would take the mines away from their owners and give them to the strikers. The committee spent a month here. It heard testimony most of the time and it furnished pages of newspaper copy. The actual cost to the people of the United States for this one isolated investigation was between $30,000 and $40,000. After taking more testimony in Chicago and Washington, the thing was dropped without even a report. The testimony was all published. But that was all. The miners here are not so angry at the lack of report as they are at the misrepresentation which kept them out of jobs. Hundreds of men were about ready to go back to work. They now are walking the streets without jobs. And their chances of getting them are slim indeed.

TORONTO—Nov. 14

Asbestos Manufacturing is to be carried on in New South Wales. The Canadian Department of Trade and Commerce has been advised of the formation of a company at Sydney which is erecting works for that purpose. Inquiries have been made with a view to obtaining supplies of the crude material from Canada, and it is contemplated to send a representative of the firm to Canada to study the situation.

Patents owned by Germans and Austrians have been the subject of considerable misapprehension, particularly as regards the action of the Canadian Government. It was supposed that they would be canceled, and many applications have been made to the patent office to secure the right to use the processes or inventions covered by the patents. It is now announced that the government will not declare the patents void, but that in cases where an applicant can show that he is in a position to manufacture advantageously, and that this will be in the public interest, the government will grant him a license, on the condition that he pay a royalty on the output. This amount will be held in the meantime by the government, and its final disposal will depend on the treatment accorded by the German and Austrian patent office to British patentees. If the rights of the latter are respected, the royalties will be turned over to the foreign patent owners at the end of the war. Where the exclusive right to use a patent is granted it is the intention of the patent commissioner to maintain control of the price of the product.

The Mining News

ALASKA

NEWSBOY (Fairbanks)—Contract given for driving 100 ft. into footwall on 215-ft. level. Hoped to cut new vein, indications of which have been found at surface.

MIDAS (Valdez)—Owing to tying up of British and Canadian capital and demoralization of copper market, this mine, controlled by Granby, closed down. Nearly 100 men were employed.

WILLIAM MARTIN, owning property at Knik, reports production of $150,000 for season. Treating 75 tons per day; will continue work through winter and expects to put in cyanide plant to increase output.

ELLAMAR MINING CO. (Ellamar)—Company recently ordered steel chutes and gates, to permit more rapid loading of buckets on aërial tramway. With these installed, expected full capacity of 200 tons per hr. can be maintained.

WILD ROSE (Fairbanks)—Leslie M. Drury, formerly superintendent of Newsboy mine, given lease on Wild Rose claim, on upper Dome Creek. Planned to work from old Spalding shaft on adjoining Soo claim, using hoisting and pumping machinery already in place.

GOPHER (Ketchikan)—Chalcopyrite and pyrite discovery recently made on this property, formerly called the Hydah. Discovery made by Polson and Ickis doing assessment work for owners, Miners & Merchants Bank. Stated shoot of magnetite chalcopyrite ore also discovered.

BIG FOUR (Valdez)—This mine, owned by William Ritz and associates, under lease to some Valdez men. Small mill installed during summer and test runs made on outcrop ore. In spite of inefficiency of mill, results reported entirely satisfactory. Some tunnel work done and contract recently let to Charles Spalding and Sam Calvin for driving 100 ft. If showing holds up, when this is completed another contract will be given.

ARIZONA

Pima County

OLD YUMA (Tucson)—W. J. Laffey and others have taken bond and lease on this mine, 14 miles west of Tucson, and will work property for molybdenum. Mine recognized for years as one of largest deposits of wulfenite and vanadinite in Arizona, but never before worked for these minerals. New company expects to install concentrating plant at once. Purchase price said to be $50,000.

Pinal County

VEKOL (Casa Grande)—Ninety-ton concentrator now completed and starts operation at once; will run two shifts for present on low-grade dumps.

BILLIKIN (Casa Grande)—E. E. Schmidt, of New York, arrived in Tucson, Nov. 12, en route to mine to begin operation. Property situated 50 miles southwest of Casa Grande in Salt Well district. Has gold ore with some copper content. Intention of Mr. Schmidt to develop mine with small crew and ship some high-grade gold ore.

MAMMOTH (Mammoth)—Old mill tailings of this mine now being reworked for third time. Robert O. Boykin & Co. has taken lease on dumps and is concentrating wulfenite left from previous amalgamation and cyanidation. Plant equipped with Overstrom and Card tables, handling about 50 tons in two shifts, making about 1500 lb. of concentrates per day, averaging about 24% MoO_3. Fifteen tons of concentrates shipped to Pennsylvania this month.

CALIFORNIA

Amador County

FREMONT (Drytown)—Regular monthly dividend 2c. per share suspended for October. Mine doing well, but improvements and extra expense entailed by compensation law and provision for impounding of tailings necessitate suspension of dividends temporarily.

KENNEDY EXTENSION-ARGONAUT SUIT—Motion for new trial submitted to Judge Wood, in Superior Court, Nov. 5, taken under advisement. Plaintiff claims to have new testimony to offer showing Argonaut vein does not extend at certain points which were not open at time of trial, on account of foul air.

Butte County

PAY GRAVEL reported at Chico in well sunk on State Normal campus; depth 85 ft. Reported to pan 30c; some lower grade found at 20 ft. Pay gravel in the neighborhood of Chico long known; three dredges now operating on Butte Creek about 10 miles east of Chico.

LAVINIA CRABBE VS. MAMMOTH CHANNEL — Supreme Court sustained Superior Court, which found verdict in favor of plaintiff and assessed damages at $20,000. Plaintiff's husband killed by falling rock in tunnel at Magalia. Was earning $3.50 per day.

Calaveras County

ROYAL CONSOLIDATED (Hodson)—Four-ft. vein high-grade quartz reported at depth of 200 ft. in shaft. Unwatering of lower levels progressing. Stamp mill being overhauled, should be in operation by end of year

Eldorado County

MAMELUKE HILL (Georgetown)—Property leased to Joe Helmas, will be immediately developed and put in operation

Imperial County

GYPSUM DEPOSITS in Coyote Hills being developed by George L. Campbell, of Seeley. Shipping contemplated by first of year. Machinery shipped in by way of El Centro.

Mariposa County

VIRGINIA (Coulterville)—William Angus, resident of Hayward and principal owner of property, killed by powder gas on 500-ft. level, Oct. 30. Joseph Garino, mine foreman, in the level with Angus, survived for time, but reported he will die.

San Bernardino County

PHOENIX (Johannesburg)—C. G. Illingworth and Barney Osdick have installed 25-ton cyanide plant. Believed that large saving will be made over former method of leaching tailings. Mine owned by Burcham estate; operated under lease.

Shasta County

DREDGING GROUND in vicinity of Igo and along Clear Creek being examined by engineers said to represent John Hays Hammond interests. Ground recently prospected by Oroville men and option said to have been surrendered because of recent financial stress.

MANGANESE DEPOSITS on Peterson claim near Heroult being developed; reported Noble Electric Steel Co. is constructing road to deposits and expects to ship ore to its plant within 60 days.

SHASTA EXPLORATION CO. (Redding)—Surveying and other preliminary work being carried on in region of Balaklala, under direction of M. E. Dittmar. Holdings of company extend along copper region west of Sacramento River, in neighborhood of Coram and Kennett.

Siskiyou County

LUCKY STRIKE (Scott Bar)—Good vein disclosed in lower levels, which it is believed will warrant installation of milling plant.

HYDRAULIC MINERS at Scott Bar preparing for winter, recent heavy rains having replenished rivers and creeks and given promise of plenty of water. Milne property putting flumes in shape. Large body of good gravel was got ready during the summer. Pay gravel in Crawford & Nesbit drift mine encountered and large body of new ground opened up.

Trinity County

ENTERPRISE (Helena)—Extensive repairs being made to water-power plant. Ten-stamp mill overhauled; large amount of development disclosed good ore. Mine operated for 28 years past; reported to have produced well in last three years. R. A. Skinner manager.

BONANZA KING (Trinity Center)—Orebody encountered about 200 ft. below winze sunk from No. 3 level, stated similar to ore mined in upper levels. Reported 10-stamp mill will be moved nearer to mine in order to receive ore direct from No. 3 tunnel, doing away with use of long aërial tramway operated at heavy cost.

Tuolumne County

HEARST AND JACOB properties on Cow Creek recently examined by R. E. Parker and Clarence Woods, of Louisiana mine, and George J. Benny, of Soulsbyville, with view to beginning development.

SANTA YSABEL (Sonora)—J. A. Prentice, formerly interested in If-I-Can gravel mine, negotiating for option on this property with view to reopening it.

HOPE (Sonora)—Property recently operated by company with head office in Salt Lake. Five-stamp mill installed, but trouble ensued between owners and mine shut down, leaving several men unpaid for two months' labor. Recently men were paid in full, and reported mine will be reopened.

COLORADO

Clear Creek County

JO REYNOLDS (Idaho Springs)—Discovery of 18-in. streak of pitchblende reported, valued at "many million dollars"—by newspapers and possibly by owners.

San Juan County

SILVER LAKE VIEW (Silverton)—This property in Arastra Basin secured by local operators under long-term lease. Crosscut tunnel now about 130 ft. long will be advanced 400 ft. Supplies laid in for winter and lessees have begun development work.

San Miguel County

NATIONAL RADIUM INSTITUTE (Norwood)—About 20 men employed at mines in Ford district. Buildings for new concentrating plant nearing completion. Plant will be ready for operation in about six weeks. During past three months about 200 tons of shipping ore mined. Mr. Thompson superintendent

STANDARD CHEMICAL COMPANY (Naturita)—Buildings for new concentrating mill on San Miguel River partially completed and some machinery installed. Power canal finished and some tests made. On account of lack of demand for radium ores company will temporarily postpone active operations

IDAHO

HUNTER MINING CO. (Mullan)—New Callow flotation system and increase of milling-plant capacity to about 150 tons per day authorized by President Thomas F. Keeley during recent visit at property. Flotation unit now being installed under direction of Otto Trojownowsky. Capacity increase taken care of in present building, which has extra floor space. New 100-hp. motor ordered.

MICHIGAN

Copper

SOUTH LAKE (Greenland)—Work in sandstone for last 60 ft., wider stratum than usual at that depth. Crosscut now in 1000 ft., 200 ft. more to cut lodes.

WHITE PINE (Ontonagon)—Construction of dam for mill water supply under way, will be finished in month. All-year-round stream supplies more than enough water. Mill interior work progressed to point ready for installing steam-heating plant.

OSCEOLA (Osceola)—Refined-copper production from three branches of company about 1,100,000 lb. per month. Producing from five shafts, one at old Osceola, two at South Kearsarge, two at North Kearsage. Total daily rock production about 4200 tons.

VICTORIA (Victoria)—Crosscut on 26th level, lowest point in mine, not yet to main vein but in hanging-wall formation looking like branch of vein and carrying commercial copper; while not so rich as streak above on 25th level, indicates presence of good orebody.

NEW ARCADIAN (Houghton)—Company one of few exploratory undertakings continuing development work. Opening up fair-looking lode rock at three different places, on line and short distance from shaft. Lode has shown up as well as drilling indicated, at three different points, the 300-, 400-, and 600-ft. depths, all attacked with upraises. Still in good ground.

FRANKLIN (Demmon)—Operations confined to two crosscuts and one raise, expenses kept down to such point that work can continue at present rate for next eight months without exhausting treasury balance. Work of limited scope, but of utmost importance to future of Franklin company as it shows mineralized formation equal to anything Franklin has heretofore mined. Crosscut went through formation at 32d level and continued in fair commercial ground.

ALLOUEZ (Allouez)—Producing more than 750,000 lb. mineral per month, cost lower than ever in history of property. Rock tonnage better than 1500 daily and grade of rock up to best Allouez ever yielded. Company operating 35 drills and maintaining advance work. Following policy of running laterals to property limits or limits of tramming economy and then stoping back towards shaft. No. 1 shaft bottomed at 10th level and No. 2 at 21st. Neither shaft yet reached one-third of possible depth and mineral reserves above present depth are of such quality and quantity as to insure certain successful future for Allouez.

HANCOCK CONSOLIDATED (Hancock)—No intention of reopening until war ends or there is decided improvement in financial and metal situation in this country. Hancock operating on borrowed capital when copper market broke, shipments of Pewabic lode rock being made to Calumet & Hecla subsidiary stamp mill at Point Mills. Copper was just about returning new dollar for old one but gave promise of real profit upon increase in tonnage or in metal price. Looked as if company had reached turning point in career. At present water kept out of shafts but no other work done. No need for additional development. Enough faces in commercial copper rock to provide large tonnage when needed.

Iron

ROSE (Wakefield)—Hanna company stopped shipping from this openpit. Output about 300,000 tons; could have been doubled had market conditions permitted.

MINNESOTA

Cuyuna Range

CUYUNA-SULTANA (Ironton)—No. 2 shaft reported through quicksand strata and anchored in hardpan. Surface of property cleared of underbrush; is planned to put shovel on stripping work if winter season does not set in too early. Company is stock company, with offices in Duluth. Annual stockholders' meeting, held Nov. 11, elected following directorate: E. Y. Sarles, Hillsboro, N. D.; W. W. Fegan, Grand Forks, N. D.; T. W. Stevenson, Minneapolis; George H. Lyons, Omaha; E. A. Lamb, Ironton, Minn.; D. S. Clark, Eau Claire, Wis.; E. J. Bunker, George P. Rosenblad, George Waters, William Yale and L. L. Culbertson, Duluth; last named is president.

Mesabi Range

GUTHRIE & CO., near Calumet, has started night crew. Seven locomotives and four steam shovels now at work. Company contemplates erection of 30 additional cottages next spring for employees.

Vermilion Range

SIBLEY (Ely)—Cave-in Nov. 9 caught six miners in main shaft; due to failure of timbering. Shaft nearly filled with débris, and four 6-hr. shifts now working to recover men or bodies. First serious accident occurring in Sibley mine.

MONTANA

Beaverhead County

OREWAY (Jackson)—Supt. S. J. Scott reports extraction of high-grade copper ore rich in silver, gold and lead. Crew of 20 men being worked. Property includes six claims.

Deer Lodge County

BUTTE-PACIFIC MINING CO. (Warm Springs)—Active operations in progress on this group of claims owned by Dr. J. M. Scanland and others and situated about four miles east of Warm Springs in new district that has strong showing of copper ore in granite formation. Common belief Butte orebodies extend into this section of mountains, theory which Butte-Pacific intends to test out. Six men engaged in development work.

WASHOE WORKS (Anaconda)—During period of curtailed production general overhauling of old equipment and installing of new being carried on. New floors have been laid in four sections of mill. Over Wilfley tables, steel cone classifiers installed in place of old spitzkasten. Two Wilfleys added to each row, addition of 12 in all. Improvements in processes and equipment will increase daily capacity to 12,500 tons. Automatic sprinkling system being extended to all buildings for fire protection. Steel workers putting up frame for 2000-ton leaching plant building, foundations laid for precipitating building. Experiments in flotation being made by staff experts to ascertain most satisfactory treatment for tailings from round table slime-plant. New coal-dust fired reverberatory furnace being built

NEVADA

Esmeralda County

YELLOW TIGER (Goldfield)—Hoist house destroyed by fire, Nov. 4; new compressor and hoist damaged. Fire confined to hoist house; headframe and shaft not injured. Compressor only recently installed and operations resumed short time ago; much development work planned. Fire believed incendiary; blaze started between shifts.

Humboldt County

LIMERICK CANON PLACER MINES, in Rochester district, being operated at profit. Present scarcity of water makes operation difficult, but this condition will be relieved by winter snows. Gold occurs both as nuggets and fine dust. Some nuggets include pieces of rose quartz, but original lode not found.

Nye County

MANHATTAN-DEXTER (Manhattan)—Operations of sublessees on southern portion of Union Nine claim proving a great deal of good mill ore available throughout old Plamenaz lease workings. Meissner & Cochran developed fine shoot in More vein north of the Plamenaz vein, 325-ft. level; new ore leads into virgin ground. Pumping operations from 400-ft. level of main working shaft on Union Nine furnishes water for Mushett & Wittenberg mill. At present, direct-connected Fairbanks-Morse electric triplex pump installed on 400-ft. level handles about 70 gal. per min., holding water level at that point. For new mill, Mushett & Wittenberg intend to have special pump installed in Union Nine shaft, which will handle flow of water from bottom of shaft, 600 ft. on the incline; pump built to handle 200 gal. This pump will drain mine to bottom level and permit sublessees to pick up downward extensions of new orebodies mentioned.

Storey County

CON. VIRGINIA (Virginia City)—Conditions steadily growing better. Ledge now 7 ft. wide. Ore assays over $15, chiefly gold.

MEXICAN (Virginia City)—Management seeking to reach scene of fire trouble in 2500 stope, through 2000 level winze. Latest reports state 2100 level reached and progress toward 2200 level encouraging. Levels being cooled and ventilation restored.

LIZARD MINE—This property, 13 miles northeast of Dayton, purchased recently and work resumed. Mine operated several years ago, but abandoned on striking fault which cut off vein. Vein found in recent work and shoot of milling-grade and some high-grade ore opened.

White Pine County

NEVADA CONSOLIDATED (Ely)—Experiments on flotation are being made with promising results, but so far no definite conclusions reached.

NEW MEXICO

Dona Ana County

RIVERVIEW MINING & DEVELOPMENT CO. (Rincon)—Company recently incorporated for $10,000. Organized among claim holders of Caballo Mountains. Claims pooled and $5000 cash contributed. Demcy Lewis statutory agent; Clyde M. Becker vice-president.

Grant County

C. & O. MINING & MILLING CO. (Pinos Altos)—Nine sacks ore weighing 640 lb. taken from Langston vein yielded over $16,000 net at San Francisco refinery. Mining forces slightly decreased. Believed another high-grade shoot encountered.

OREGON

D. B. MINING CO., capitalized at $50,000 has filed articles of incorporation; incorporators are Robert J. Upton, R. H. Bailey and George R. Mokel, all of Portland, Oregon.

GOLDEN GATE MINE (Greenhorn Camp)—Heavy boiler and other machinery being moved from Whitney to this mine. New mill will have 10 stamps; construction work progressing satisfactorily.

HIGHLAND GOLD MINES CO.—(Rock Creek District)—Suit brought by Eastern Oregon Light & Power Co., against this company and Highland Development Co. to collect $4185. Power company claims amount named is balance due upon electrical energy and electrical machinery purchased.

SOUTH DAKOTA

INCA (Mystic)—J. T. Harrington, owner, says has large quantity of free-milling ore blocked out, is erecting five-stamp mill.

ANACONDA (Roubaix)—Machinery being installed; shaft will be sunk on northerly section of orebody. South shaft 500 ft. deep.

LISTON (Keystone)—Ten-stamp mill being erected and should be in operation by end of year. Mine has good surface showing of free-milling ore.

ECHO (Maitland)—Orders placed for air compressor, hoist and pumps, all electrically driven. New shaft will be sunk at point between two large mineralized lodes.

NEW RELIANCE (Trojan)—Plant working full complement of 30 stamps, after considerable difficulty. Delays occasioned first by breakdowns and later fire destroyed hoist house.

CUMBERLAND (Hill City)—Litigation involving this property appears in fair way toward settlement; tentative plans for resumption under consideration. Property equipped with small mill, hoisting plant, etc. On 460-ft. level good shoot of high-grade ore exposed.

MONARCH (Deadwood)—Lessees Sweet & Hanson getting out third car of high-grade ore for shipment to smelting plant. Since shipping second car porphyry dike encountered, about 12 ft. wide, which cut off ore; beyond dike ore again found.

HOMESTAKE (Lead)—Contributions not exceeding $1 each being received at Homestake office to be used in erecting memorial to late superintendent, T. J. Grier. Fund already amounts to over $1500. Plans and expenditures will be under supervision of Homestake Veterans association, of which Mr. Grier was member.

McNISH & MILLS (Hill City)—Small mill equipped for handling tin ore in active operation. Treatment involves crushing dry with rolls, mixing with water, agitating, and concentrating on two tables. Saving of tin concentrate made on tables and in carpet-bottomed launders. Only best grade ore handled and operations said to be profitable although no slime treatment attempted.

UTAH

Beaver County

HORN SILVER (Frisco)—Item in "Journal," Nov. 14, p. 896, erroneous. Mine not closed down; merely curtailed output to point sufficient to pay expenses and no more. Prefers not to ship and deplete metal resources at present low prices. Information received from Jacob Neadle, president.

Juab County

GEMINI (Eureka)—Owing to low prices of metals, ore shipments discontinued, and lessees suspending operations. All leases expired. Company will carry on development both for itself and Ridge & Valley, which operates through Gemini shaft.

UTAH MINERALS CONCENTRATING (Eureka)—New mill to treat Chief ores being warmed up, construction and installation of machinery having been completed within two months. Capacity 100 tons, and if desired new units can be added to increase output. Electric power used.

CHIEF CONSOLIDATED (Eureka)—Shipments suspended for time being, and working force reduced. Shaft being repaired and on completion, considerable force will be put on development. Diamond-drill operations will not be interfered with by these repairs. Company has been shipping extensively and making satisfactory profits in spite of low metal price. During October 129 cars shipped.

Salt Lake County

CARDIFF (Salt Lake)—Orebody recently opened followed 113 ft. Teams hauling about 40 tons daily from strike. About 300 tons of ore on dump.

OHIO COPPER (Bingham) — Ernest Bamberger, Duncan MacVichie, and H. L. Lambrecht appointed appraisers to place valuation on all tangible assets of company.

Summit County

DALY WEST (Park City)—Machinery started at new mill. Everything ready for installation of electric hoist expected shortly.

WASHINGTON

GOLDEN EAGLE (Blewett)—F. Le Roi has five-year lease on this property. Latest clean-up 13 oz. gold from 35 tons ore. Expects to work on higher-grade stuff. Employing four men, hopes to run mill to capacity next year.

CANADA

Ontario

FROM COBALT LAKE preliminary pumping operations about to begin. Expected water will be lowered 6 ft. before end of month. Additional heavy pumps to be installed and will be in operation before end of March.

SCHUMACHER (Schumacher)—Plans in preparation for 150-ton mill with cyanide treatment.

NIPISSING (Cobalt)—Hydraulicking has disclosed two new veins, one 2 in. wide, other varying up to 6 in., opened for 150 ft. and shows several patches of high-grade.

NORTH THOMPSON (Timmins)—On Nov. 5 final payment made on the property by English interests represented by Dr. J. M. Bell. Amalgamation with Porcupine Crown still under discussion.

TEMISKAMING (Cobalt)—Underhand stoping in progress on new orebody at 750-ft. level; now opened up for 50 to 60 ft., close to shaft. Not yet settled whether to sink new shaft to 825-ft. level, or develop new showing by winze. Vein still shows strong in face at 750-ft. level.

DOME LAKE (South Porcupine)—Mill running regularly, treating about 40 tons of ore per day, so far mainly for sampling purposes. Expected to obtain extraction of 80 to 85% without cyanide treatment. Bumping table being installed to sort ore from waste; until this is in operation mill grade cannot be determined definitely.

HOLLINGER (Timmins)—Second unit new compressor plant started; provides air for 45 drills. Smaller machines will not be used now. Underground vein No. 10 reached at 200-ft. level and southern extension of vein No. 2 cut by crosscut on 300-ft. No. 1 vein on 550-ft. yielding high-grade ore in south drift

BEEDERMAN CLAIMS—These properties, lying in new district about eight miles west of Sesekinika, between Porcupine and Kirkland Lake, being developed by Buffalo capitalists. Diamond drilling outfit being taken in. Claimed wide vein of high-grade quartz discovered and extensive exploration work will be carried on during winter.

LA ROSE (Cobalt)—Surface operations successful recently in picking up stringer paralleling No. 6 vein and showing several patches of high-grade. Does not show at tunnel level and will be developed by raising and crosscutting from No. 6. New shaft on Extension belonging to the property has reached depth of 50 ft.; being sunk to prospect some favorable conglomerate ground on this area.

Yukon

BOYLE DITCH just completed, contractors turning over last shovelful of gravel, Oct. 20. One of most extensive mining improvements ever undertaken in district; four miles long from mouth of Henry Gulch, up Hunker, around Dago Hill up side of Last Chance where water will be used for hydraulicking. Has capacity of 1000 in. Water will come from Klondike River in ditch dug some time ago from Klondike Bluff near Rock Creek running around base of Australia Hill.

MEXICO

Sonora

SIERRA MADRE MINING CO. incorporated in West Virginia, U. S. A., to operate in Arizpe district. Home office, Buckhannon, Upshur County, W. Va.

SOUTH AMERICA

Bolivia

COMPANIA HUANCHACA—At annual meeting, held in Valparaiso, June 10, following officers and directors elected for ensuing year: Arthuro Alessandri, president; George Matte, vice-president; Martial Edwards, Eugene Schneider (president of the Creusot works), Edmond Delvincourt. Purpose of new board to cease shipping silver ore unless a price of at least 20d. per oz. for silver in ore can be realized; and also to discontinue shipping raw material, build necessary plants and export concentrates; this in view of high freight rates. Inflow of water always perplexing problem, but with improvement of power plant and installation of large compressors, difficulty will in great measure be remedied. Cyanidation plant much needed and estimates will probably soon be made on one.

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ASSESSMENTS

Company	Delinq.	Sale	Amt.
Amador, Ida	Oct. 31	Nov. 28	$0.01
Annie Laurie, Utah (old stock)	Nov. 9	Nov. 28	0.004
Annie Laurie, Utah (new stock)	Nov. 9	Nov. 28	0.001
Atlantic, Ida	Nov. 28	Dec. 28	0.0005
Austrian, Calif	Sept. 29	Nov. 28	0.02
Beaver Copper, Utah	Dec. 3	Dec. 22	0.005
Black Bear, Ida. (post)	Oct. 30	Nov. 28	0.01
Brooklyn, Utah	Nov. 19	Dec. 4	0.0025
Bullion, Ida. (post.)	Nov. 4	Dec. 7	0.005
Confidence, Nev	Nov. 11	Dec. 2	0.10
Consolidated Ores, Utah	Dec. 4	Dec. 20	0.25
Continental, Ida. (post.)		Dec. 5	0.016
Con. Virginia, Nev	Nov 27	Dec. 18	0.10
Copper Chief, Ida. (post.)	Nov 4	Dec. 7	0.005
Copper King, Ida. (post.)	Oct. 1	Dec. 1	0.01
Copper Plate, Ida	Aug 29	Nov. 29	0.002
Crown Point, Nev	Dec. 8	Dec. 29	0.05
Davis-Daly, Mont	Oct 15		0.25
Eagle Bird, Calif	...	..	20.00
East Hercules, Ida. (post.)	Dec 1	Jan. 2, '15	0.001
Echo, Ida	Nov. 20	Dec. 15	0.0015
Ely Con, Nev	Oct. 15	Dec. 2	0.03
Emerald, Utah (three installments)	.	June 9, '15	0.01
Federal Ely, Nev	Oct. 21	Nov 24	0.115
Gold Bond, Utah	Nov 24	Dec 24	0.001
Gold Mountain Champion, Utah	Nov 14	Dec. 2	0.0025
Greenhorn, Utah	Oct. 26	Nov. 30	0.005
Hider Nevada, Nev	Nov. 24	Dec. 10	0.015
Hilarity, Ida.	Oct 12	Nov. 23	0.003
Idaho-Nevada, Ida	Nov 7	Dec. 1	0.001
Imlay, Nev	Nov 15	Nov 26	0.01
Indian Pete, Utah	Nov 30	Dec 15	0.01
Little North Fork, Ida. (post)		Dec 12	0.001
Lynn Big Six, Utah	Nov 21	Dec 26	0.005
Mammoth Gold, Nev.	Nov. 23	Jan 4, '15	0.02
M. & P. Gold, Utah	Nov. 10	Dec 1	0.0025
Maxfield, Utah	Dec. 9	Dec 30	0.0016
National Copper, Ida. (post)	..	Dec. 5	0.03
Nevada Silver Reed, Nev	Nov. 24	Dec 14	0.0015
North Bunker Hill, Ida. (post)		Nov. 28	0.002
North Scranton, Utah	Nov 3	Dec. 3	0.002
Ophir, Nev	Nov. 19	Dec. 11	0.10
Pacific Slab, Calif		Dec 1	0.06
Phoenix, Ida	Oct 26	Nov. 20	0.005
Rainbow, Ida	Nov 30	Dec. 31	0.002
Rarus, Utah	Nov 13	Nov. 30	0.001
Reindeer-Queen, Ida. (post).	Sept. 21	Nov. 28	0.002
Revelator, Utah	Nov. 9	Dec. 8	0.005
Rexall, Utah	Dec. 1	Dec. 21	0.002
St. Francis, Calif	Dec. 8	Dec. 28	0.0025
Sonora, Ida.	Nov. 30	Dec. 30	0.002
Sunset Banner, Ida.	Nov. 26	Dec. 17	0.0005
Sunset Development, Ida	Nov. 7	Nov. 30	0.003
Sunshine, Ida.	Nov 23	Dec 22	0.001
Syndicate, Ida	Nov 26	Dec 28	0.001
Tarbox, Ida. (post)	Nov 25	Dec 28	0.0025
Tuscumbia, Ida	Nov 20	Dec 21	0.002
United Tintic, Utah.	Nov. 7	Nov 24	0.01
Wasatch-Utah, Utah	Oct. 26	Nov 26	0.01
Wilbert, Utah	Dec. 3	Dec 16	0.01
Wisconsin, Ida.	Nov. 16	Dec. 21	0.003
Yellow Jacket, Nev	Nov. 5	Nov 25	0.07
Zella, Utah	Oct. 25	Nov 25	0.0025

The Market Report

METAL MARKETS

NEW YORK—Nov. 18

Copper and lead have been remarkably strong, domestic consumers having been large purchasers. Spelter has been a little stronger; there has been a resumption of large sales for export. Tin remained about stationary until the end of the week, when it declined.

Copper, Tin, Lead and Zinc

Copper—The improving tendency and substantial demand for copper noted in our last report, continued right through the week of present record. On Nov. 12 there were sales at 11⅜@11½c., regular terms, and from that time onward there was an advance of nearly ⅛c. per day. Certain sellers kept out of the market, expecting still higher prices. Those who supplied the demand sold moderately at one level, then raised their prices and so on, the demand being sufficiently strong and genuine to permit this. It is beyond doubt that domestic consumption is improving. This had previously been remarked in the brass business, which has reflected the filling of orders for war material, and is now becoming apparent in other directions. The improving financial conditions are leading to a resumption of building. Another factor in the copper market is the sound statistical position.

On Nov. 16 and 17 the market scored sharp advances between the beginning and end of the days and on Nov. 17 sales were made at 12c., regular terms. On Nov. 18, that price was fully established as a basis with domestic consumers, while 12c., cash, New York, was realized on sales for export. The noteworthy feature of the latter was the demand that suddenly developed in France, which for a long time has been conspicuous by its abstention from copper buying. The new demand began to appear on Nov. 17 and attained large proportions on Nov. 18, it being characterized in one quarter as being urgent.

The aggregate of transactions from Nov. 12 to 18, inclusive, amounted to many millions of pounds, 40 to 50 millions being a reasonable estimate. Probably the larger part of this business was for domestic consumption, certain agencies reporting all sales as domestic. Another noteworthy feature was the willingness of domestic buyers to contract for supplies well ahead, a fair volume of business for January delivery having been done. Sellers have asked about 5@7½ points advance for December and 5@7½ points more for January contracts.

The A. S. & R. Co. has announced 11.10c. as its copper settling price for October.

Henry Gardner, chief of Henry R. Merton & Co., Ltd., London, visited New York to get the copper producers to put the foreign sales of their copper in the hands of his company. Important producers were unwilling to do that and his mission failed.

The British have made more copper seizures at Gibraltar from steamships bound for Italian ports.

Base price of copper sheets is now 16½c. per lb. for hot rolled and 17½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 12@12½c. per lb. for carload lots at mill.

Visible Stocks of Copper in Europe on Nov. 15 are reported as follows: Great Britain and France, 20,906; Rotterdam, 1150; total, 22,056 long tons, a decrease of 551 tons from the Oct. 31 statement. In addition to the stocks above, 200 tons are reported afloat from Chile and 4200 tons from Australia, making a total of 26,456 tons.

Tin—The better tendency exhibited generally also had its effect on the tin market, which was recorded as being strong on the London Metal Exchange for the larger part of the week. On Nov. 18, however, the market declined suddenly about £4 for Straits tin and closed weak. In this market the only interest was shown in spot tin, which is held at a slight premium. The close of the market in London is £137½ for spot and £137 for futures; 31¾c. here.

Lead—A big business has again been done in this metal, and the A. S. & R. Co. having apparently disposed of all it wanted to at 3.50c., raised its price to 3.60c. on Nov. 12. Although this had been foreshadowed in the St. Louis market, the advance took sellers there by surprise and there was a considerable tonnage sold there on that day at the old price before the news was received. The St. Louis price then rose again above the normal differential, foreshadowing another advance by the leading interest, but when that happened on Nov. 17 outsiders were once more taken by surprise, there being sales in the morning at about 3.52½c. while 3.62½c. was realized later in the day. In spite of the sharp advances of the week, the market continues strong and active, certain important interests being quite reserved about talking business, while others are sold out and consequently unable to talk business anyhow. The lead market is therefore, for the moment, chiefly in the hands of the principal producer.

Spelter—There has been an advance in this metal, but the demand was freely met by the producers, who still have large unsold stocks, and consequently the market had none of the snap exhibited in copper and lead. A considerable tonnage of spelter was sold from day to day for domestic consumption, but the aggregate of these transactions was not sufficiently large to cause special comment. The especially noteworthy feature of the week was the resumption of sales for export on a large scale. We estimate the export sales of the week at about 5000 tons. On Nov. 17 and 18 there were sales at 5c. and sellers over at that price.

Zinc dust is quoted at 9@10c., New York.

DAILY PRICES OF METALS

NEW YORK

Nov.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
12	4.8813	48¼	11¼ @11⅜	33½	3.60	3.40 @3.50	4.95 @5.00	4.80 @4.85
13	4.8725	47⅝	11⅜ @11½	33¼	3.60	3.47½ @3.52½	4.95 @5.05	4.80 @4.90
14	4.8825	47⅝	11.45 @11.55	33	3.60	3.50 @3.55	5.00 @5.10	4.85 @4.95
16	4.8775	48⅞	11.55 @11.75	33¼	3.60	3.50 @3.55	5.05 @5.15	4.90 @5.00
17	4.8700	49	11¾ @11⅞	32¾	3.70	3.52½ @3.62½	5.15	5.00
18	4.8700	49⅝	11⅞ @12	31¾	3.70	3.60 @3.65	5.15	5.00

The quotations herein are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb. are; St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triests, 22c.

LONDON

Nov.	Sil-ver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts per Lb.	3 Mos	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
12	22 5/16	51¼	11.23	53	*	138½	*	17⅞	3.89	24¼	5.26
13	22⅛	51⅝	11.32	53⅛	*	139	*	17⅞	3.89	24½	5.32
14	22¼										
16	22⅜	52⅜	11.48	53½	*	139	*	17⅞	3.89	25	5.43
17	22¾	53	11.51	53⅝	*	138½	*	18	3.91	24⅞	5.40
18	22 11/16	53¼	11.68	53¾	*	137½	*	18¼	3.96	25⅛	5.46

*No quotations.

Other Metals

Aluminum—Business has improved somewhat recently. The domestic marke is still rather quiet, though buying is on a little larger scale. It is reported that some purchases have been made for export. Quotations for No. 1 ingots are 18@19c. per lb., New York, according to size and terms of order.

Antimony—Domestic business has been on a moderate scale only, but there are still inquiries for export, although no large quantities have been taken for that purpose during the present week, so far as known. Ordinary brands are quoted at 13½@14½c. per lb. Cookson's is held at 17@18c. and is very strong at these figures, stocks being low.

Quicksilver—At the beginning of the week sales were made at $47.50; in the latter part, transactions were reported at $50. The agents for the California producers have raised their asking price and the market is exhibiting a stronger tendency. This is probably explained by the stronger market in London and the disappearance of the Italian quicksilver offered here. It is understood that the Italian supply has been disposed of. The London price is reported as £11, which is equivalent to about $55, London.

Minor Metals—Quotations for **Bismuth** are now $2.75 per lb.—**Magnesium**, $1.50 per lb., New York.—**Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, $5 per lb. for small quantities.

Gold, Silver and Platinum

Gold in the United States, Nov. 2, is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, $946,979,869; in Treasury current balances, $222,582,210; in banks and circulation, $665,854,219; total, $1,835,416,298, a decrease of $26,421,966 during October.

Gold production in the Transvaal in October was $15,166,523. For the 10 months ended Oct. 31, the total was $153,960,970 in 1913, and $144,011,300 in 1914; a decrease of $9,949,670, or 6.5%, this year.

Iridium—This metal is still rather scarce and quotations vary widely. The range seems to be about $78@83 per oz., New York.

Platinum—The market is quiet and a little lower. Dealers ask $45@46 for refined platinum and $53 for hard metal, 15% iridium. Sales are reported at $44 and $44.50 per oz. today.

Our Russian correspondent writes under date of Oct. 16, that the market does not change. No sales or prices are reported at Petrograd. From Ekaterinburg it is reported that the starateli and small producers are in straitened circumstances and are willing to sell small lots at low prices to get money for their immediate needs. The larger producers are holding their platinum, with the assistance of the banks, which have made heavy advances on the stock of metal.

Silver—Owing to purchases account of the Indian Bazaars, silver has had a little tonic added to it and under moderate buying has advanced to 22$\frac{15}{16}$d. in London.

Exports of silver from London to the East, Jan. 1 to Nov. 5, as reported by Messrs. Pixley & Abell, in value:

	1913	1914	Changes
India	£9,001,500	£4,679,500	D. £4,322,000
China	752,000	42,000	D. 710,000
Total	£9,753,500	£4,721,500	D £5,032,000

Coined silver in the United States on Nov. 2, is estimated by the Treasury Department as follows: Standard dollars, $565,886,478; subsidiary coins, $183,644,414; total, $749,530,892. Of the Standard dollars $493,813,000 are held in the Treasury against silver certificates outstanding.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Nov. 14

The base price paid this week for 60% zinc ore was $44 per ton; $42 per ton was offered for 80% lead ore. No sales of lead ore were reported.

SHIPMENTS WEEK ENDED NOV. 14

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	4,312,790	....	205,200
Year	144,937,290	4,444,950	29,974,750

Shipped during week to separating plants, 3,664,740 lb. zinc ore.

JOPLIN, MO.—Nov. 14

Blende, high price $47; assay base, 60% zinc, $11@44; metal base, $40@41; calamine, base 40% zinc, $21@23; average, all grades of zinc, $40.66 per ton.

Lead, high price, $45; base, $42 per ton of 80% metal content; average, all grades of lead, $42.78 per ton.

This district is running behind an average production by 5000 tons per month. Reports received from Wisconsin are that the northern field is short 4000 tons per month, and reports from Montana show 5000 tons per month shortage in zinc-ore production in the Butte district, a total of 14,000 tons, or approximately 10,000 tons of spelter short each month. Producers are figuring that with the continued exportations of spelter there will be a shortage of metal early in next year.

SHIPMENTS WEEK ENDED NOV. 4

	Blende	Calamine	Lead	Values
Totals this week...	8,532,990	889,370	1,192,820	$217,070
Totals this year....	452,393,930	34,192,330	78,252,570	$11,235,160

Blende value, the week, $180,720; 46 weeks, $9,009,330.
Calamine value, the week, $10,830; 46 weeks, $400,330.
Lead value, the week, $25,520; 46 weeks, $1,825,500.

IRON TRADE REVIEW

NEW YORK—Nov. 18

With no material change in actual conditions, there is slightly more activity in the market, and a good deal of discussion over possible improvement before long.

There has been a little more contracting for structural steel, several orders of fair size having been placed. A little more movement in bars and wire is noted, but no large orders.

The pig-iron market shows some demand for basic iron. In the East there is some movement in foundry iron, but orders are generally for small lots.

The British Government has put an embargo on exports of ferromanganese from the United Kingdom. It is reported that buyers of ferro now afloat will be required to give guarantees that it is to be consumed in the United States and not reëxported.

Imports at Baltimore for the week included 4925 tons ferromanganese and 30 tons silicospiegel from Great Britain. Imports at New York for the week included 1300 tons manganese ore from Lisbon.

Foreign Trade in the United States in iron and steel, including machinery, is valued as below for the nine months ended Sept. 30, by the Department of Commerce:

	1913	1914	Changes
Exports	$226,482,431	$152,776,838	D. $73,705,593
Imports	25,716,327	22,877,803	D. 2,838,524
Excess, exports	$200,766,104	$129,899,035	D. $70,867,069

This shows a decrease in exports of 35.3% in 1914, as compared with 1913; and a decrease of 11.4% in imports.

PITTSBURGH—Nov. 17

While there have been only slight increases in the buying of some steel products, the general tone of the market has experienced further improvement. It is believed that the decrease in buying has run its course and that very soon there will be a definite though probably small increase, while after the turn of the year there will be a large improvement. Some well trained observers are predicting that by the beginning of the second quarter of the new year the steel industry will be running very nearly at capacity.

Daily newspaper reports of various steel plants resuming operations are incorrect in substance. The tendency in steel production is still toward decreases, except possibly in a few isolated instances. This declining tendency is due to the exhaustion of old orders, for current bookings are not sufficient to support even the present rate of operation, which averages not over 40% of capacity

Steel prices are fairly steady, and there does not seem to be room for further declines of consequence, unless mills are willing to lose money, apart from not making their fixed charges. The last very low point in steel prices was in November, 1911, three years ago. Prices then averaged less than a dollar a ton below the present level, but the mills were operating at about 75% of capacity and wages were lower, so that the cost of production now is $2 to $4 a ton higher

Pig Iron—Consumers are showing decidedly more interest in the market, but are not inquiring much more freely They seem to be getting to the point where they will definitely decide whether to take hold. Actual sales are only fair in point of number and are very small in point of tonnage About one-third of the merchant furnaces in this general district are in blast, and some of them are piling iron, while most of the furnaces that recently went out of blast are carrying large stocks. In the absence of large sales or inquiries, prices are more or less nominal, as follows: Bessemer, $13.75; basic, $12.50; No. 2 foundry and malleable, $12.75@13; gray forge, $12.50@12.75, at Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese—Before the announcement of the English Government's provisional embargo on exportations of ferromanganese, there were many lots of prompt material offered for resale, and no inquiry. Now there are many inquiries and hardly anything offered. Consumers are well stocked, but might buy at attractive prices to protect the future. The regular contract market, subject to possibility of making shipment from England, is $68, Baltimore, while the prompt market lies somewhere between this and $75 per ton.

Steel—The market for billets and sheet bars is altogether inactive. We quote billets at $19 and sheet bars at $19.50, maker's mill, Youngstown, and billets at $19.50 and sheet bars at $20, maker's mill, Pittsburgh, but these prices are practically nominal, and on inquiry for any desirable tonnage would probably be shaded about 50c. Rods are nominal at $25.50, Pittsburgh.

IRON ORE

Some sales of Cuban low-phosphorus ore to an Eastern furnace are reported. The quantity is said to be 30,000 tons.

Shipments of iron ore from the Lake Superior district in October were 4,242,392 tons, a decrease of 2,283,711 tons from last year. For the season to Nov. 1, the total shipments are reported as below, in long tons:

Port	1913	1914	Changes
Escanaba	4,914,342	3,440,992	D. 1,473,350
Marquette	2,942,897	1,651,579	D. 1,291,318
Ashland	4,056,754	3,229,746	D. 827,008
Superior	12,858,975	10,920,469	D. 1,938,506
Duluth	11,520,153	6,197,043	D. 5,323,110
Two Harbors	9,506,399	5,511,976	D. 3,994,423
Total	45,799,520	30,951,805	D 14,847,715

The heavy decrease in Duluth shipments and the comparatively light one from Superior indicate that the Steeel Corporation has been working hard this season on its Hill leases.

Of the total shipments of iron ore from the Lake Superior district in October 3,526,795 tons, or 83.1%, were sent to Lake Erie ports.

Imports and Exports of Iron Ore in the United States nine months ended Sept. 30, in long tons:

	1913	1914	Changes
Imports	1,916,733	1,095,752	D 820,981
Exports	826,584	536,115	I. 290,469

The more important imports of iron ore this year were 631,214 tons from Cuba, 262,519 from Sweden, 47,326 from Spain, 38,515 from New Foundland and Labrador, 33,625 from Canada. Exports were chiefly to Canada.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 211,554 tons; shipments, 203,743 tons. Production of Greensburg and Upper Connellsville districts was 30,853 tons

Foreign Coal Trade of the United States nine months ended Sept. 30, in long tons:

	Exports		Imports	
	1913	1914	1913	1914
Anthracite	8,173,002	3,062,057	836	18,257
Bituminous	13,793,963	10,902,780	1,035,887	990,284
Coke	662,863	485,171	58,838	83,980
Bunker coal	5,763,584	5,711,948	.	.....
Total	23,393,412	20,161,956	1,095,561	1,092,521

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous Most of the trade, both imports and exports, is with Canada

CHEMICALS

NEW YORK—Nov. 18

The general market is quieter and less unsettled than it has been, but shows no great activity

Arsenic—The market remains dull and unchanged Quotations are around $3.75 per 100 lb. for both spot and futures.

Copper Sulphate—Business is steady and on a fair scale. Prices are a shade firmer than reported last week, $4.35 per 100 lb. being asked for carload lots, and $4.60 per 100 lb. for smaller parcels

Nitrate of Soda—Business is quiet, as is to be expected at this season Prices are a little softer 1.85c. per lb. being quoted for November and December, and 1.87½c. for 1915 deliveries.

PETROLEUM

The monthly statement of the "Oil City Derrick" shows new wells completed in October as follows: Pennsylvania grade, 292; Lima-Indiana, 66; Central Ohio, 80; Kentucky, 8; Illinois, 98; Kansas-Oklahoma, 491; Texas-Louisiana, 129. This shows 1173 wells completed, a decrease of 261 from the September report. New production amounts to 105,332 bbl., a decline of 26,578. Among the completions were 216 dry holes and 222 gas wells. At the close of October the new work was made up of 466 rigs and 1477 wells drilling, an increase of 30 wells.

Production figures as issued monthly by the Standard Oil Co. for nine months ending Sept. 30, 1914, show a grand total for all fields in California of 79,305,083 bbl. There were 340 new rigs built; 343 wells completed and 40 wells reported abandoned. Stoeks reported were 55,027,328 bbl. at the end of September.

STOCK QUOTATIONS

The trend toward normal conditions is reflected in the gradual opening of the mining-stock exchanges, so that we again resume stock quotations after over three months' intermission. It should be noted that the marked (‡) quotations represent those of July and should not be taken as in any wise indicative of present market prices.

COLO. SPRINGS Nov. 16

Name of Comp.	Bid.
Acacia	02½
Cripple Cr'k Con	006
C. K. & N.	04
Doctor Jack Pot	07½
Elkton Con.	38
El Paso	95
Findlay	‡ 006
Gold Dollar	02
Gold Sovereign	07
Golden Cycle	‡1 00
Isabella	11¼
Jack Pot	06
Jennie Sample	02
Jerry Johnson	.02¼
Lexington	003
Old Gold	01
Mary McKinney	36
Pharmacist	‡ 009
Portland	1 03½
Vindicator	1 07

SALT LAKE Nov. 16

Name of Comp.	Bid.
Beck Tunnel	04
Black Jack	02½
Cedar Talisman	‡ 00½
Colorado Mining	.08
Crown Point	.00½
Daly-Judge	4.10
Gold Chain	07
Grand Central	62
Iron Blossom	1 10
Little Bell	10
Lower Mammoth	.01½
Mason Valley	‡2 12½
May Day	08
Opohongo	01
Prince Con	2 35
Silver King Coal'n.	2 25
Silver King Cons.	1 42½
Sioux Con.	01
Uncle Sam	02
Yankee	02½

SAN FRANCISCO Nov 16

Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks		Misc Nev & Cal.	
Alta	.03	Belmont	4.67½
Belcher	.75	Jim Butler	65
Best & Belcher	.05	MacNamara	02
Caledonia	.36	Midway	07
Challenge Con.	.04	Mont.-Tonopah	37
Chollar	‡.02	North Star	19
Confidence	.19	West End Con.	.53
Con. Virginia	03	Atlanta	29
Crown Point (Nev.)	28	Booth	04
Gould & Curry	01	C.O.D. Con	.04
Hale & Norcross	02	Comb. Frac.	10
Mexican	.24	Jumbo Extension	95
Occidental	85	Pitts.-Silver Peak	17
Ophir	11	Round Mountain	28
Overman	13	Sandstorm Kendall	07
Potosi	‡ 01	Silver Pick	.07
Savage	‡ 05	Argonaut	‡2.50
Sierra Nevada	24	Brunswick Con	‡1 50
Union Con.	05	Central Eureka	22
Yellow Jacket	35	So. Eureka	1 80

TORONTO Nov 17

Name of Comp	Bid.	Name of Comp	Bid.
Bailey	01¾	Foley O'Brien	18
Conlagas	5 50	Hollinger	18 00
Peterson Lake	23	Imperial	00½
Right of Way	‡ 02	Jupiter	12½
T. & Hudson Bay	30 00	Pearl Lake	02½
Timiskaming	09	Porcu. Gold	‡ 05
Wettlaufer-Lor.	03½	Preston E. D.	00½
Big Dome	6 20	Rea	10
Crown Chartered	‡ 00½	Swastika	‡ 01
Dome Exten.	05½	West Dome	‡ 05

N. Y. CURB Nov. 16

Name of Comp.	Clg.
Beaver Con.	.21
Big Four	.06
Boston Montana	‡9¾
Braden Copper	5¾
B. C. Copper	‡1¼
Buffalo Mines	60
Can. Cop. Corpn.	‡2
Can. G. & S.	.03
Caribou	64
Chambers Ferland	‡.12
Con. Ariz. Sm	‡$\frac{7}{16}$
Cons. Nev.-Utah	‡¼
Coppermines Cons.	1¼
Davis-Daly	52
Diam'field-Daisy	.05
Ely Con.	‡ 05
Florence	38
Goldfield Con.	1.06
Greene Cananea	‡28
Kerr Lake	4½
La Rose	73
McKinley-Dar-Sa.	.50
Mines of Am.	2¼
Mutual Min., pf	‡2¼
Nevada Hills	25
New Utah Bingham	‡¼
Nipissing Mines	5½
North Star	17
Ohio Copper	07
Oro	09
Puebla S. & R	‡2¼
Stand'd Oil of N.J.	371
Stand'd Silver Lead	‡1$\frac{11}{16}$
Stewart	1$\frac{3}{16}$
Tonopah	7½
Tonopah Ex.	2$\frac{11}{16}$
Tonopah Merger	.32
Tularosa	$\frac{3}{16}$
West End Ex.	.02
Yukon Gold	2

BOSTON CURB Nov. 16

Name of Comp.	Bid.
Bingham Mines	04½
Boston & Corbin	‡.25
Boston Ely	.10
Butte & Lon'n Dev.	22
Calaveras	93
Calumet-Corbin	.07
Chief Cons.	65
Corbin	‡.90
Cortez	.10
Crown Reserve	.65
Eagle & Blue Bell	80
First Nat. Cop.	.95
Houghton Copper	1.00
Iron Cap Cop., pf.	‡4 75
Majestic	.12
Mexican Metals	.16
Nevada-Douglas	.43
New Baltic	.70
Oneco	.30
Raven Copper	.10
Smokey Dev.	.15
So. Lake	1 75
Tonopah Victor	‡ 18
Trethewey	12
United Verde Ext.	1.12½

LONDON July 30

Name of Comp.	Clg.
Camp Bird	£0 7s 0d
El Oro	0 12 3
Esperanza	0 10 7½
Mexico Mines	4 7 6
Oroville	0 8 9
Santa Gert'dis	0 10 0
Stratton's	‡0 0 6
Tomboy	0 18 9

The Engineering and Mining Journal

VOLUME 98 NOVEMBER 28, 1914 NUMBER 22

Stripping with Drag-Line Excavators

By L. E. Ives*

SYNOPSIS—At the Balkan mine in the Menominee region of Michigan, sand and water led to the use of drag-line machines instead of steam shovels for removing the overburden. Innovation was successful. One Bucyrus and one Marion machine used. Detailed mechanical description of each.

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The Balkan mine of Pickands-Mather is being opened on the famous Mastodon find of the E. J. Longyear Co., at Alpha, Mich., near Crystal Falls. At this mine, for the first time on any of the Lake Superior iron ranges, drag-line excavators have replaced the familiar steam shovels for stripping the overburden and the results are eminently satisfactory.

When it was decided to strip the overburden and mine the ore in an openpit, the Winston Bros. Co., which has done a great deal of stripping on the Mesabi, was asked to bid on the work. The job was a large one, calling for the removal of 1,200,000 cu.yd. before July, 1915, and bids were not called for until March, 1914. The Winston company made a preliminary examination and was convinced that the only way the work could be handled successfully would be through the use of drag-line machines, and that these would have to be larger than those it had used before on railroad work. Therefore when it got the contract it immediately ordered one Marion and one Bucyrus drag-line bucket excavator. The mechanical descriptions and features of these machines will follow later.

REASONS FOR CHOOSING DRAG-LINE MACHINES

The principal factors leading to the selection of drag-line machines were the nature of the material, largely sand, and the fact that a good deal of water was expected. It was contended that the combination of sand and water offered a bottom which would not support a steam shovel, and furthermore the steam shovel is not an elastic machine; it must keep close to its work and must be on the same elevation as the cut, an important consideration in this case. The drag-line machine, on the other hand, remains on the surface and takes a first cut below its own elevation, the depth and slope of the cut depending on the size of the machine.

Under the contract the Balkan Mining Co. handles the water in the pit and the contractor the dirt. It was reasoned that with the drag-line machines a first cut could be taken all around the pit with the machines on the surface and that this would give the mining company a chance to drain the water from the ground to an extent sufficient to provide a suitable bottom from which the machines could take their second cut, for it is a well known fact that quicksand drained to a depth of 3 or 4 ft. constitutes an excellent bottom for supporting heavy loads. With the first cut nearly completed at the time of visiting in August, it was evident that the contractor had judged correctly, for it was evident that no steam shovel could have been kept upright long enough to dig on the bottom presented by the quicksand after the first cut had been taken out. It was literally soup.

Another advantage of the drag-line is that it requires no blasting. And finally it has a greater range of ver-

THE BALKAN PIT, MICHIGAN, IN PROCESS OF STRIPPING tical lift and therefore necessitates less climbing on the part of the train and locomotive.

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*Chicago editor, "Engineering and Mining Journal."

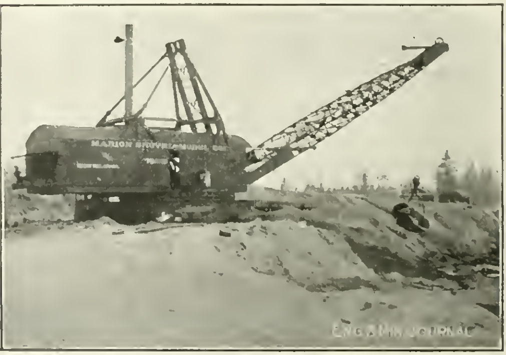
The Balkan pit itself is oval in shape, with axial dimensions 1100 ft. and 700 ft. The general trackage arrangement and operation of trains are patterned after the Mahoning pit on the Mesabi. The first bench will spiral down with sides sloping 2 : 1 and a track grade of 26%. The depth of the overburden varies from 60 to 100 ft. At some place lower than the first bench, hardpan is expected, but the contractor believes the Page buckets which are being used, built by the Page Engineering Co., of Chicago, will handle the hardpan without difficulty, and judging from their weight, 11,800 lb. empty, this does not seem unreasonable.

Methods and Performance

Before the pit was opened plans for working it were drawn up and operations were started according to these plans. It was intended to work on two or three benches with cuts of about 30 ft. each. It was found, however, that the slopes would not stand and the continuous spiral plan was finally decided upon. It has been found necessary to use 35° curves in the track arrangement and this forced the use of contractor's equipment rather than of the standard railroad type, as would have been preferred. The larger equipment would have permitted an increased output, but even with the smaller equipment some excellent records have been made. During July the two machines together moved 206,000 yd., 103,000 yd. apiece; good steam shovel performance on the Mesabi range is from 70,000 to 80,000 yd. in 26 working days, with an occasional production under unusually favorable conditions of 100,000 yd. It is only fair to say, though, that the material being handled at the Balkan is ideal for a drag-line machine, consisting as it does largely of sand, gravel and clay. At the time of visiting one machine was loading 400, the other 600, four-yard cars per 10-hr. shift. The discrepancy was due entirely to the position of the slower excavator which was temporarily so situated that only a limited number of cars could be served to it. Before closing down for the winter, Winston Bros. expected to move a total of 900,000 yd., leaving 300,000 to be handled during next spring and in the early summer, with ample leeway for additional new material that may have to be moved. On the entire work there are employed 170 men divided into two 10-hr. shifts.

The Bucyrus

Dumping the load into the loading hopper.



The Marion

Taking up a 4½-cu.yd. load.

An interesting feature of the excavating is the manner in which the machines propel themselves when a change of site is necessary. The underframe is supported on rollers which rest on planking on the ground. When it is desired to move, the bucket is simply thrown out, dropped, and used as an anchor. The line to it is used as a dead line, and by pulling against this, the shovel propels itself toward the bucket.

Necessity for a Loading Hopper

The capacity of the Page buckets is larger than that of the contractor's cars. Therefore, when loading directly into the cars, it was found that much dirt was spilled on the ground and track, blocking the cars and sometimes derailing them. The hopper shown in one of the illustrations was therefore built and put into use; it permits the trains to pass beneath it and each car in turn is centered under its mouth. In this way the dirt is guided into the cars more satisfactorily. The hopper sides are lined with hard maple, which is asserted to be superior to sheet iron for the purpose, since it wears smooth and shiny and offers a better sliding surface. The trains are made up of 10 cars and a dinkey locomotive, three trains serving each shovel.

The Bucyrus Machine

The Bucyrus machine is a Class 24 drag-line excavator, having a turntable diameter of 24 ft. The standard machine of this class has a 100-ft. boom and a 3½-cu.yd. bucket. This machine, however, has an 85-ft. boom and a 4½-cu.yd. bucket, the variation from the standard being determined probably by local conditions. The engines are self-contained on one-piece bases and are the same as those used on the larger Bucyrus shovels. The drums, engines, etc., are mounted on a structural-steel base, a strong and flexible arrangement designed to obviate cracked side-frames. The gears are steel castings with machine-cut teeth and the shafting is extra large. The hoisting and drag-line frictions are of the outside-band type with large friction surface. The sheaves are steel castings with turned grooves and bronze-bushed hubs; their diameter as well as that of the drums is large, to reduce wear on the cables.

The fair-lead consists of two horizontal sheaves mounted on a casting riveted to the front sill of the machine. The two vertical sheaves are carried in a swinging frame pivoting on the first casting, which allows them to turn in the direction of the drag line and give it a straight lead in a vertical direction. The rope as it enters the machine thus travels over sheaves which are in line with the strains so that little slipping occurs and wear is reduced. The digging rope is 1⅜ in. The main engines are double, 10½x12 in.; the swinging engines are double, 8x8 in. The locomotive-type boiler is 58 in. in diameter and 15 ft. long with a working pressure of 125 lb. The boom suspension is operated by a drum geared to the main engine. The shipping weight of this machine without counterweight is 112 tons.

The Marion Machine

The Marion excavator also has an 85-ft. boom, a 4½-cu.yd. bucket and a 24-ft. turntable. The lower frame is 24 ft. square, built up of structural-steel shapes and plates. The turntable itself is of the roller-bearing type. The upper or rotating frame is constructed entirely of structural steel. The fair-lead for the drag rope is mounted in the bracket at the front of the frame and consists of two vertical and two horizontal sheaves of large diameter, fitted with the necessary guides and so arranged that the cable can pass over them without fouling, for any position of the bucket.

Bottom after First Cut

Showing drainage trenches, pump station and spiral-riveted discharge pipe.

Stripping Dump

Note favorable start out from hill.

The main engines are double, horizontal, side-crank type, with 12-in. bore and 14-in. stroke. The machinery frame, in addition to supporting the engines, also carries the intermediate or clutch shaft and the drag-drum shaft. The hoist and drag drums have grooved barrels and are provided with two housings of large diameter and wide face, one for the friction band and one for the lowering or check band. The drums are actuated by steam-set frictions of the outside-band type. The boom-hoist drum is mounted at the rear of the machinery frame between the engine cylinders, and is driven from the intermediate shaft through bevel gears. The rotating engines are double, horizontal, center-crank type with 9-in. bore and 9-in. stroke, reversed and controlled by a central valve, requiring but one operating lever. The locomotive boiler is 60 in. in diameter and 17 ft. long; the maximum allowable steam pressure varying from 135 to 150 lb., although the pressure used is 125 lb. The operating levers are banked in quadrants at the forward end of the rotating frame on the left-hand side and are arranged to give the operator a clear view of the work. The boom is fitted at its point with a sheave for the hoisting cable in addition to the bail and sheaves for the boom-hoist cable. The drag rope is direct-connected to the drag chains on the bucket, while the hoisting rope passes over a sheave in the bail and is anchored to the point of the boom. The boom-hoist cable is reeved between sheaves in the frame and the support bail on the boom and leads to the boom-hoist drum.

With the boom at a 30° angle, the maximum height of dump above the bottom of the rollers is 15 ft.; the maximum depth of cut below the bottom of the rollers, 45 ft.; the maximum reach from pivotal center, 81 ft.; the radius of cut, 84 to 102 ft. The size of the hoisting cable is 1 in.; of the drag cable, 1¼ in.; of the boom-hoist cable, 1 in. The approximate shipping weight less ballast is 252,000 lb.; the approximate working weight, 315,000 pounds.

Advantages of Drag-Line Machines

For many classes of work the drag-line machine is supplanting hand and team labor, the steam shovel and the dredge. In mining operations, it has already found a field of usefulness in the stripping of coal and phosphate properties, and now in iron mining. There are a number of reasons for this, but the most prominent advantages seem to be: (1) The wide radius of action, requiring less moving and making it possible to deposit material far enough from the cut to keep the weight off the banks and prevent caving; (2) the possibility of digging a much better slope than can a dipper dredge or steam shovel. (3) a reduction in the amount of rehandling of material and the necessary equipment therefor; (4) the ability to dig wet material below the level on which the machine stands, where a steam shovel would be drowned out; (5) the fact that a skilled operator can throw the bucket from 10 to 30 ft. beyond the end of the boom, depending upon the size of the machine and the conditions under which it is working, thus still further increasing the radius of work.

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Mine Lessee's Liability for Royalties and Damages

By A. L. H. Street*

In a recent suit (Northern Light Mining Co. vs. Blue Goose Mining Co., 143 *Pacific Reporter* 540) to recover royalties due under a placer-mining lease, and damages for claimed breach thereof by the lessee, the California

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District Court of Appeals decided that where such a lease calls for payment of an annual royalty, without fixing a time of payment, the amount falls due at the end of the year; that where the place for payment is not specified, tender should be made on the premises, and payment should not be withheld for omission of the lessor to fix a place, in the absence of notice to him requiring him to do so; and that suit for royalties may be brought after they are due, although no demand for payment has been made, if it appears that a demand would have been useless.

On the question of damages for the lessee's failure to continue operations required by his contract, it is held that proof as to the number of cubic yards of gold-bearing gravel that he could have mined by using reasonable diligence to perform his contract, and the best obtainable royalties obtainable elsewhere at the time of the breach, for working the claim, affords sufficient basis for computing the damages recoverable. The court declared that the lessor is not bound to work the claim himself or obtain someone else to do so as a condition precedent to recovering damages.

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California Mine Owners Discuss Insurance

By Lewis H. Eddy

The permanent organization of the California Metal Producers' Association was completed at a meeting in San Francisco on Oct. 28. The meeting was attended by 30 mine owners or managers, representing some of the largest operations in the state. The following named were elected officers and executive committee: A. Burch, representative Bewick, Moreing & Co., president; George W. Metcalfe, manager Mammoth Copper Co., vice-president; E. C. Hutchinson, president Kennedy Mining & Milling Co., San Francisco, vice-president; George W. Starr, manager Empire mine, Grass Valley, Nevada County; C. G. Knox, manager Black Oak Development Co., Berkeley; S. W. Mudd, manager Tunco Mine Co., Los Angeles; Newton Cleaveland, manager Yuba Construction Co., San Francisco. On Nov. 4 the organization selected John Mocine, of Nevada, for the position of secretary-treasurer. Mr. Mocine has had experience with a similar organization in Nevada and will become a resident of San Francisco when he undertakes the duties of the position. At the meeting on Nov. 4 the president of the association appointed a committee on workmen's compensation and insurance, naming E. C. Hutchinson, George W. Starr, and Newton Cleaveland. The executive committee will meet again on Nov. 17, and the association will meet again on Nov. 25.

On Nov. 5 the California Industrial Accident Commission held a public meeting, having invited a large number of metal producers and mine managers to participate in a conference regarding the insurance rates charged by the insurance department of the commission. The mining industry was represented at this meeting by members of the California Metal Producers' Association. The meeting was presided over by Mr. Pillsbury of the commission and was attended on the part of the commission by Col. Weinstock and Mr. French, members of the commission, Mr. Fellows, manager of the insurance department, Mr. Leslie of the same department and Mr. Wolflin of the safety department. The principal subject discussed was the high rate of mine insurance charged by the state and the fact that the insurance department of the commission has not undertaken to write unlimited insurance on mining risks, declining anything further than the sum of $10,000 on a single risk.

Mr. Burch, who is conducting mining operations in Nevada and California, recited briefly the history of the working of compensation and insurance in Nevada and showed that the insurance department of that state started without legislative appropriation and has written $250,000 of insurance, and has operated at a cost of 10% of premiums collected, plus about $\frac{3}{5}$ of 1%, which it found necessary, and for which an appropriation will be asked of the legislature.

The California insurance rates carry a load of 40% for expenses and the insurance department of the commission shows that about one-third of the amount paid out in risks is expended in medical assistance for injured men. The Nevada showing is much less than this. But it must be remembered that the insurance department in Nevada pays nothing for medical assistance, which is provided for by a monthly assessment upon the workmen. The Nevada compensation is only 50% of the wages earned, as against 65% in California. As stated by Mr. Burch, the total expense of operation of insurance in Nevada was only about one-quarter of that required in California. The insurance rate in Nevada is less than 3% of the payroll, while the rate in California is nearly 8%. But the situation in Nevada referred to by Mr. Burch covered mine accidents, while California does not give its mines unlimited insurances, but has written $500,000 insurance on other industries.

The mine owners and managers, so far as represented at this meeting, are apparently in favor of state insurance provided the state will write such insurance and write it at a reasonable rate. It was made plain that there was little disposition on the part of the mining men to encourage mutual-insurance plans, which would require the loaning to the state of sufficient funds by the mine owners, to carry out insurance.

It was held by the representatives of the commission that the high rate charged was for the purpose of taking care of extra hazardous risks such as great disasters in which a large number of men may be killed at one time. But in the history of California mining there have been, so far, no great disasters of this character. There have been some close chances taken in some deep mines provided with only one exit, and in some instances there are inflammable structures near intake airways and danger from underground fires in timbered mines. But these dangers should be very largely reduced by carrying out the careful plans in process by the commission in coöperation with the Bureau of Mines.

It is fortunate the metal producers had completed their permanent organization prior to the meeting of the mining men with the commission. When the representatives of the mining industry spoke at the meeting with the accident commission, they spoke not only as individuals representing their own particular operations, but they spoke as a representative body of strong and influential mine owners and managers; and what they said or may say must have weight not only with the commission but with legislators.

The Law of Crushing--II

By H. Stadler*

SYNOPSIS—Having shown the known laws of physics to favor Kick's law, the previous discussion on the subject is reviewed and shown to indicate the same thing. Practical examples in many cases support Kick's formula. The energy-unit comparison for crushing machinery is based on Kick's law, and the methods of utilizing it in practice are shown.

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Readers of the Journal have been so well kept *au fait* with the argument that it may be opportune to make through this medium a few remarks on other contributions of recent times, as far as they have come to my knowledge.

Del Mar's Comparisons

Algernon Del Mar,[6] in a praiseworthy effort to get at the truth, works out some comparisons of efficiency calculations by using the surface method (Rittinger's law) and the volume method (Kick's law), but he was unfortunate in selecting his examples. First he compares the efficiency of the same stamps crushing through a 12- and a 4-mesh battery screen, and finds by an elaborate calculation by the surface method, an efficiency ratio of 8:11 in favor of the 4-mesh screen. However, as the gradings given are, within a limit of 5% allowed by him for accuracy of screening, practically identical for both screens, he would have saved time by simply taking the proportion of the duties of 6 tons and 8.46 tons, respectively (all other factors being equal), which, reduced to above, works out at 8:11.28. In a second example, he compares the efficiencies of a Nissen stamp with a 5-stamp unit and found a ratio of 1:0.59 in favor of the Nissen stamp by the surface method, and of 1:0.56 by the volume method. Here again the gradings are practically identical and the efficiency ratio is therefore at once given by the ratio of the only different factor: of the quotient of duty into power consumption, which works out at 1:0.55. With identical gradings the application of all laws of crushing are bound to give identical results. In passing, I may remark that difficulties experienced in obtaining reliable tonnage and power measurements are evidently responsible for an experimental error. The figure of a 50% higher efficiency for the Nissen stamp is obviously unreasonable and not borne out by other tests.

The example of the two tube mills, shown in the table, dealing with feeds of different coarseness under similar other conditions, is best adapted for analysis:

COMPARISON OF TUBE MILL WORK

	Tube Mill I		Tube Mill II	
Duty per Day, Tons	75	2.5 tons per hp	75	3 tons per hp.
Power Consumption	30 hp.		25	
Mesh	Intake	Discharge	Intake	Discharge
120	39.2%	63.6%	20.7%	30.5%
Comparative mechanical efficiency:				
Surface method	12,750 energy units per hp. Increase 8.7%		11,771 energy units per hp	
Volume method..	447 energy units per hp		531 energy units per hp. Increase 19%	

The surface method having been proved to be based on error, the onus of proof that the greater efficiency shown by this method in favor of tube mill 1 lies on the other side. A most important fact must, however, be kept in mind. The factors, or multipliers, representing the average size of the grade passing the finest mesh employed can only be determined by approximation, but Mr. Del Mar says, "Any reasonable average will be fair alike for both machines." In this generalization the statement is not correct because the average size of the comparatively small percentage on the —120 grade of the second tube mill is naturally coarser than the average size of the considerably larger percentages on the same grade of the first tube mill. By applying in both cases the same factors, no credit is given to the first tube mill for the work performed in reducing a larger percentage of the −120 grade to overdone slime. From the metallurgical point of view we may purposely use for the totals of the finest grade a conventional standard independent of the true value of the actual average sizes, but then the efficiency values determined refer not really to the mechanical efficiency but they include a concession to the economical efficiency.

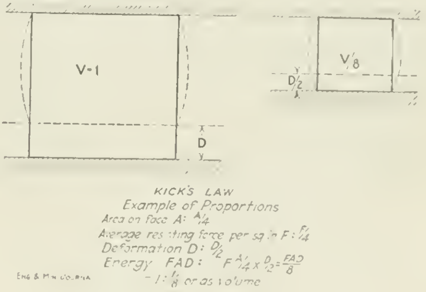

Fig. 9. Kick's Law

In order to make a rough correction, we may take, for the sake of argument, instead of the multiplicator of 253, brought by Mr. Del Mar into account for the —120 grade, the higher value of 400 (applied by him in another example for the —200 grade) for the surface method, and of 26 against 24, respectively, for the volume method. The increase of the mechanical efficiency then works out in both cases in favor of the first tube mill; by the surface method, 91%; by the volume method, 7.5%.

In consequence of the rapid progression with which the surface factor increases with the fineness of the grades, an absurdly high efficiency is shown by the surface method for the first tube mill. The volume method, on the other hand, leads to a possible figure which is in logical agreement with the reasoning that the mechanical efficiency cannot differ much if all the work done in overgrinding the —120 grade is duly brought into account. As the mechanical losses by vibration, production of heat, sound, etc., are in this case very likely the same for both machines, a relatively greater loss shown for one machine must be accounted for by the production of a larger amount of ultra-fine slime.

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[6] "Eng. and Min. Journal," Dec. 14, 1912.

A. O. Gates' Argument Favoring Rittinger

Arthur O. Gates,[7] in an elaborate article, breaks a lance in favor of Rittinger's law, which he believes to be more applicable to the study of crushing efficiency than that of Kick. Based on deduction drawn from Fig. 9, he admits that in this particular instance the energy absorbed is proportional to the volume. The first error creeps in when he limits the operation of this law to deformation within the limits of elasticity during which the molecular bond is only temporarily strained but not interrupted. Perfectly elastic materials do not exist, and we know (Bauschinger, Bach and others) that the application of any force, feeble though it may be, has always a permanent set as result. This permanent deformation may be so small that it is not measurable, but that it exists is proved by the fatigue to which finally any spring must succumb when the alternate exertion and release of the stresses is repeated millions of times.

With reference to Fig. 10, Mr. Gates claims to explain how Rittinger's law applies. Supposing, he says, that forces were applied on the two offset faces until the deformation shown by the dotted lines was obtained, it will be seen that only the molecules along the vertical center line are stressed and deformed, "the mass of the cube away from this surface receiving practically no pressure or deformation." The only excuse for venturing such a bold statement is the quite arbitrary assumption that the material on which the external force acts be perfectly rigid and inelastic. In this fictitious and impossible case the force would act in the fracture plane itself, but then the distance which the external force has to overcome to do mechanical work would also have vanished. Not the work, but the force alone is in this ultimate hypothetical case proportional to the area of fracture. Both cases are exactly alike, as also in Fig. 9 the force would act in the fracture planes themselves if also here the material is assumed to be perfectly rigid and incompressible. Such a state is actually reached at the moment immediately preceding the rupture, when at the end of the performance of work the opposing stresses yield to the pressure. The breaking loads ascertained by testing machines measure, therefore, the stresses, and not the work spent upon producing them.

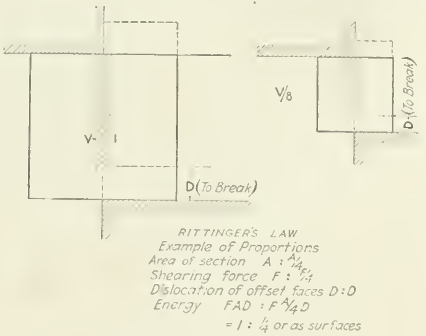

Fig. 10. Rittinger's Law

The most interesting remaining portion of the article in which Mr. Gates reduces the work done in crushing to graphic form would have been much more appreciated if the examples selected had not been based on a wrong law.

Conformity of Opinion by J. W. Bell

The metallurgical staff of the McGill University was the first to give early appreciation to my suggested system of applying grading analyses in connection with Kick's law to the computation of crushing efficiency. In 1911, on the occasion of H. S. Ball's experiments on tube-mill efficiency, it was, after careful consideration, unanimously decided that my method would in future be applied to all crushing tests carried out in the mining laboratory. The McGill University report of the same year states that the results of a large series of experiments directed to settle the truth of the laws of crushing agreed with Kick's law to within the reasonable limits of error of experiment on so variable a material as broken rock. In a later article,[8] Mr. Bell worked out a most interesting extension of the practical applicability of my method. By using the data given by Messrs. Caetani and Burt, of tests carried out by them at the El Oro mill in Mexico,[9] he studied the possible relations between the volume grades and the corresponding gold and silver extractions. It was at once apparent that the curves of the plotted results were straight lines, showing that extraction and volume vary very closely in the same proportion. Another important conclusion arrived at was that the extraction does not seem to be proportional to the increase of surface exposed, since the surface exposed increases at a rapid progression from one grade to another while the increase in extraction appears to be constant for a great interval. By prolonging the curve until it intercepts the parallel to the abscissa at 100% extraction, the fineness of the ore can be read off at which total extraction would be obtained. The value thus found for the limit of fine grinding at which the highest metallurgical efficiency is obtained is a valuable guide for the estimation of the critical size of the economical efficiency which, of course, is reached before the end limit of the estimated total extraction.

Arthur F. Taggart's Argument for Kick's Law

After a careful analysis of the proofs adduced for and against the various crushing laws, Arthur F. Taggart[10] arrives at the conclusion that Kick's law is unquestionably correct for all substances where the changes of configuration are within the elastic limit. Mr. Taggart, like Mr. Gates, appears to take exception to the applicability of the law during the stage of permanent deformation taking place between the so called limit of elasticity and the point of final rupture. He adds, however, that these points so closely approximate one another that this permanent deformation can for all practical purposes be neglected. It has already been shown that the term "limit of elasticity" in the sense applied by him is misleading and would be better called "limit of plastic deformation" because the curve for compression of materials such as are generally subject to crushing show in strain-stress diagrams no bow, and it is, with the exception of a slight swell at the start, an uninterrupted straight line until the upset point is reached. The law holds good, therefore, right up to this point and does not need a concession of elbow room for accuracy. In tensile tests of ductile materials the different kinds of deformation are clearly discernible in the strain-stress diagram. The curve is here composite but as the law applies to each individual stage of "analogous deformation," it holds good also for the full range, and the curves will therefore be similar for different sizes of similar testbars. In plotting the strain-stress curves of two similar testbars of different volumes in the proportion of 1:8 (homologous dimensions 1:2) the deformation of bar II (on the abscissa) will be twice that of bar I and the stresses (on the ordinate) four times that of bar I, and as the area representing the work is consequently eight times that of bar I it is graphically proved once more that the work varies as the volume.

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[7] "Eng. and Min. Journ.," May 24, 1913.

[8] "Eng. and Min. Journ.," May 24, 1913.

[9] "Trans.," A. I. M. E., Vol. 37.

[10] "Trans.," A. I. M. E., February, 1914.

Dr. Caldecott's Breaking Tests

At the time of my connection with the late Mines Trials Committee, exhaustive breaking tests extending over a year (about 1910) were carried out under the auspices of Dr. Caldecott at the Government mechanical laboratory by the Mines Department. The report has never been made public. All that was heard about it was the following short remark in the annual report of the Mines Department for 1912: "The result of the tests made with falling weights showed that under impact the strength of the specimens to resist crushing varied in a way nearly dependent on the square of the diameter. This result corresponds with the well known crushing law of Rittinger." The conclusion of the second sentence is, of course, incorrect, being in contradiction to the first in which it is said that the resistance to crushing, i.e., the stresses, vary as the square of the diameter, while Rittinger's law refers to the energy spent in producing these stresses.

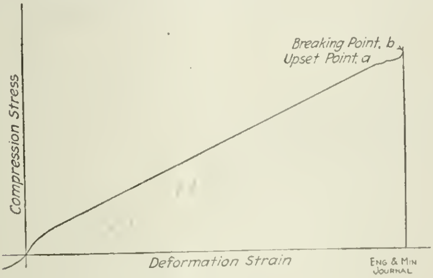

FIG. 11. TYPICAL COMPRESSION STRAIN STRESS CURVE FOR GRANITE

All through the experimental work carried out by the writer over several years on behalf of the late Mines Trials Committee it could be ascertained that my method of efficiency calculation, derived from Kick's law, is for fine as well as for coarse crushing correct and reliable and in perfect accordance with the results of practical experience.

Scientifically and experimentally, the correctness of my method of efficiency computation can no longer be questioned and, thanks to the outside support received, I now have the satisfaction of seeing the following statement, made four years ago, fully confirmed:

"With this method we are now in a position to determine with a comparatively high degree of accuracy the relative merits of different crushing appliances, or the efficiency of one and the same machine working under varying conditions."

Procedure for Computing Crushing Efficiency

The application of the suggested method in practice is much simpler and easier than would appear from the many theoretical considerations required in devising it. The arithmetical mean of the ordinal numbers of the two screens determining a grade represents, in accordance with Kick's law, the work spent upon reducing the unit of volume, or weight, to the respective grade. These ordinal numbers, or energy units (E. U.), are the indicators, or multipliers, by which the percentages of the respective grades are to be multiplied for obtaining the energy value of that grade. The total of these products is the ordinal number, or energy value, of the complex samples. The difference between these values taken at the intake and discharge of the crushing appliances represents the comparative work done by the machines per unit, and the comparative mechanical efficiency per horsepower is then obtained by dividing the product of the work done by the machines per unit and the total tonnage by the unit of power consumption. In J. W. Bell's opinion, "there would be substantial reason for introducing the Stadler series of grades into the regular milling practice" on the ground of the simplification realized by being able to describe a grade, or a complex screen analysis, by a single number.

In order to bring about more uniformity in the records of grading analyses all over the world, it would be highly desirable for metallurgists to use the set of screens shown in the accompanying table, selected in such a way from the complete set of I. M. M. standards that a regular reduction by one-quarter from one grade to the next is obtained. For any odd screen used or interpolated, the ordinal number, which is to be determined once and for all, is calculated by the formula:

Ord. number = —10 × log. of clear mesh aperture

STANDARD GRADES FOR SCREEN ANALYSES

Mathematically Correct Scale Reduction Ratio 1 : 4			Nearest I M M Standard Laboratory Screens			
Ord. No. Mech. Val. EU.	Mesh Aperture In.	Mesh Aperture m/m		Mesh p. Lin. In. No.	Mesh Aperture In.	Mesh Aperture m/m
0	1.0	25.4	Commercial hand-screens	1 in.	—	—
2	0.630	16.0		⅝ in.	—	—
4	0.3969	10.080		[illegible] in.	—	—
6	0.250	6.35		¼ in.	—	—
8	0.1575	4.0003		2 3/16	—	—
10	0.09922	2.52		5	0.10	2.540
12	0.06250	1.5874		8	0.062	1.574
14	0.03937	1.0		12	0.0416	1.056
16	0.0248	0.630		20	0.025	0.635
18	0.01562	0.3968		30	0.0166	0.421
20	0.00984	0.250	(60)	50	0.01	0.254
22	0.00620	0.1575	(90)	80	0.0062	0.157
24	0.00391	0.0992		120	0.0042	0.107
26	0.00246	0.0625		200	0.0025	0.063
28	0.00155	0.0394		—	—	—
30	0.00098	0.0248		—	—	—

$R = \frac{1}{\sqrt[3]{4}} = 1.5874$

Diameter of wire very close, equal to mesh aperture
Area of discharge fairly constant 25 per cent

Applicability of the Method

The necessity for fine grinding is limited for each ore to a certain size at which it yields its metal contents at the highest economical efficiency. Still further grinding means waste of energy, since a possible gain in extraction by chemical treatment is nullified by additional costs incurred for finer grinding, and the greater losses of gold sustained in the slimes-treatment plant by dissolved gold going to waste with the greater percentage of moisture retained in very fine slimes. Beyond this critical size, which for Rand ore is reached before the finest available screen, the mechanical efficiency, being no longer representative of the metallurgical efficiency, ceases to be of interest, and it is therefore, for practical purposes, advantageous and expedient to replace the multiplier expressing the mechanical efficiency by that of the economical efficiency, which is exactly that belonging to the grade of the critical size. The useless work done by overgrinding is then considered as waste, the same as losses of mechanical energy by friction, production of vibration, heat, sound, etc.

In addition to the required similarity of shape and technological state of the materials subject to deformation, it is as self evident and tacitly understood that the conditions under which the forces are applied must also be analogous within reasonable limits. For instance, the effect produced on a particle caught between two rollers is affected by the diameters and by the speeds. It has also been ascertained that similar deformations are produced by slow compression with less work than by the exertion of a blow, and further, that one single heavy blow is more efficient than a successive repetition of weaker blows representing in their total the same work. The effect of the velocity is, however, negligible for those varying within the range covered by all crushing appliances in use at the present time.

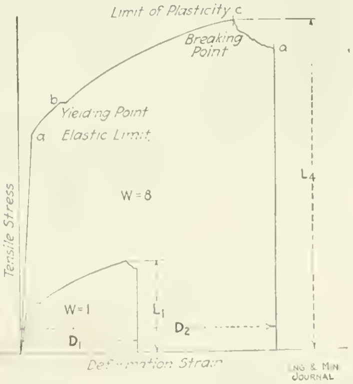

FIG. 12. TYPICAL TENSILE STRAIN STRESS CURVE FOR MILD STEEL

It might appear that all these reservations and limitations, which are common to all crushing laws, would impair the practical usefulness of efficiency computations. Such fears are groundless because the fulfillment of these conditions is of importance only to the experimentalist who, in investigating the laws of crushing, must carefully eliminate all sources of error. From the moment the correctness of the law is definitely proved we are no longer concerned with how far the reliability of the results may be affected by the influences of the physical peculiarities of the material, or of the different working conditions, etc. On the contrary, it is precisely the extent of the effect of these factors on crushing efficiency that we propose to measure by comparison of actual results with a theoretically unobjectionable ideal standard.

The industry of grinding has become so specialized that the practical value of the method is not seriously diminished by the limitation of giving only relative values for given materials. It is doubtful whether attempts to arrive at a direct determination of the absolute values would be of any use, but in this direction the different breaking heights for the various materials may perhaps prove to be a valuable indication of the amenability to crushing of various materials.

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La Rose Consolidated

The report of the La Rose Consolidated Mines Co., Cobalt, Ont., for 1913, shows a profit of $955,130 from operations by the operating company, the La Rose Mines; after deducting losses and expenses on outside properties, a net profit of $952,816. Dividends declared during the year amounted to $931,000. Deducting the expenses of the holding company, the net profit for 1913 would be $918,638. The mine produced 2,636,696 oz. of silver at a cost of 22.8c. per oz., and the net selling price was 59.32c. per oz. The property has produced 20,420,064 oz. of silver to date. Ore reserves are estimated to contain 94,082 tons of ore containing 2,071,098 oz. of silver, having a net value of $622,521. Of the ore in reserve 93,159 tons are milling ore and the remainder high-grade shipping ore. The cost of production for 1913 was made up as follows:

	Per ounce silver
Mine operations	$0.1474
Concentration	0.0388
Marketing, including deductions	0.0616
Depreciation	0.0045
Corporation and traveling expenses	0.0008
Total	$0.2531
Less rents, interest and discounts	0.0251
Total cost of production	$0.2280

Marketing expense was 10.42% of the gross value of the silver contained in shipments; of this, 4.18% was for smelter deductions, 2.63% for treatment charges, 2.33% for freights; and 0.98% for assaying, sampling, smelter representatives and ore insurance. The mine shipped 3274 tons of ore, of which 916 tons were concentrates. A record of concentrate production for the year follows:

CONCENTRATION

Ore milled	37,556 dry tons
Silver contents of heads	508,288 oz.
Average assay of heads	13.53 oz. per ton
Concentrates produced	950.142 tons
Silver contents of concentrates	437,439 oz.
Average assay of concentrates	460 oz. per ton
Net value of concentrates	$217,924
Cost of concentration	$102,447
Cost per ton of ore milled	$2.73
Average tonnage for 313 days	120 tons per day
Ratio of concentration	39.5 to 1

The development work consisted of 542 ft. of shafts, 8939 ft. of drifts and crosscuts, and 853 ft. of raises. Stoping resulted in the breaking of 11,186 cu.yd. of material.

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Rutile Production in 1913

Virginia produced all the American rutile in 1913, according to the U. S. Geological Survey, the deposits being located at Roseland, Nelson County. The output was 305 tons. A large part was used in the manufacture of titanium-carbide electrodes for arc lamps. A part of the ilmenite found in the deposits and separated by means of a magnetic separator has been sold for use in making electrodes for electric lights, and the experiments with the electric furnace point to the possible use of ilmenite in the direct production of tool steel.

Butte & Superior Copper Co.

During the third quarter of 1914, the Butte & Superior Copper Co. milled 100,600 dry tons of ore, containing 18.582% zinc and 8.6359 oz. silver per ton. Concentrates amounting to 60,974,968 lb. were produced, containing 54.32% zinc and 24.15 oz. silver per ton. The zinc recovery in concentrates amounted to 89.14% of the total ore content. Milling cost was $2.049 per ton, and mining cost, $3.201 per ton.

Total value of product for the quarter was $1,027,576, and costs were $528,440, leaving profit of $499,136. At the close of the quarter, and after payment of dividend, the total cash on hand was $808,760, and the net current and working assets, including the value of products in transit, amounted to $1,327,152. Profits for the quarter were calculated on an average price of 5.11c. per lb. for spelter.

During the past few months it has become apparent that it would be necessary to suspend operations for a time to make repairs to a section of the main shaft between the 300- and 700-ft. levels. This portion of the shaft was sunk many years ago and has not since been retimbered. When originally constructed it was not as strongly timbered as it should have been, considering the heavy ground through which it was driven. It was hoped that operations might be continued until near the end of the year, but the condition of the shaft deteriorated more rapidly than was expected, with the result that near the middle of October, just previous to the writing of this report, some of the weakened timbering and guides gave way, causing damage that would have required several days for repair. Temporary repairs would have been difficult and expensive and would have left the shaft in about the same condition. It was decided, therefore, to suspend operations for sufficient time to make permanent repairs, which should be completed about the end of the year. Until that time operations will be confined to a necessary amount of work in development and maintenance, as many as possible of the regular employees being used in this work and in some minor betterments and improvements to the mill and the surface equipment at the mine. In the meantime, the earnings for the short operating period for October, together with accumulated surplus from excess of value of products in transit, over and above the estimated values, will go a long way to offset the decrease in operating earnings for the fourth quarter. In fact, the incomes referred to and creditable to the fourth quarter will probably cover fully all of the expenditures for repairs and betterments incurred during the period of suspension. Such being the case, the cash received during the quarter for products in transit will more than cover the quarter's dividends and leave the company's cash position at the end of the year and after dividend payments for the year fully as strong as it was at the end of the third quarter.

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Imports of Copper Matte

The Court of Customs Appeals has rendered a decision sustaining the Board of General Appraisers in its ruling on copper regulus, ore and matte imported. There were several cases arising, the appeal of the American Smelting & Refining Co. being taken as a test case. The question was the status of certain material, which the importers claimed to be copper regulus or matte, and free, while the government representative claimed it was lead ore and liable to duty on the lead contents. The evidence showed that it was an impure, unfinished product of the smelting of sulphide ore, the chief value being in the copper contents. That is, it was, commercially, copper matte, and not an ore. The Board of General Appraisers decided in favor of the importers, holding it to be copper matte or regulus, free of duty. The Customs Court sustains this decision. It affects a considerable number of entries, and there is a large amount of money paid under protest which will have to be refunded.

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Zinc Mining in Wisconsin

The Wisconsin orebodies have their greatest extent horizontally rather than vertically. They vary in dimensions as follows: Length, from about 100 ft. to about 5000 ft.; width, from about 10 ft. to about 1500 ft.; thickness, from about 1 ft. to about 80 ft. The bottom varies in different mines, according to the locality, from a few feet to about 250 ft. below the surface.

The chief metallic constituents—sphalerite, iron sulphide, and galena—occur disseminated and in veins in Trenton and Galena limestone and dolomite, and at times constitute by weight as much as 15 to 20% of the total. The mixed ore and rock as broken in the mine and hoisted into the mill is known as "dirt."

The general practice is to cull out of the dirt as broken whatever barren or dead pieces may be conveniently thrown out. This is done either underground where the waste is piled up or "gobbed," or just before the dirt enters the mill, when it is thrown from a grizzly into the boulder pile. The amount of broken rock discarded runs up to 60 or 70% in the former case, and up to about 20% in the latter.

Two products result from the milling practices, a galena concentrate, which usually averages between 70 and 80% lead, and a sphalerite-iron-sulphide concentrate running between 20 and 60% zinc. The average grade of zinc concentrates for Wisconsin is now between 35 and 38%.

A planimeter computation made from several mine maps showed that approximately 10% of the volume of crude ore (ore and country rock in place) in a deposit is left in the mine as pillars and not recovered. Figures for mill recovery as far as they are at present available, show that of the metallic zinc that enters the mill in the "mill dirt" about 70 to 75% is saved in the concentrates. Of the metallic iron that goes through the mill, the saving varies from about 30 to 50%.

Exploratory Practice

The most efficient companies do just sufficient drilling to assure themselves that the orebody is large and rich enough to justify the necessary expenditure for development and equipment. Even this practice is far from general. Churn drills alone are used, and when ore is first struck, average samples of the cuttings are taken about every 2 ft. These samples are either assayed indi-

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Note—This article is taken from a treatise entitled "A Study of Methods of Mine Valuation and Assessment, with Especial Reference to the Zinc Mines of Southwestern Wisconsin," by W. L. Uglow, which is to be published as Bulletin No. 41, Economic Series 18, of the Wisconsin Geological and Natural History Survey. It has been communicated to us in advance of publication by the courtesy of W. O. Hotchkiss, State Geologist of Wisconsin.

vidually for zinc, iron and lead, or a composite sample of every 2 ft. of cutting from the time ore is first struck until it is lost, is made for each hole. Considerable inaccuracies occur in the estimation of ore reserves from these assays, due in large part to: (*a*) Natural breaks or openings in the rocks which carry away a part of the cuttings; (*b*) the degree of fineness of the disseminated pyrites; (*c*) and whether or not the drill cuts perpendicularly or obliquely across a vein. Many of the smaller companies, of which there are a large number, do practically no exploratory drilling and have little or no reserve blocked out in advance of working breasts.

It is interesting to note that during each of the last five years the ratio of lead to zinc concentrates for the whole district has remained remarkably uniform, varying from 1.83% to 2.02%, the average for the five years being 1.91%.

Through the kindness of the Vinegar Hill Zinc Co., the Mineral Point Zinc Co., the Wisconsin Zinc Co., the Cleveland Mining Co., and the Field Mining & Milling Co., complete cost and production details of the following properties were made available for the purpose of constructing therefrom an average life history of one of the large zinc mines. Other companies also kindly volunteered their data, but owing to the lack of a few important details, it was considered inadvisable to include their mines in the composite. The following mines have been included: Vinegar Hill Mine (Day's Siding, Ill.); Ellsworth-Rundell Mine (Livingston, Wis.); Kennedy Mine (Hazel Green, Wis.); Fox Mine (Strawbridge, Wis.); East End Mine (Platteville, Wis.); Winskell Mine (New Diggings, Wis.); Cleveland Mine (Hazel Green, Wis.); Crawhall Mine (New Diggings, Wis.).

From the data thus available, the figures appearing in Column I, Table 1, have been obtained. The figures for annual tonnage of dirt hoisted, grades or dirt and concentrates, and costs per ton of dirt and per ton of concentrates, represent the weighted averages for all the eight mines taken together. In Columns II to V, this set of figures is split up over a period of four years in such a way that the weighted averages for the four years are equivalent to the figures of Column I. The average annual spelter prices are assumed, and on them and on information obtained in the district, the prices of the various grades of zinc ore are based.

TABLE I. WISCONSIN ZINC-MINING PRACTICE

Item	I 4 Years Weighted Average	II 1st Year Average Figures	III 2nd Year Average Figures	IV 3d Year Average Figures	V 4th Year Average Figures
Tons dirt hoisted (total)......	300,000				
Tons dirt hoisted (per year... . . .	75,000	60,000	70,000	80,000	90,000
Grade of dirt	8.62	10.25	8.50	8.20	8.06
Percentage ratio, Pbs to total concentrates	1.96	1.96	1.96	1.96	1.96
Tons ZnS concentrates	25,352.4	6,030	5,833	6,131.4	7,059
Tons Pbs concentrates	506.6	120	117	128 6	141
Grade ZnS concentrates	38.7	12 5	44.0	38 4	31.3
Price of spelter......	. . .	5 70	5.40	5.00	5.50
Sale price of ZnS concentrates...	. . . .	$21 27	$24 10	$17.90	$15.50
Sale price of PbS concentrates...	.	$56 00	$51.00	$46.25	$51.80
Operating cost* per ton of dirt.....	$1.266	$1.350	$1.300	$1.260	$1.190
Operating cost per ton of concentrates. .	$14.70		.	.	
Cost of preliminary exploration, sinking, development and equipment......	$30,000				
Salvage value..	$1,500				

*Operating cost signifies the actual mining, milling and other expense essential to getting the ore ready for the market No charges are included for interest, royalty or amortization

The data in Table I have been recast into a series of annual totals for receipts, costs, and profits, as given in Table II

TABLE II

Year	I Gross Receipts	II Royalty (10%)	III Cost, Including Amortization of Capital ($28,500)	IV Net Profits* Col. I - Col. III	V Cost No Amortization Charge Included	VI Operating Profits** Col. I - Col. V
1	$153,200	$15,320	$87,710	$65,490	$81,000	$72,200
2	146,570	14,657	97,710	48,860	91,000	55,570
3	121,050	12 105	107,510	13,540	100,800	20,250
4	116,570	11,657	113,810	2,760	107,100	9,470

* See Part II, Chapter III, page 67, for method of determination.

** Operating profits are the difference between receipts and operating cost, as the latter is defined in the foot note, page 20.

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Park City Mills

SPECIAL CORRESPONDENCE

The new custom mill at Park City, Utah, began operation Oct. 1, treating ore from the American Flag mine. A company was recently incorporated by Salt Lake men as the Park City Mills, to treat siliceous silver-gold-lead-copper ores. The process to be used includes a chloridizing roast and leaching, similar to that used at the Knight mill at Silver City and also to that employed by the Mines Operating Co. at Park City. The precious metals are converted into chlorides, which are soluble in the chlorides of the base metals and in brine. The process consists of four steps: Crushing and grinding, chloridizing roasting, leaching the roasted ore with concentrated brine solution, and precipitating the dissolved metals.

PARK CITY MILLS, FORMERLY GRASSELLI CHEMICAL CO.'S ZINC MILL

The Grasselli zinc plant was taken over early in the year, and the work of remodeling started Apr. 15. The crushing machinery was received in June and was installed by the middle of July. The Knight-Christensen roaster was received in August, but was not completely installed until the latter part of September.

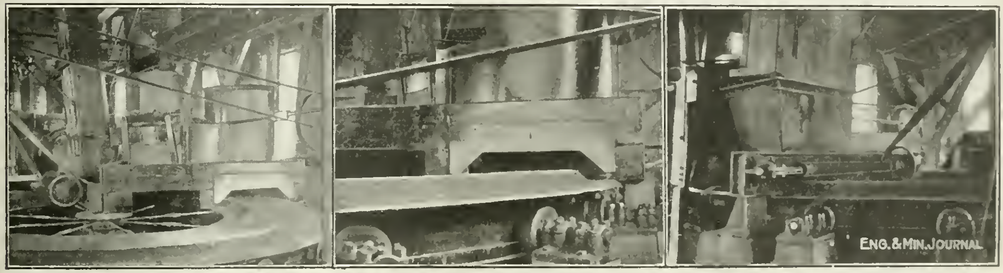
The mill has been designed to treat 50 tons daily, but can treat more without additional roasting capacity. The ore passes over a 1-in. grizzly to the crusher. Ninety per cent. of the American Flag ore passes through the grizzly. The crusher is a swinging-jaw Blake type, 7x10 in., and crushes to about 2 in. Traylor 30x14-in. rolls reduce the ore to about 1/4 in. Tests show that this size gives as good an extraction as if ground finer.

The ore is mixed with 9% of salt, 2% of pyrite and 1% of coal dust before being fed to the Knight-Christensen roaster. About 10% moisture is left in the mixture

The Knight-Christensen roaster is 17 ft. in diameter (as compared to 36 ft. in diameter at Silver City) and consists of a circular revolving hearth, or grate, which is about 2 ft. wide. This grate is made up of 32 plates with fine slots approximately 1½x¼ in. The roasting width, or slotted part of the grate is 2 ft., and the whole grate 3 ft. wide. The furnace makes one revolution in 45 min., the ore remaining under the firebox for 1½ min. Crude oil is burned, and a suction or down draft used. The charge keeps on burning all the way around, and goes into the concrete bins red hot. In roasting, some of the fines passes through the grate, and this is shoveled out every few days. The grate is revolved once for a complete roast, and the ore taken off by a worm. The bed of ore, or charge, has been tested from 2 in. to 8 in. deep, but as far as determined, about 6 in. has been found to give the best results.

The roasted ore in the concrete bins is dumped into cars and transferred hot to the leaching tanks. There are three 60-ton ore tanks and three solution tanks. The ore remains in the tanks 24 hr. and is leached with a salt solution, containing chlorides of the base metals, which dissolves the silver and gold. The solution is run over scrap iron to precipitate the copper, silver, gold and lead. Later, copper will first be used to precipitate the gold and silver. The tailings from the ore tanks are discharged on a traveling belt and are stacked.

A saving of 92% of the silver, 90% of the gold, 90% of the lead, and 75% of the copper has been indicated by laboratory tests. It is expected that in practice a saving of at least 90% will be reached.



THE KNIGHT-CHRISTENSEN ROASTER

General view Firebox and ore bed Discharge end, showing feed box

The estimated operating costs on a basis of 50 tons daily are: Roasting, $0.35; supplies, $1.15; labor, $1; interest, depreciation, insurance and administration, $1; or total, $3.50. These are outside figures, and will probably be reduced. Tests made by the Mines Operating Co. on American Flag ore showed an extraction of over 90%. It was estimated by the Mines Operating Co. that the costs would amount to about $2.50 a ton in a modern 50-ton plant. This is exclusive of the cost of marketing, which would be about 5% of the gross value of the product if sold to the local smelteries.

The Park City Mills has made arrangements to treat American Flag ores, which are sufficient in quantity to keep the mill busy for some time. Other custom ores at Park City will probably be treated. The company is capitalized at 150,000 shares of a par value $1, of which 50,000 shares remain in the treasury. The metallurgical work has been under the direction of George H. Seibird, general manager. F. V. Bodfish is president of the company.

⁂

Production of Selenium in 1913 in the United States is reported by the Geological Survey as 29,097 lb., valued at $46,900. It is produced by most of the electrolytic copper refineries from anode slimes. The demand, however, is much less than the possible output of electrolytic refineries. A small quantity of tellurium was produced at the Raritan Copper Works of the Anaconda Copper Mining Co. and shipped to Europe.

Silicidized Carbon--Silfrax*

When solid carbon is acted upon by vapors of silica or silicon there is formed a silicon-carbide product of the same shape as the original carbon but differing from carborundum in essential characteristics. To distinguish this form of silicidized carbon commercially, it has been given the name "silfrax." The properties and characteristics of the product vary with the temperature of formation. If the carbon article is heated in the amorphous zone of a carborundum furnace, the temperature range of this zone being 1550 to 1820°, the product is amorphous in appearance, showing no crystals except under high magnification. It has a yellow color and a lusterless fracture. If the carbon is heated in the crystalline zone of the furnace, the temperature of this zone ranging from 1820 to 2220°, the material is of great density and plainly crystalline. Upon fracture it shows a steel-black color and a metallic luster.

The commercial applications of silfrax are as refractory materials, electric-heating elements and chemical ware. It has all the chemical and heat-resisting properties of carborundum and in addition great density and toughness. Heretofore the articles produced have been of small size. Pyrometer tubes are now made 24 in. in length, and by special furnace construction it will be possible to make much larger articles for refractory vessels and chemical apparatus. It has not yet been determined whether the material can be produced of sufficient density to be used as acid-evaporating vessels, for which its very low coefficient of expansion and high thermal conductivity specially adapt it.

⁂

Nitride of Iron

Iron nitride (Fe_2N), obtained by heating finely divided iron in a rapid current of ammonia at 650° to 700° C., is completely decomposed when heated in nitrogen above 600° C., even at pressures as high as 18 atmospheres, according to Charpy and Bonnerot (*Comptes rendus*, 1914, p. 994). Below 600° C. only about half the nitrogen is expelled, which suggests the existence of a more stable nitride, Fe_4N. Iron does not combine directly with nitrogen even at pressures of 18 atmospheres. Having regard to its properties, iron nitride probably does not exist in metallurgical products; the nitrogen often found in iron may either be occluded or combined with some other element than iron.

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*Excerpts from a paper by F. J. Tone read at the Niagara Falls meeting of the American Electrochemical Society.

Underhand Square Setting for Finishing Stopes*

SYNOPSIS—Overhand stopes at Broken Hill South mine, New South Wales, are stopped 30 ft. below old filled stopes and the top section taken out by underhand stoping with square sets. A winze enlarged for starting. Ore removed in transverse slices. Timber sets and bottom of fill caught up by spiles and booms. Certain sequence in taking out sets and slices. Precautions necessary. Filling keeps pace with extraction. Pillars may be left. Former careless mining makes difficulty.

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It is customary practice at the Broken Hill South mine in New South Wales to mine by overhand methods, using either the open-stope system or the square-set system with subsequent filling. When such a stope approaches an old filled stope, it is stopped about 30 ft. below, and this 30-ft. section is removed by underhand stoping methods and square setting. This operation is called "picking up bottoms." It consists of taking out a series of vertical slices, whereas the overhand stoping involves a removal of the ore in horizontal slices. The relation of the two methods is exhibited diagrammatically in Figs. 1 and 2. The object of this vertical slicing is to have exposed only a small section of back under the old filled stope; while the extent of the back is limited, however, the fact that the slice is 30 ft. deep results in capacity and reasonable economy.

FINISHING THE UNDERHAND STOPE

The last horizontal slice taken off on the overhand principle is somewhat thin and designed to allow room for standing a floor of square sets which are then completely filled. An open gangway is left, however, from a chute and ladder-road connecting to the level below to a winze from the level above. The square-set floor gives a feeling of security to the miners, serves as an excellent foundation for the square-set timbers of the subsequent underhand-stoping operations, and closes the stope with a level back so that the section left has a uniform thickness, and its lower floor is available for tramming purposes.

The thickness of the remaining section is measured, and the number and dimensions of the sets to be used in extracting it are decided upon. It is customary to use four sets with posts of 7 ft. 2 in. in the clear, which gives a little clearance under the bottom of the filled area above for booms and spiling. When it is necessary to vary this dimension of 7 ft. 2 in., the top set is made shorter, or possibly longer, rather than the bottom set where headroom is more necessary.

ENLARGING WINZE FROM UPPER LEVEL

The first operation consists of enlarging some winze which has been previously sunk from the level above and has communication with an open gangway through the filling in and above such level. This winze must be enlarged to take two square sets, one for a filling chute and the other for a ladderway. It will then serve as a starting point for the underhand stoping. In this mine the winzes are all 5x6-ft. openings in solid ground. The first operation of enlarging consists of catching up the timbers of the gangway through the fill on the level above. This is done by supporting with booms the caps of the sets which will be undermined, the booms themselves being held under the caps of sets farther back. A common way of doing this is illustrated in Fig. 3. Another method is shown in Fig. 4, in which a single boom is stood in the middle of the gangway. The posts of such booms must be well "spragged" against the sides of the drift. With these sets caught up, the winze may be enlarged in three ways.

In self-supporting ground the sides of the winze may be stripped by drilling down holes; when the enlargement has been carried through to the gangway of the filled square-set floor 30 ft. below, timber is built up from this floor, and the timbers of the gangway above till then supported on booms, are caught up and blocked. This method is shown in Fig. 5.

When the ground is not strong enough to stand unsupported for a height of 30 ft., the sets are carried down from the level above by hanging, as shown in Fig. 6.

Finally, the winze may be enlarged by raising from the lower gangway and carrying up the timber as work proceeds. This involves the blasting out of the timber already set, but is a convenient method for the miners. Fig. 7 illustrates the procedure.

BEGINNING OF UNDERHAND STOPING

After the winze has been opened and timbered, the method of carrying on the underhand stoping is most typically described for a lode about 60 ft. in width. The first operation consists of taking out a block of ground opposite to the top set of the winze and working toward one of the walls. Fig. 8 shows this operation taking place toward the hanging wall. This operation would undermine one of the sets of the upper gangway, which must therefore be caught up with a boom, as shown at *S*. The ground is extracted by drilling short holes with light burdens. A new set is stood in the excavation and caught up with a boom from the winze set as shown in Figs. 8 and 9. A 6x10-in. crosspiece *A* supports the two caps and is itself supported by the boom *B*, which rests on a post *C*, with its other end caught under the winze timber at *D*. The two legs *F* are supported by the two caps *E* and themselves support two lower caps *G*. For this purpose there are used iron dogs of ⅝-in. square iron, 15 in. long, with 1-in. points on them as at *K*. Such dogs are useful for closing up the joints as well as for suspending the timbers.

After this set has been well blocked, the piece of ground below is taken out, another set suspended and blocked, and the operation continued until the top of a buried set on the filled square-set slice is reached. Unless the last suspended set fits exactly, it is supported on the buried set by means of blocking, and the top set being now supported from below, the boom can be removed. The stope now looks as shown in Fig. 10.

Another section of ground, *BCDE* of Fig. 10, is taken out in a similar manner, and this operation is repeated

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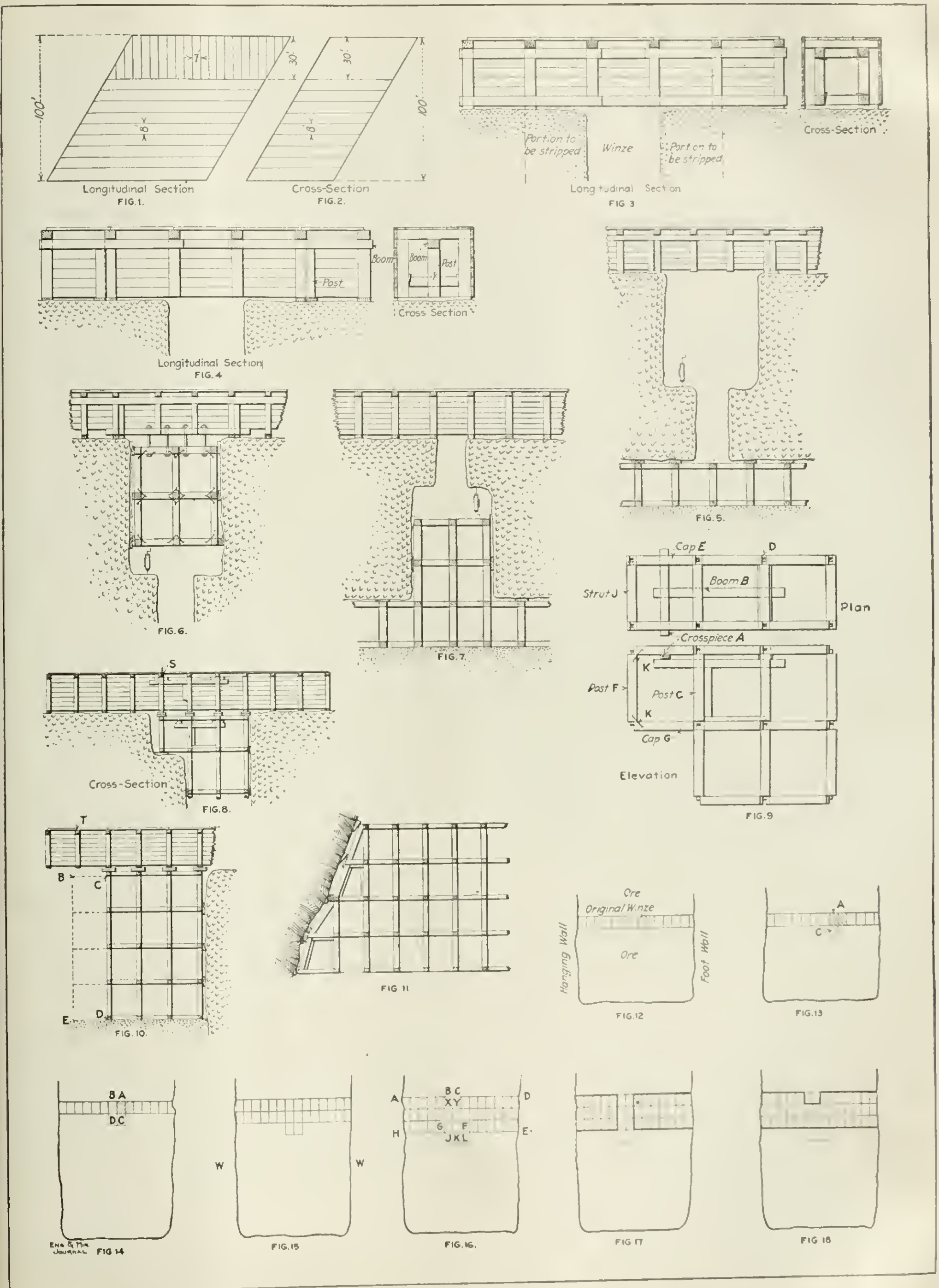
*An abstract of an article by Andrew Fairweather in the Proceedings of the Australasian Institute of Mining Engineers, No. 13, 1914.



Figs. 1 to 18. Illustrating Enlarging of Winze and Removal of Successive Slices until the hanging wall is reached. At this point angle timbers usually have to be employed, and the completed stope will appear as shown in Fig. 11. Especially good blocking is necessary against the hanging wall. The miners now return to the winze and take out a slice toward the foot wall in a similar manner; so that finally a slice 60 ft. long, 30 ft. deep and 6 ft. wide will have been removed, and the stope will appear in plan as shown in Fig. 12.

Successive Slices

The original winze from which this work takes place will have been chosen, as near as possible, about 40 or 50 ft. from the end of the orebody. The next operation consists of taking out what is called a "leading" set, marked *C*, in Fig. 13. Whereas the slice just removed was under an open gangway on the upper level, subsequent slices will be largely under old filled stope bottoms. If these bottoms consist, as they should, of 14-ft. timbers, 4x10 in., with joints broken, the operation is not difficult. The ground is removed by careful drilling and blasting, and the timbers of the bottom are caught up with a boom held under a cap in set *A*. This boom is edged forward as new timbers are exposed until sufficient area at the top for the set *C* is opened out: the excavation is then continued down until enough ground has been removed to accommodate the entire set *C*. The ground under *C* is next removed and successive sets installed. In the next step the ground to one side of the block *C* is excavated as, for instance, *D*, Fig. 14. As before, the bottom timbers must be picked up with booms which may be extended from either set *C* or set *B*, being open on two sides, and being more conveniently got at, this block is more cheaply removed. The slice is extracted toward one wall and usually a second party of miners is put in to work toward the other wall from the block C, thus doubling the output from the stope and decreasing the time for which the sets must remain unfilled. The first party of miners will complete their work before the second and will then return and take out a leading set on a new slice so that faces are available for two parties again, and the stope appears in plan as shown in Fig. 15. This third slice is removed in a similar fashion and the fourth slice is started. At this point the stope will appear as in Fig. 16.

Filling

The three completed slices are now to be filled. Since, however, communication must be kept open, the sets *XY* are not filled at all, and at the bottom and top floors the double-set gangway is left open between *XY* and *JK*. Thus, in Fig. 17, the heavy lines surround the areas which are filled on the top and bottom levels; while in Fig. 18, the heavy lines indicate the outline of the filling on the two middle floors. A longitudinal section through the original winze would show the stope as in Fig. 19. The filling is held in the set by 2x10-in. Oregon pine planks, spiked horizontally inside the posts. It may happen that the work has disclosed new ladderways and chutes, so that it is not necessary to keep open the gangways shown in Figs. 17, 18 and 19.

Whereas in filling most of the material will run by gravity, the last 4 or 5 ft. requires handling with a shovel and is somewhat expensive, since the stope must be solidly packed to the caps of the top set. When removing ground next to filled sets, great care is necessary not to cut out the spragging of the filling by material from the blast. For this reason, old sollar or other timber is wedged between the caps against the 2x10-in. lagging. If the filling has to stand for a long time and takes considerable pressure, the posts may be strengthened against breaking by tying into the filling behind them, as shown in Fig. 20; bolts or fencing wire are used for this purpose. If the blocking is good between the pillar and the filling, the sets of the latter may remain sound until the pillar is worked; when it comes time to work, however, the tie rods are of great service for keeping the posts in position. To provide good blocking, the small space between the pillar and the filled block is filled with tailings.

The ore as mined is handled on the bottom floor of the underhand stope, shovels being used as far as possible; while cars on a 15-in. gage track are used where some distance must be covered. As new chutes are exposed, the old chutes are abandoned unless they are so situated as to be of service in future mining of some pillars, in which case they may be left open.

Finishing the Stope

Referring to Fig. 16, the fourth slice will be completed by the miners as the previous three slices were extracted and mining continued to the end of the stope. As mining proceeds, filling is continued, blocks of three slices usually being filled at one time, although blocks of two slices may be filled if the timber shows signs of weight. While the end of the stope is being filled, the miners return to *X* and *Y*, open out in the other direction and remove slices in the same manner as described. This is shown in Fig. 21. The process is continued until the other end of the orebody is reached, when everything is securely filled. When a new gangway is reached, the old gangway itself is filled as shown in Fig. 22. Thus, while slicing is going on from *CD* to *AB*, the central gangway shown is kept open, but when *AB* is reached, the new gangway to the right is used for communication and the longitudinal gangway in the filled ground is itself filled.

Catching Up Poor Bottoms

Usually, the operation is not so simple as has just been described. For one thing, the bottoms of the old filled stopes do not usually consist of long timbers well laid; they may be light timbers, may have rotted or may be a jumbled mass of waste and some blocking. In such case, the bottoms must be caught up by spiling and booming. When rocks are encountered, these must be blasted out as lightly as possible, as there is always danger from a run of filling from the old workings. Under these conditions, it is a rule that the miners must cover their top floor with sollars and lag up two adjacent posts half way; then if a run does occur, it is stopped short before extending over all four floors. Figs. 23, 24 and 25 illustrate the principle of this. In this difficult work of spiling, more trouble is encountered with the leading sets than with the others in any one slice, for the reason that the others can be attacked from two sides.

Precautions against Runs of Filling

A further precaution against runs of filling consists of always keeping the top floor at least one set in advance of the lower floors in either direction. This arrange-

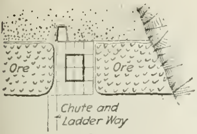


FIG. 19.

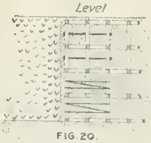
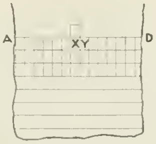
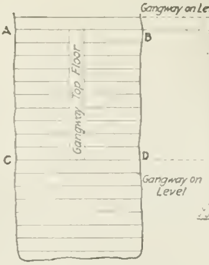


FIG. 20.



Plan
FIG. 21.



Plan
FIG. 22.

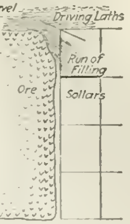


FIG. 23.

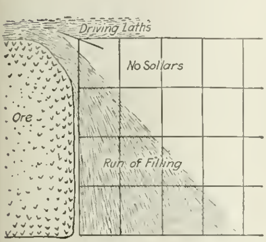


FIG. 24.

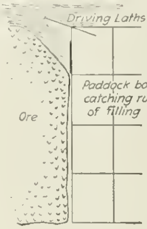
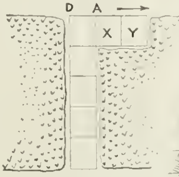
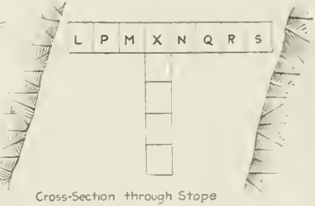


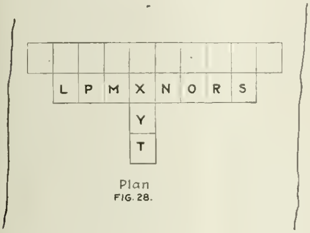
FIG. 25.



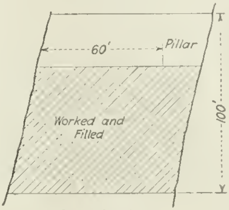
Longitudinal Section through Stope
FIG. 26.



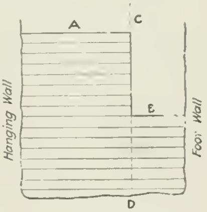
Cross-Section through Stope
FIG. 27.



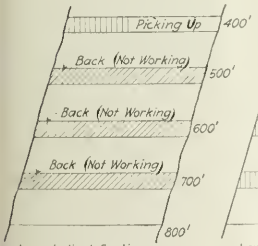
Plan
FIG. 28.



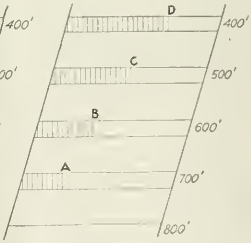
Cross Section
FIG. 29.



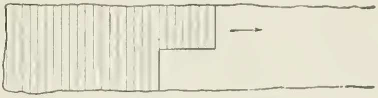
Plan of Slices
FIG. 30.



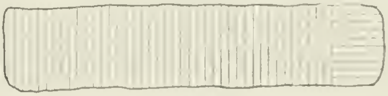
Longitudinal Section
FIG. 31.



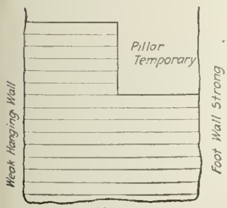
Longitudinal Section
FIG. 32.



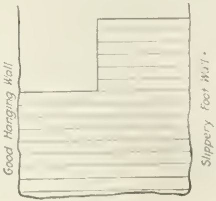
Plan
FIG. 33.



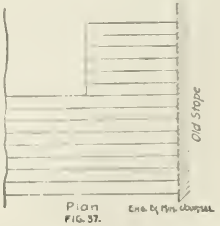
Plan
FIG. 34.



Plan
FIG. 35.



Plan
FIG. 36.



Plan
FIG. 37.

FIGS. 19 TO 37. ILLUSTRATING PRECAUTIONS TAKEN IN REGARD TO FILLING, QUESTIONS OF PILLARS AND RELATIONS OF LEVELS ment is illustrated in Figs. 26, 27 and 28. Thus, in Fig. 26, instead of carrying down the block of ground under *X*, room for set *Y* is first made. Then sets *M* and *N*, in Figs. 27 and 28, are extracted, when *X* may be carried down another floor. The order of extraction would then be *P*, the block under *M*, *L*, the block under *P*, *Q*, the block under *N*, *R*, the block under *Q*, *S*, the block under *R*, etc. This slice completed, a new leading set *T*, Fig. 28, is put in before *Y* is carried down. The advantage of this is that such a set as *Y* is always on solid ground while *X* is being undermined, and helps to support the timbers of *X*, and at the same time a filling run of any great size is prevented.

Drilling in this work is always done with small steel and light machines, and blasting is made as light as possible. Sullivan 2½-in. piston drills have proved efficient, but a hammer drill for putting in a horizontal hole should find an excellent field here.

THE USE OF PILLARS

The length of the slices in this work is limited to 60 ft., approximately. With longer slices, before a block is completed and ready for filling, the timber will have taken such weight as either to fail or become distorted. Consequently, where the lode is more than 60 ft. wide, the slice is stopped at that length and a pillar of solid ground is left for future working as shown in Fig. 29; this pillar is to be extracted as soon as possible, but kept behind the working face by an interval of 50 or 60 ft., as shown in Fig. 30, where faces *A* and *B* advance at about the same rate. It will be seen from this that the sectional area of exposed back is reduced from what it would be if the face *A* were carried clear to the foot wall; whereas at the same time the face *B* is kept near enough to *A* so that a long unsupported space along the line *CD* does not occur.

CONFUSION BECAUSE OF PREVIOUS POOR MINING

Before this operation of picking up is conducted on any level, it is necessary that the stopes above be completely exploited. Subsidence is sure to occur and in upper levels gangways would be closed, grades destroyed and working rendered expensive or impossible. Furthermore, any trouble in a lower stope upon which picking-up work is going on would probably run through to an upper stope; a big run of filling, for instance, could easily cause a collapse of the sets in the upper stopes.

Due to irregular and erratic working in the past, this rule cannot be followed except at considerable expense. The cheapest ore of upper workings having been extracted, the expensive "fag ends" were left to accumulate and their extraction now requires considerable heavy preparatory expense. Furthermore, they are situated high in the upcast air where work is difficult and is carried on only at low efficiency. The greatest difficulty is met with in the fact that the lower stopes must wait on those above, which results in a considerable curtailment of output and means continuous repairs in keeping the lower workings open. Thus, in Fig. 31 the work on three lower levels is shown held up by that above the 500 level.

It is not necessary, however, to wait for the completion of the work on the 500 slice before the 600 slice is attacked. Thus, in Fig. 32, work is shown begun in the lower levels, but kept behind the work on the upper level.

GENERAL DIRECTION OF WORKINGS

The picking-up operation in any one stope should be carried on toward the chute through which filling material is to be delivered; so that the openings through which this material is moved horizontally are always in solid ground and in good repair. Thus, in Fig. 33, it is shown that a pillar is left on the side nearest the filling chute, while the advanced stage is kept on the side farthest therefrom.

This picking-up stoping should be carried on toward the main haulage shaft, so that the outlying stopes may not be cut off by subsidence. This, of course, would not apply where all the stopes are served by a drift in the country rock, which is not liable to become closed.

DIRECTION OF SLICES

The long dimension of any slice should be parallel with the short axis of the stope. That is to say, in an ordinary oreshoot, the width of the lode being less than its length, the slices run parallel with the width and are, in effect, crosscuts. If, for any reason, the dimension of the oreshoot parallel to the strike is less than its dimension across the strike, slices are run parallel to the strike. The main reason for this is that the hanging wall usually runs parallel to the long axis, and the crosscut system meets it on a short span only, so that no great length of hanging is left unsupported between filling operations. Furthermore, when the slices run parallel to the shorter axis, the effect, due to the cutting through of the ground, is less pronounced. Thus, when a stope arrives near the end of the orebody, the direction of the slices is turned 90 deg., and the end taken out as exhibited diagrammatically in Fig. 34.

When it is necessary to leave pillars, the weaker side should be worked first and the stronger side left as the pillar. The strength of the side will depend on the nature of the ore, strength of the adjacent wall, and the distance from old stopes. Where the hanging wall is weak, therefore, the hanging side will be worked first, as shown in Fig. 35. Where the hanging wall is strong, or there is no hanging wall, while the foot wall is slippery, the pillar is left on the hanging side, as shown in Fig. 36.

Where work is being prosecuted next to an old stope, the latter should be met by the ends of the slices. Where the ground is too wide for a single space, the pillars should be left on the side away from the old stope, as in Fig. 37. In actual mining, conditions are so various that a compromise between these various requirements is often necessary.

※

Sulphur Dioxide Production

A method of producing pure sulphur dioxide is outlined in a recent patent of H. K. Moore and R. B. Wolf (U. S. pat. 1,091,689). Combustion products containing sulphur dioxide are passed through a solution of calcium chloride or other solvent, cooled to about 32° F., and the sulphur dioxide is subsequently extracted from the refrigerated solution and liquefied, *in vacuo*. The solvent is preferably circulated continuously from an absorbing chamber to a vacuum chamber, and *vice versa*.

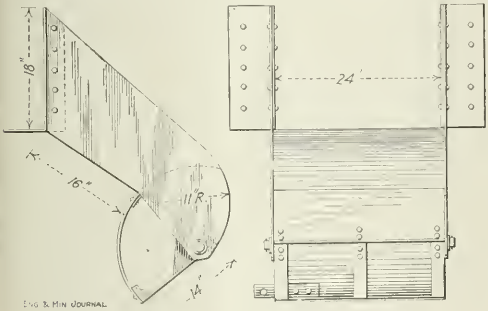
Details of Practical Mining

Ore Chute and Gate

By J. R. Thoenen*

The accompanying sketch shows the front and side views of an ore chute for use where the bin supplies mixed fine and coarse ore. The chute proper is made of one piece of ¼-in. steel plate, with bottom extending 6 in. into the bin to protect it from wear of running ore. Two wing plates of ¼-in. steel are riveted on the vertical sides to protect the sides of the chute, and for the same purpose, a piece of angle steel may be placed on top of the opening. In this instance, the bottom of chute is 16 in. long, but may be altered to suit the existing arrangement of timbers.

The gate is hung on a 1½-in. round-iron axle supported in holes bored through the sides of the chute. The sketch shows the chute open and the gate down. The gate itself forms the lip of the chute. A timber is placed under the gate, so that when open, the gate rests upon it and is flush with the bottom of the chute. The gate is worked by a short detachable lever (not shown), which is rounded at one end to fit in the hole in the short piece riveted to the bottom of chute gate. A hole through a lever, which fits over the end of the axle, forms the fulcrum. Washers and pins are provided to keep the axle in place.



Ore Chute and Gate

The gate is made of two pieces of ¼-in. steel plate, one bent in the arc of a circle of 1 ft. radius, the other flat with one edge turned over 2 in. at a little less than a right angle. These two plates are riveted together with countersunk rivets. The gate bearing for the axle is provided by a small web piece riveted at each end to the upper plate and lower brace. Three ¼x2-in. braces support the under side of the gate.

When the gate is well centered, so that the arc forms a true circle with the center of the axle as its center, there is practically no trouble with fines causing the gate to stick.

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*Mining engineer, Garson, Ont.

Accuracy of Stadia Surveying

By L. Hall Goodwin*

The results of several important boundary surveys done by the stadia have been published, which indicate a high degree of accuracy for that method when carefully applied to long surveys. The reason for this is that with proper determination of instrument constants and careful work in the field, all of the errors are balancing, and in accordance with the accepted theory of errors the percentage deviation in a survey actually approaches zero as the number of observations, that is, the length of the survey, increases. In looking up the subject, however, I was unable to find concise data concerning the accuracy of this method in shorter surveys, such as would be used in running traverses from which to tie in surface detail; therefore the summary in the accompanying table and a discussion of the results obtained in running 19 short traverses for that purpose may be of interest.

The object of this survey involving these traverses was to plot a large amount of surface detail on an old map, the ground already being laid out by long traverses with permanent iron-pin monuments which had been located by taped surveys. All of these traverses had been closed and balanced and were precise, but many new and shorter traverses had to be run in order to reach all points. The method employed in this new survey was to take azimuth and position from two of the iron pins, and then run a stadia traverse which would most advantageously cover the ground, either closing on the two original stations or on any other two of the old survey. Either case gave the closing error of the traverse, as all traverses were computed and plotted by coördinates; furthermore, those traverses run between different iron pins had to check results obtained by careful taping.

SUMMARY OF THE RESULTS OF NINETEEN STADIA TRAVERSES

No. of Traverse	Latitude: Numerical Total	Latitude: Closing Error in Feet	Departure: Numerical Total	Departure: Closing Error in Feet	Distance: Total	Distance: Closing Error in Feet	Distance: Closing Error in 1000
1	2759	0.5	1195	0.1	3245	0.5	0.2
2	1030	0.3	929	0.1	1745	0.3	0.2
3	11074	1.9	2286	3.1	11780	3.6	0.3
4	1841	1.6	2838	0.3	3771	1.6	0.4
5	1014	0.6	2068	1.1	2109	1.3	0.5
6	1480	1.9	2430	0.5	3164	1.9	0.6
7	1246	1.0	2622	1.7	5650	4.3	0.8
8	2660	2.4	1290	0.9	3315	2.6	0.8
9	904	0.9	1037	1.1	1668	1.4	0.8
10	3860	1.3	2887	1.3	5097	4.5	0.9
11	1560	0.2	1618	4.5	4833	4.5	0.9
12	904	0.8	754	0.5	1025	0.9	0.9
13	1655	0.7	1079	2.1	2431	2.1	1.0
14	1294	1.1	1763	2.0	2309	2.3	1.0
15	765	1.7	1669	2.0	2027	2.5	1.2
16	1677	0.6	1457	3.2	2692	3.3	1.2
17	2777	2.2	1706	4.2	3429	4.8	1.4
18	876	1.6	858	1.7	1711	2.6	1.5
19	1570	3.1	2380	3.2	2595	4.4	1.7

In the accompanying table these traverses are arranged according to the decreasing precision of their results, and the results are summarized by giving the total numerical sums of latitudes, departures, and distances, and the corresponding errors in those factors. This arrangement was given to show that the results do not seem logical in many cases; for instance, in traverse No. 3, the apparent error in departures was much greater than that in latitudes, although the ratio of those two factors themselves would suggest that the reverse should be true; this is simply because the errors in latitudes happened to be balancing to a greater extent than those in departures.

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*Mining engineer, 3 [illegible] St., Allston [illegible], Mass.

When traverses are closed as these were, any large error in reading angles will be disclosed, and the small errors of fractions of a minute will largely balance each other, and in no case will they result in deviations comparable to those introduced by the stadia readings. Therefore, the accuracy obtained depends on the reading of the stadia rod and the application of the law of averages. The latter will take care of itself; the error in reading the stadia will increase as the distance increases, but not in direct proportion.

It was found that with the instrument used on this work, under ordinary conditions of light and wind, distances ranging up to 700 ft. could be read directly with a precision of 1 ft., but for longer distances the error increased rapidly, so that, in general, direct readings of a 1000-ft. course were not trusted. In reading courses over 700 ft. in length the transit was set roughly half-way between the two stations, the distance read to each station and the two results added to obtain the length of the course.

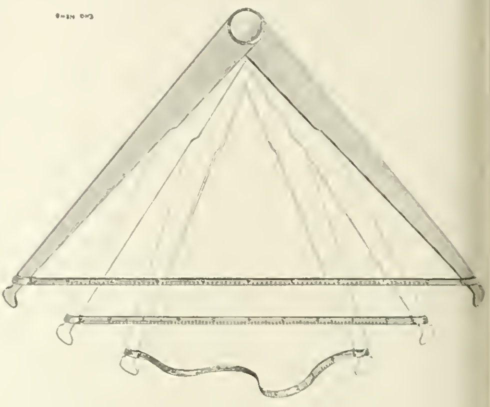
For this purpose the transit need not be set accurately on line. For longer courses two or more intermediate set-ups were made. All distances were read at least twice—once when the station was set, again when the rodman was giving a backsight for angle reading. It is far better to take several fairly careful readings of the rod and average those readings, than to rely on one reading which is thought to be particularly accurate because of special care in taking it. The several readings for each course were added and averaged, but were weighted by the surveyor as he thought they should be; tenths of feet were carried in the averaged results, although no attempt was made to read the rod closer than one-half foot.

It is my opinion that the stadia method, when used with proper care and with proper attention to small details, offers a means of rapid surveying which may be also highly accurate. In fact, for many classes of work it can be made more accurate than careless tape surveying, and for a given survey piece the time consumed in doing the most careful stadia work is less than that consumed in the most careless taping. Traverse No. 7, for instance, was run along the side of a steep bluff over numerous small gulches, where if taping had been used a large amount of time would necessarily have been consumed in securing anything like the accuracy of 8 parts in 10,000 which was so easily obtained by stadia. The 19 traverses summarized were not selected from a longer list, but represent practically all that were run in this survey; it will be noticed that 14 of them, or about three-quarters of the total, had an apparent precision of one part in 1000 or better; the stadia method when used in this class of work is usually credited with a precision of about one part in 500.

The good results obtained in this work, if they may be called good, were largely due to the practice of limiting to about 700 ft. the length of single sights upon which dependence was put and taking at least two readings of each distance.

Ingenious Proportional Scale

A device for measuring or transferring dimensions, worked out by F. J. Winters, is described in *Engineering News*. As shown, it consists of a piece of narrow elastic webbing stretched between the points of a pair of firm-joint straight-leg calipers. A scale inked on the webbing can be stretched or shortened as desired by changing the spread of the calipers. The device is particularly useful in picking the scale from a drawing on which it is not specified but on which some specific dimension is shown. It should be available in mining where work has to be transferred from old maps, a frequent chore in Mexico.



PROPORTIONAL SCALE OF HAT TAPE AND CALIPERS

The elastic band is simply elastic hat tape about $\frac{1}{16}$ in. wide. The markings must be made with a fine brush on the stretched tape; a pen pulls the tape out of line. Since the tape tends to lose its quality of uniform stretch, it should be replaced about every three or four months.

⁂

Ventilating Pipes

A useful novelty in ventilating equipment, especially adapted to the wide connecting drives, raises and winzes of the district, is described by H. Bottomly of the Boksburg Inspectorate, Transvaal, in the Annual Report of the Department of Mines and Industries of South Africa. The system has been recently applied at the State Mines, its inventor being the manager, Graham Bell.

The device consists of $\frac{1}{8}$-in. steel plates, 6x4 ft., bent to U-shapes, 18 in. across and 18 in. deep. The sections are inverted and laid on the floor of the drive, loose ground being placed against the contact with the rock to insure a tight joint. Sections are machine rolled and are capable of being bolted together in a tight joint, assisted by a gasket of tarred cloth.

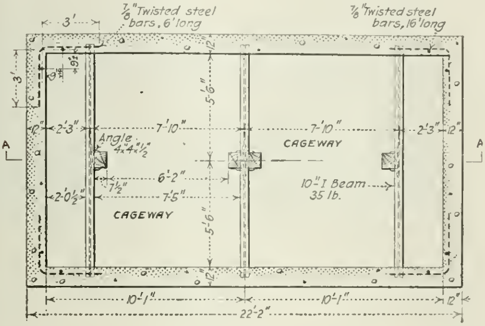
Area available in these pipes is 2 sq.ft., which is far superior to the 10-in. galvanized-iron pipes in common use, and their comparative immunity from damage places them above anything else in use for the purpose at the present time. The manager has tried galvanized-iron pipes at 10d. per ft., and corrugated-iron bratticing along the main connection drives at a cost of 5s. per ft., but has given both up for the steel pipes now in use, which cost 3s. 7d. per running foot and require practically no maintenance.

Explosive boxes have also been devised and adopted by Mr. Bell. These have a pitched roof, so that they cannot be used as a seat or candle rest by the miners. Mr. Bell's action has been accelerated by two recent accidents due to the burning of gelatin boxes, the cause of which has not been discovered. Fortunately, no deaths resulted from these accidents. The style of explosive box not subject to the danger of burning is a precaution against accidents which may have serious results.

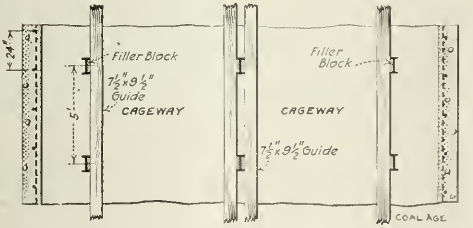
⁂

Rectangular Concrete Shaft Linings

Two concrete-lined shafts recently sunk by the Bunsen Coal Co., of Danville, Ill., are illustrated herewith. The dimensions and arrangements of the two shafts are exhibited in the drawings taken from *Coal Age*, Nov. 7, 1914.



Plan



Section A-A

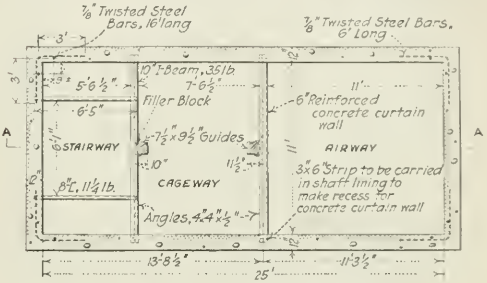
Plan and Section of Main Shaft

In the main shaft the thickness of the walls for 89 ft. down from the collar is 18 in., and thence to the bottom, 12 in. In the auxiliary shaft the 18-in. walls extend down for 79 ft. The walls in both shafts are of plain concrete except the corners, which are reinforced vertically, each with two lines of $\frac{7}{8}$-in. by 16-ft. twisted steel bars, back of which are placed $\frac{7}{8}$-in. by 6-ft. bars laid horizontally and spaced every 2 ft. for the entire depth of the shaft. The concreted depth of the main shaft is 225 ft. and of the auxiliary, 215 feet.

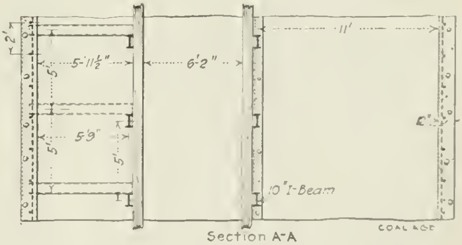
The dividers or guide supports are all 10-in. I-beams weighing 35 lb. per ft. The reinforced-concrete curtain wall separating the airway from the cage compartment in the auxiliary shaft was poured 7 in. thick and extends from top to bottom of the shaft. Its reinforcement consists of plain $\frac{3}{4}$-in. rods spaced 9 in. center to center, staggered along the full flange length of the I-beam dividers. These rods are connected to the top and bottom flanges of the I-beams by means of nuts on the threaded ends.

The forms used for the lining in each shaft were of the company's design, made and put together at the shaft site. A description of those used for the main shaft only will be given. The sides and ends were composed of $1\frac{1}{2}$x10-in. tongue-and-groove yellow-pine boards, surfaced on both sides, and cut into lengths making the section $2\frac{1}{2}$ ft. high. Nailing strips $1\frac{1}{2}$x12 in. extended around the top and $1\frac{1}{2}$x4 in. placed at the bottom formed cleats for the several units and held the matched boards securely in place. The top piece extended a distance of 1 in. above the top of the form on the inside for the reception of the next form section.

For stiffening the forms and supporting the concrete until it should set, a steel frame consisting of 4x4x$\frac{1}{2}$-in. angles was placed midway of each section and attached to the form boards by means of $\frac{3}{4}$-in. bolts spaced 13 in. center to center around the entire section. The steel framework was stiffened at the corners with 4x4x$\frac{1}{2}$-in angle bracing; while $\frac{3}{8}$-in. splice and gusset plates were used for bolting together the several units composing the frame.


7/8" Twisted Steel Bars, 16' long
7/8" Twisted Steel Bars, 6' Long
3'
3'
9½"
5'-6½"
10" I-Beam, 35 lb.
7'-6½"
11'
Filler Block
6'-5"
6" Reinforced concrete curtain wall
A
A
STAIRWAY
7½"x9½" Guides
AIRWAY
10"
1½"
CAGEWAY
3"x6" Strip to be carried in shaft lining to make recess for concrete curtain wall
12"
8" [, 11¼ lb.
Angles, 4"x4"x½"
13'-8½"
11'-3½"
25'

Plan



Section A-A

Plan and Section of Auxiliary or Air Shaft

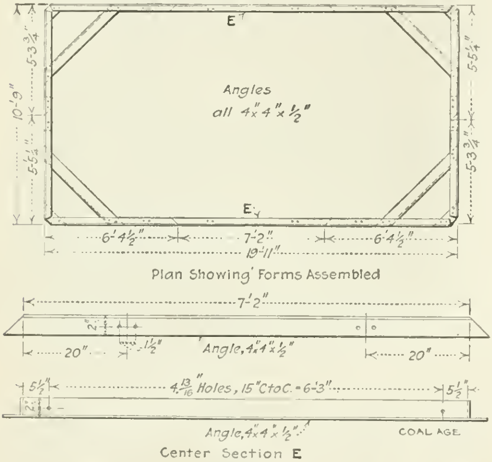
To insure easy removal of the forms and to increase the thickness of the walls, the corner pieces were cut on a 45° angle with a 5-in. bevel face. The vertical edges of each unit, including the forms and angle frames, were also cut on a 45° bevel, while 6x10-in. pockets were made in the top of every other form for the reception of the 10-in. I-beam dividers which are spaced vertically 5 ft. center to center. The completed $2\frac{1}{2}$-ft. section, including the steel frame, weighed 2080 lb., and the heaviest unit 400 pounds.

The designs of the steel frames are illustrated. That for the auxiliary shaft provides for the reinforced-concrete curtain wall.

One 10-hp. portable cubical concrete mixer with 5x7-in. vertical steam engine attached, having a capacity of 11 cu.ft., was placed at the top of each shaft. The method of concreting was the same in each case. No concrete was poured until the bottom of the shaft was reached.

At the auxiliary shaft it was necessary to use a floating double-deck scaffold for the placing and removal of the forms in the airway. No forms were removed from the work under a period of 48 hr. The 8x10-in. dividers supporting the temporary lining were removed as the concrete lining advanced; these were replaced after each form was in position with 4x6-in. temporary supports for the forms until the concrete had set.

Both lines of 4x6-in. temporary support were carried on 1½x4x10-in. blocks attached to 1½x10-in. vertical wall plates cut in 5-ft. lengths. These plates extended back of the forms. Four 1½x2½x10-in. blocks attached to the back of the wall plates cleared the steel angles on the forms and made a substantial support.



STEEL FRAME USED FOR STIFFENING FORMS IN MAIN SHAFT

In the main shaft the concrete yardage per vertical foot for 12-in. lining walls was 2.5 cu.yd., and 3.8 cu.yd. for walls having a thickness of 18 in. In the auxiliary shaft the 12-in. walls averaged 2.8 cu.yd. per vertical foot and the 18-in. walls, 4.3 cu.yd. All of the concrete work was composed of one part cement and five parts of clean river gravel. Cement for the entire work was the "Universal."

The progress of work at the main shaft was as follows: Concreting started Aug. 7, 1911, and the collar was reached Sept. 8, 1911. The concreting included the placing of 15 ft. of 8-ft. span arch for the sump tunnel and 30 ft. of 18-ft. 2-in. span arch for the bottom cage landing approaches from the empty and loaded sides. The entire work done in connection with the concreting of the shaft-lining walls occupied a period of 4½ weeks, which was an average of 50 ft. per week.

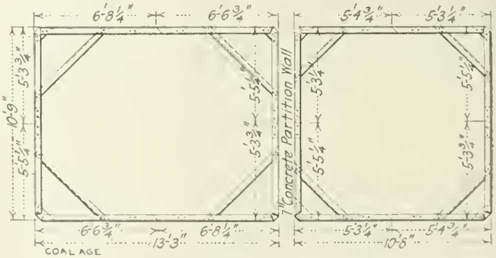
On the auxiliary shaft concreting started Aug. 7, 1911, and the collar was reached Sept. 30, 1911. This process included the placing of 15 ft. of a 10-ft. 4-in. span arch at the bottom cage landing and 15 ft. of a 17-ft. 6-in. span arch leading from the bottom of the air compartment. The total work done in connection with concreting the shaft lining and the pouring of the concrete curtain wall occupied a period of 6.7 weeks, which was an average of 32.4 ft. per week and 129.6 ft. per month.

⁂

Accident-Prevention Score-Board*

An interesting and novel plan for stimulating interest in the safety-first movement is used at the plant of the Dodge Mfg. Co., Mishawaka, Ind. It consists primarily of a contest between foremen as to which shall make the best monthly and annual showing from a safety viewpoint, and its outstanding feature is a score board 24 ft. long, standing just inside the main gate of the factory, on which are shown the departments, foremen, percentages for month and year, and rank of the various competing divisions. The starting point is 1000 both for year and month, and each division is penalized according to its accidents, minor accidents of less than one day's absence not being considered. Each day's absence bears a percentage charge in proportion to the total number of "man-days" per month per division.

The use of this score board has resulted in the fostering of great interest among individual employees and foremen. Departmental loyalty has shown itself to be the foundation upon which the whole plan rests. Although it was originated for the use of an industrial concern, there seems to be no good reason why it could not be applied to mine, mill or smelting-plant organizations.



STEEL FRAME USED IN FORMS FOR AUXILIARY SHAFT

⁂

Welded Wire Hose Bands

Galvanized steel-wire hose bands, electrically welded, are being marketed by J. S. McChesney & Co., Chicago, and when properly tightened, have withstood a direct pull on the hose of 600 lb. The bands are supplied in various lengths for different sizes of hose. They secure the hose to the nipple and may be used on steam, compressed air or vacuum lines using rubber hose.

This device should find a ready use around mines, especially for the purpose of making quick repairs. It is being used in large quantities by the Canadian Copper Co. and the Utah Copper Co., in addition to many railroads and industrial concerns.

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*Abstracted from a report by W. L. Chandler, supervisor of insurance, Dodge Manufacturing Co., Mishawaka, Ind.

Details of Milling and Smelting

Thaw House for Concentrates

The concentrates from the mills of the St. Joseph Lead Co. are smelted at Herculaneum, Mo. On account of the high moisture content of the lead concentrates, difficulty was experienced in unloading during winter weather. The mills of the company are at Bonne Terre, Rivermines and Leadwood, the distance from the mills to the smelting works ranging from 31 to 38 miles. In consequence, the concentrates frequently arrive at the smelting plant in a frozen condition during a few weeks of each winter. The thaw house holds eight 50-ton cars and is heated by a small coal-fired furnace connected with 350 ft. of 48-in. pipe. It has removed a source of much annoyance during some of the winter months, putting the concentrates in condition, not only for unloading, but also for sampling with a post-hole auger.

THAW HOUSE AT HERCULANEUM, MO.

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Jones' Method of Treating Zinc Residues

Archibald Jones, of Bartlesville, Okla., has been granted a patent (U. S. Pat. 1,112,010) for a method of treatment of zinc residues. The process consists of concentrating the residues by burning off the contained carbon, simultaneously volatilizing the zinc and catching the latter in the cooled outer layers of the mass.

The operation is conducted on a checker-work of bricks; underneath is a main flue with cross branches through which air is delivered by an ordinary fan blower. The residues are drawn from the retort and placed on the checker-work while hot, so that they will ignite more readily. As the residues contain from 30 to 40% of carbon, extraneous fuel is not often needed except, perhaps, immediately adjoining the cross-flues, for the purpose of more readily initiating the ignition of the mass. With the elimination of the carbonaceous material by combustion, the zinc is volatilized and entrapped in the outer crust of the pile as zinc oxide.

At the completion of the operation the crust is broken off and treated in retorts in the usual manner for the contained zinc. The remainder of the pile constitutes a sintered mass, containing other metals such as gold, silver, copper or lead, and may be readily broken into lumps suitable for smelting, this material being now relatively free from zinc and carbon. The sintering may be done in an open pile or within confining walls, as for instance, within a suitable kiln.

⁂

Leaching-Plant Construction*

Reinforced concrete seems to offer many advantages for large leaching vats. It has long been used at the works of the Pennsylvania Salt Co., at Natrona and at Philadelphia, for leaching small tonnages of chloridized copper ores. The solutions there are a mixture of sulphate and chloride of copper and contain from 1 to 2% of free acid. No protective coating or lining has been used for the concrete although a new vat constructed at Philadelphia is lined with chemical brick laid with cement.

The stronger acid solutions used in leaching the Ajo ores necessitated some protective covering for the concrete. A paint of this character is made by Toch Brothers. It is known as "R. I. W. No. 41" and is advertised to have the following properties:

(1) It stands heat up to the point of carbonization.

(2) It withstands sulphuric acid, 20° strength, for two months without showing the slightest sign of decomposition.

(3) It withstands the action of 15% sulphuric acid; 10% copper sulphate, at a temperature of 135° F., for six months, without showing any sign of decomposition. Withstands influence of caustic soda up to about 10% strength.

(4) Two coats will last for several years on the interior of stand pipes. Steel must be clean and dry before material is applied.

(5) Has a record of three years and four months on the interior walls, floors and ceilings of storage battery rooms where the vapors of sulphuric acid are condensed twice a day. Three coats were applied.

The dates of its longevity are simply minimum dates, as the material lasts much longer than our statements indicate.

The protection of these concrete vats was submitted to Toch Brothers and they recommended the following specifications:

Make your concrete a 1:2:4 mix, using an aggregate graded up to 1½ in., adding 3 lb. of "Toxement" for each bag of cement necessary to complete the operation. After the concrete has set up thoroughly dry, clean the surface and then apply one coat of R. I. W. No. 89, allow about 36 hr. for it to dry, then apply a second coat of R. I. W. No. 89. Care should be taken after the first coat is applied so that every particle of the surface is thoroughly and completely covered. R. I. W. No. 89 is constructed slightly different from R. I. W. No. 41 in order to meet your specifications.

To make a concrete vat acid proof, it must first be made waterproof. For this purpose they recommended "Toxement," a patented preparation of their own which is advertised to be "a colloidal double resinate and silicate of calcium and aluminum."

A second method of waterproofing concrete was obtained from *Bul.* No. 46, U. S. Department of Agriculture. In this method crude petroleum or preferably residuum is mixed with the concrete as follows:

For most purposes where damp proofing is required [illegible] of oil based on the weight of the cement in the mixture is all that is necessary. For each bag of cement (weighing 94 lb.) 4.7 lb. or about 2½ quarts of oil are required.

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*Excerpt from a paper read by Stuart Croasdale at the Utah meeting of the A. I. M. E.

Mix the concrete in proportions of 1 part cement to 2 of sand and 4 of broken stone or gravel. Add water and thoroughly mix until no trace of oil is visible on the surface. If oil-mixed mortar is desired, prepare in the same manner without the gravel.

The use of 5% of oil increases the time of the initial set by 50% and the time of the final set by 47%.

Concrete with 10% oil has 75% of the strength of plain concrete at 28 days. At the end of one year the strength of 1:3 mortar suffers but little from the addition of oil in amounts up to 10 per cent.

Oil-mixed mortar containing 10% of oil is absolutely water tight under pressures as high as 40 lb. to the square inch. Oil-mixed mortar is effective as a water-proofing agent under low pressures when plastered on either side of porous concrete.

Tests were also made on the acid-resisting qualities of the following brick, which might be used for lining concrete vats: Ordinary wire-cut shale brick from El Paso; "acid-proof tile" from El Paso; low-temperature firebrick from El Paso; "star" firebrick from Pueblo, Colo.; silica brick from Pueblo, Colorado.

These bricks were allowed to stand three months in 10% sulphuric-acid solution; in 5% sulphuric acid and 5% copper-sulphate solution, and in 10% copper-sulphate solution (10% $CuSO_4 + 5\,H_2O$). There was no apparent disintegration or injury to the physical structure of any of these brick at the end of the test.

Chemical analysis of the solutions likewise showed that none of the brick had been appreciably attacked by either acid or copper-sulphate solutions. The solutions from the silica brick contained some gelatinous silica, which probably came from the decomposition of the sodium silicate used as a binder, but this did not weaken the brick.

Two concrete storage tanks were made for holding wash water, in order to bring it up to normal strength (about 10° B.) of acid to be used as a lixiviant. In practice it would be better to build these tanks of steel or wood and line them with lead, but in this experimental plant, concrete was used to determine its efficiency as well as that of acid-proof paints. Both of these tanks were made of oil-mixed reinforced concrete. They were 5 ft. in diameter and 5 ft. in depth, with walls 8 in. thick. One was plastered inside with "Toxement" mortar and the other with oil-mixed mortar. Both were painted inside with R. I. W. No. 89 paint as specified. For better protection from abrasion, the bottoms of these tanks were covered with ½ in. or more of hot asphalt and sand, troweled smooth and compact with a hot iron like street paving. Five leaching vats were also constructed, as follows: Vat *A*, 5 ft. in diameter and 5 ft. in depth. Concrete, mixed with "Toxement" according to the Toch specifications. Plastered inside with cement mortar mixed with "Toxement." Painted inside with three coats of R. I. W. No. 89 paint. A false lining of wood was made to set inside this vat, but it was impracticable to retain this lining without scarring the paint, so it was abandoned at the start. It was also impossible to keep the paint from being worn off by the ore, so the vat was given one coat of asphalt dissolved in gasoline and then lined with El Paso common brick. The bricks were laid in hot asphalt, and hot asphalt and sand were poured between the brick lining and the concrete. The bottom was covered with asphalt and sand, troweled smooth while hot.

Vat *B*. Same construction and dimensions as Vat *A*. This was given two coats of hot asphalt, which was difficult to apply and on cooling contracted and left pin holes of uncovered cement. A thin paint was then made by pouring hot asphalt into gasoline and a coat of this was applied to the concrete. On top of this was placeed asphalt and sand, troweled smoooth while hot.

Vat *C*. Same dimensions as Vats *A* and *B*, but made of oil-mixed concrete and plastered inside with oil-mixed cement mortar. A priming coat of R. I. W. No. 89 paint was applied to the concrete. On top of this was placeed a coat of hot asphalt followed by a coat of asphalt paint as described under Vat *B*. The bottom was made of hot asphalt and sand, as already described.

Vat *D*. This was rectangular, 5 ft. by 8 ft. by 5 ft. in depth. It was made of oil-mixed concrete and plastered inside with oil-mixed cement mortar. The protective coatings were one coat of R. I. W. No. 89 and two coats of asphalt paint as described above The bottom was covered with hot asphalt and sand.

Vat *E*. Made of oil-mixed concrete and plastered inside with oil-mixed mortar. Diameter 5 ft. and depth 10 ft. Protective coatings, one of R. I. W. No. 89 and one of asphalt paint. Bottom covered with hot asphalt and sand. The capacity of Vats *A*, *B* and *C* was between 3 and 4 tons, respectively. Vats *D* and *E* each held a little more than 8 tons. Three solution or precipitating tanks, 5 ft. in diameter and 5 ft. in depth, were made and protected in the same manner as Vat *E*.

Of the two methods recommended for waterproofing concrete, viz., by the use of "Toxement" and by the use of crude oil, the concrete mixed with crude oil appeared to be less attacked by the acid solutions at the end of two months' service than that mixed with "Toxement," although the difference was scarcely noticeable.

So far as could be observed, the acid-resisting qualities of concrete and plaster prepared with either "Toxement" or oil were not any better than those of ordinary concrete and cement plaster made with siliceous sand.

Acid-resisting paint known as "R. I. W. No. 89," prepared especially for this work, was of no value whatever in protecting the concrete vats from the 10% sulphuric solutions, the weaker lixiviant in the leaching vats or the neutralized copper sulphate in the precipitating tanks. Asphalt applied hot or as a paint was likewise useless as a protective covering for the cement plaster under any of the above conditions. One difficulty in retaining this on the walls of the vats was the high temperature of the water used for washing the ore, which averaged 100° F.

The use of such warm wash water may be criticized, but there was a possibility of the water supply coming from hot springs or wells, if developed near the mine, so it was thought best to put the asphalt coverings to the severest test. Asphalt that would soften and run from joints between bricks or from walls under the heat of the sun might be brittle enough to crack at night and allow the acid solutions to get at the cement behind it.

With the exception of Vat *A*, all the leaching vats, acid and precipitating tanks may be considered as operated for the entire two months on the cement plaster alone, for at no time did the protective covering last more than 24 to 48 hr. on the leaching vats and on the acid and precipitating tanks the paint would come off in patches after a few hours' or a few days' exposure to the solutions. At the end of two months the "Toxement" plaster, ½ in. thick, was disintegrated to the concrete in places on Vat *B* and the oil-mixed plaster of the same thickness was disintegrated nearly to the concrete on vat *C*. In the acid storage tanks both the "Toxement" and oil-mixed plaster were dissolved in patches by the 10% acid solutions and the solutions leaked through the 8-in. concrete walls. These holes were patched with ordinary cement and sand plaster and also with straight cement, both of which held the solutions successfully for several weeks.

One of the storage tanks was replastered with cement and sand and thoroughly coated with paraffin, which was forced into the plaster with a hot iron. When filled with dilute acid lixiviant, the paraffin came off immediately and was of no value whatever as a protective covering.

A plaster recommended by the Standard Oil Co. was also tried on the acid-storage tanks. It was composed by weight, of 10 per cent. litharge, 20 per cent. short-fiber asbestos, and 70 per cent. sand. These were mixed into a mortar with 40° silicate of soda and applied in the usual manner. This plaster immediately disintegrated on filling the tank with water. The tank was then replastered with the same materials and filled with dilute acid. So long as the plaster remained covered with acid, it was a satisfactory protection, but on exposure to air it began to disintegrate.

Some of the leaching vats were plastered with ordinary cement and sand mortar and painted with several coats of crude petroleum. Each application of oil was allowed to soak into the cement and become perfectly dry before another coat was applied. This was done at the close of my experiments and I had no opportunity to test its merits.

The brick lining in Vat *A* proved to be satisfactory. With the exception of where the asphalt was melted from the joints by the hot wash water, no deterioration could be noticed. This was due to the irregular size and shape of the common brick used for the lining and could be avoided by using pressed brick of uniform size which would permit of thin joints. In a large vat the brick would also be laid flat instead of on edge.

The sand and asphalt bottoms were entirely satisfactory when they were pressed solid with a heavy hot iron muller like that used in street paving. If this was not done, they were porous and spongy and no protection against the solutions.

As now developed by the limited operation of the experimental plant, ordinary or oil-mixed concrete will be entirely satisfactory for leaching vats, wash-water and neutralized copper-sulphate solution tanks. These can be made tight and acid resisting by lining with pressed brick of uniform size, laid in asphalt and backed with hot asphalt poured between the brick and concrete. Vitrified brick would be less porous and preferable if they can be obtained straight and uniform in size. The vats should be plastered inside with cement and sand mortar before putting in the brick lining.

The cement we used in construction came from the regular run of the mill at El Paso and contained more or less free lime. It is my belief that with cement and other materials containing *no* free lime, a concrete vat can be built and lined with brick, laid with thin joints of cement and sand mortar, that will be entirely satisfactory for acid leaching. After the bricks soak full of mineral salts, there is very little if any transfusion of the corrosive solutions to the concrete back of the lining and they form a protective coating for both ore and solutions.

Oil-mixed cement plaster will last two or three months without patching or renewal. A brick lining laid in oil-mixed cement mortar would probably last longer than plaster, but the asphalt and brick lining is recommended if it can be held in place. The cracks that form after construction are the most serious, if not a fatal defect in concrete for leaching vats. These are often so small that they are scarcely noticeable and yet are sufficient to start a leak that is almost impossible to stop, even with asphalt itself.

The shape of the vats is immaterial, although for economy of construction and operation a rectangular concrete vat is preferable. The tailings can then be removed from the top and the bottom of the vat made solid with no openings.

The bottoms of the vats should be paved with sand and asphalt, thoroughly pressed down with hot iron mullers or otherwise to make a *compact* covering. On top of this should be a brick paving laid in asphalt. The storage or acid-mixing tanks for the 5% to 10% acid solutions should be made of steel or wood and lined with lead.

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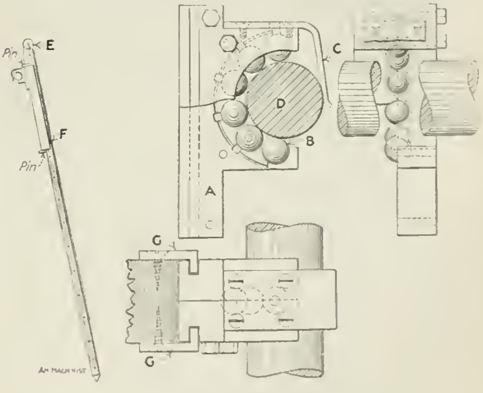
Ball-Bearing Shaft Ladder

With all the various styles of ladders used in the shop there is always more or less difficulty in placing them up against a shaft in motion, one fault being that the foot of the ordinary ladder is in constant danger of slipping. Ladders with heavy shoes attached are cumbersome and difficult to handle, as iron shoes generally weigh from 5 to 12 lb. each.



Ball-Bearing Shaft Ladder

The illustration shows a device, described by J. A. Duckstone in the *American Machinist*, that can be applied to any height of shaft without changing the slant of ladder. The casting *A* has a semicircular opening in which the balls *B* are held. These rest upon the shaft *D* and do away with the friction which wears the wooden ladder.

The latch *C* prevents any possible slipping. The device has a track *F* which fits in the groove made by the two angles *G*, a rope and pulley moving the ball bearing to suit any height of shaft.

The Assayer and Chemist

Quick Method to Precipitate Tin Electrolytically

By Leon Humphreville*

In the Engineering and Mining Journal for June 6, 1914, there is a communication from R. L. Hallett with reference to a quick method for determining tin. Mr. Hallett mentions the electrolytic method with oxalic-acid solution, which he, however, rejects as being too tedious for technical analysis.

I thought it might be of interest to describe the electrolytic method with ammonium-sulphide solution as originated and used at the Aix-la-Chapelle Polytechnicum, which is admirably adapted for rapid technical analysis.

The sulphide method to precipitate tin electrolytically, which was first brought out by A. Classen, in his well known work, "Quantitative Analyse durch Elektrolyse," seems to be little known and applied. Although it has not reached the state of perfection for scientific purposes which one could wish, it is for technical analysis amply sufficient.

The conditions for the quick determination by the ammonium-sulphide method, which are set forth in the book, "Elektroanalytische Schnellmethoden," by Prof. A. Fischer, collaborator of A. Classen at the Polytechnicum, are as follows:

Form of electrode	Net electrodes
Electrolyte	16cc. $(NH_4)_2S$ and 20cc. Na_2SO_3 (40%)
Volume of solution	120cc.
Metal precipitated	0.2-0.3 gram
Temperature	60° C.
Potential	4 volts
Current strength	5.5 amp.
Revolutions of stirrer	600 r.p.m.
Duration of precipitation	25 minutes.

The apparatus and electrodes are illustrated in the accompanying figures.

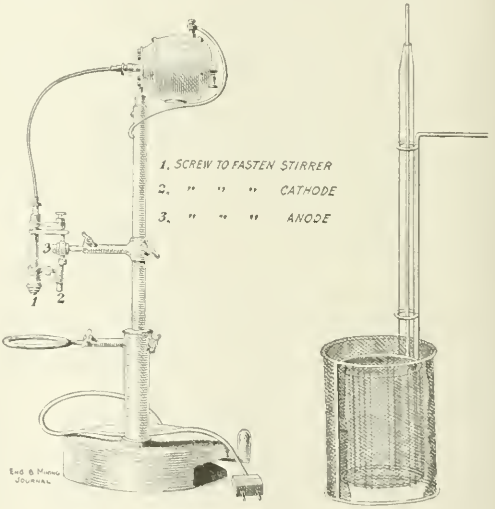
The ammonium sulphide is made from an ammonia solution of 0.91 sp.gr. Ordinary ammonia contains sufficient impurities to impair the accuracy of the results from the electrolytic method. The ammonia is therefore prepared from ammonia gas secured in cylinders.

The sodium sulphite should render the solution colorless and is added before beginning the precipitation; in case the color should not disappear more should be added.

The precipitation should be started before the stirring is begun. The amperage may vary a little, but it is important that the voltage be exactly four volts, otherwise the tin will take on a dull gray color, due to the presence of more or less sulphur, and not possess its normal bright, metallic luster. The precipitated tin always contains very small quantities of sulphur, which do not, however, affect the accuracy of the results within a limit of 0.05%. The platinum cathode must be first coated with copper, as platinum alloys with tin. The copper is in turn coated with tin, against which the potential of generation of hydrogen ("überspannung") is sufficiently high to prevent the latter being formed and interfering with the precipitation of the tin. Cadmium has been proposed and successfully employed as a substitute for the double coating of copper and tin described. The cadmium is precipitated out of a cyanide solution like silver, an operation requiring one to two minutes.

It is not possible to precipitate pure tin electrolytically out of a solution containing other metals, and it must therefore be first separated from them as in quantitative analysis. This can be done most advantageously by securing the tin as sulphide, which can then be dissolved in ammonium sulphide and submitted to the electrolysis.

The total duration of the analysis depends on the material analyzed and may vary from ¾ to 1½ hours. The electrodes are most quickly and easily freed from tin by immersing them in a mixture of hydrochloric and oxalic acids. The one unpleasant feature of the analysis is that the ammoniacal solution attacks the brass parts of the apparatus. This can, however, be very easily prevented by covering the latter with a rubber hood. The Gebrüder Raacke, Aix la-Chapelle, manufacturers of the apparatus, were kind enough to place the illustrations at my disposal.



Apparatus for Quick Precipitation of Tin

Cobalt in Steel

A process for the determination of cobalt in steel is given by P. Slawik (*Chem.-Ztg.*, 1914, p. 514). One to two grams of drillings are dissolved in dilute hydrochloric acid, oxidized with potassium chlorate and the excess of acid evaporated. The solution is treated with zinc oxide emulsion, added in small portions at a time, carefully avoiding excess, until the precipitate coagulates. The volume is made up to 500 c.c., and 250 c.c. are filtered. The solution, containing only cobalt, nickel and manganese, is concentrated to 100 c.c., treated with 20 c.c. of strong hydrochloric acid, and the cobalt precipitated by 30 c.c. of a 2% alcoholic solution of nitroso-β-naphthol. The precipitate is strongly ignited and weighed as Co_3O_4. In the case of nickel steel the ignited precipitate should be dissolved and the precipitation repeated.

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*Polytechnicum, Aix la Chapelle, Germany.

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Assay of Cobalt Silver Ores

The method of assay used by the Ledoux laboratory of New York was recently described by A. M. Smoot in the *Bulletin* of the Canadian Mining Institute, in a discussion of a paper by Mr. Campbell. This method is entirely different from the straight scorification method used at Cobalt. Quarter- or half-assay ton portions of pulp are taken, the former weight if the sample contains over 2000 oz. per ton, the latter if the silver is less than this. The pulp is treated in beakers with strong nitric acid added a little at a time until danger of frothing is past. About 75 c.c. of acid is required for ¼-a.t. portions and 100 c.c. for ½-a.t. portions. The solutions are heated on a steam bath until red fumes cease to be generated and then they are diluted with 200 c.c. of distilled water and allowed to stand until cold—best over night.

It is important that the solutions be allowed to stand before they are filtered because with certain ores containing much arsenic together with some antimony and lime, a white crystalline coating appears on the bottoms and sides of the beakers which cannot be detached by washing or even scraping. This coating contains a little silver and if it is not allowed to form in the original nitric-acid solution it forms later on in the process and makes trouble. Insoluble residues are filtered off and washed thoroughly. If there is any coating on the sides and bottoms of the beakers which cannot be readily detached with a piece of filter paper, it is treated in the beaker with a hot solution of caustic soda, which quickly disintegrates it. The caustic-soda solution is acidulated with a little nitric acid and washed into the filter with the soluble residue.

Most of the silver is dissolved by the original nitric-acid treatment and passes through the filters as silver nitrate, but a little remains with the insoluble. If the insoluble residues are large in amount, they are dried and burned in crucibles, fused with sodium carbonate, borax glass, litharge and a reducing agent. If they are small, they are dried on scorifiers and scorified with test lead and borax glass. In either case, the lead buttons from the insolubles are reserved. Standard sodium-chloride solution is added to the nitric-acid solutions containing most of the silver in amount sufficient to precipitate all silver as chloride, but avoiding any considerable excess of the precipitant.

The silver chloride is stirred briskly until it agglomerates and then allowed to stand for an hour until it settles and the supernatant liquid becomes clear. If it remains cloudy, rapid stirring is repeated and it is again allowed to settle. The clear solutions are filtered through double filter papers and the silver-chloride precipitates transferred to the filters by a water jet and there washed slightly with water. The beakers are washed well with a jet and any traces of silver chloride remaining in them are wiped off with small pieces of filter paper which are placed in the filters. Filters containing the silver chloride are transferred to scorifiers which have been glazed on the inside by melting litharge in them and pouring away the excess. The glazing is done to prevent the porous scorifiers from absorbing moisture from the damp paper, and as a further protection, a small disk of pure sheet lead is placed beneath the filter papers.

The scorifiers are transferred to a closed oven heated to about 250° to 300° C., where they are dried and the paper is slowly charred until it is practically all consumed except a small amount of carbon. This method of burning the filter papers is an essential step, since it avoids losses of silver chloride which are apt to occur if the burning is done rapidly in a muffle. Fine test lead is sprinkled over the burned silver-chloride residues and the lead buttons resulting from the crucible fusions and scorifications of the corresponding residues insoluble in nitric acid are added. Scorification is then conducted at a low temperature so as to obtain 15-gram lead buttons. These are cupelled at a low temperature, taking care, in the case of large silver buttons, to avoid "spitting" at the end of the cupellation.

This combination method, properly conducted, yields results higher and more concordant than can be attained by any all-fire process. It is, nevertheless, a commercial assay and is acceptable to the smelters since it does not include slag and cupel corrections. Inasmuch as all impurities likely to effect variations in the volatilization and slag losses are removed prior to the fire work, the results of assays made on different days and in different conditions are more uniform than when the fire assaying is done directly on the untreated ores.

Small amounts of bismuth occurring in the Cobalt silver ores are a source of irregularity in that bismuth is retained to some extent by silver after cupellation. In the combination method, bismuth is eliminated before any fire work is done. It is also essential that the test lead shall be free from bismuth. Bismuth-free lead can be obtained, but most brands of test lead contain sufficient bismuth to interfere seriously with accuracy in silver assaying.

The following example, taken at random, of a recent assay made in our laboratory will serve to show the concordance of assays by the combination method:

	Weight	Oz. per ton
Charge ¼ a.t.	823.0 mg	3292.0
	822.4 mg	3289.6
	823.2 mg	3292.8
	824.5 mg	3298.0
	3293.1 mg	3293.1

Four assays are made of each individual sample and as the amount taken, being ¼ or ½ a.t. for each determination, is far greater than the amount which can be taken for the direct fire assay, the sample is represented better and variations are thus reduced in effect. Metallic scales from the four samples are assayed separately by the all-fire process, using 1-gram charges and when the amount of scales is small as many assays of each sample are made as the amount of scales will permit, but in cases where the amount of scale is large, six 1-20-a.t. portions are used.

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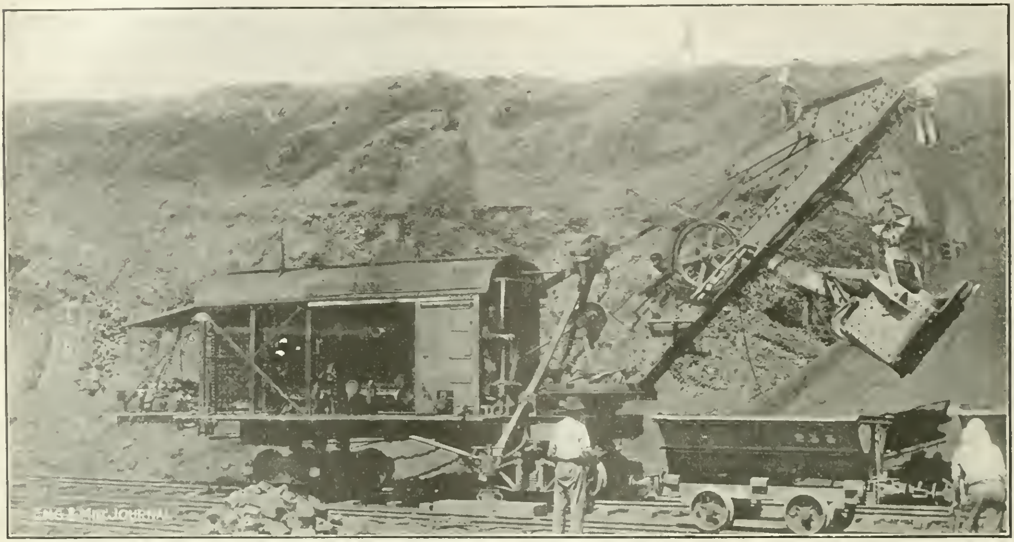
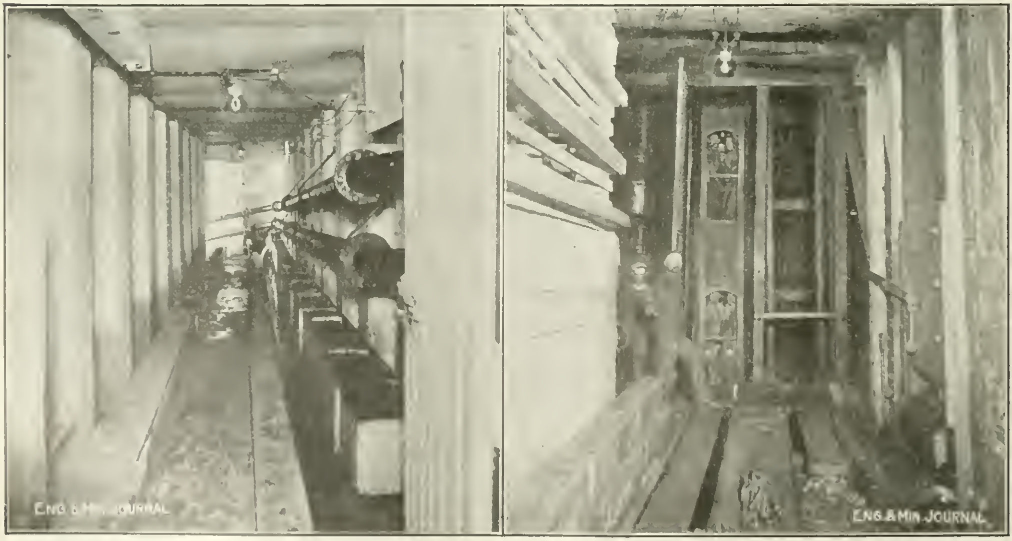
Tellurous Acid Can Be Detected in Presence of Telluric by making the solution to be tested alkaline and then acidifying with acetic acid. According to Browning [illegible] M[illegible]ing (Am. Journ. Sci., 1913, p. 72), tellurous [illegible] precipitate, telluric gives none

Photographs from the Field



Bucyrus Steam Shovel at Work in Old Dumps, Wallaroo & Moonta Mines, South Australia



Taylor's Shaft, Wallaroo Mines

Entrance to electric-pump chamber and sump at 2430-ft. level

Man skip at 2430-ft. level

Port Wallaroo, South Australia

The Jetty

The Smelting Works

Headframe at Young's Shaft

Headframe and Ore Bins at Taylor's Shaft

Wallaroo & Moonta Mines, South Australia
General View of Wallaroo Mines

Correspondence and Discussion

Australia under Labor-Union Rule

In the JOURNAL of Oct. 31, p. 800, there appears an article headed "Australia under Labor-Union Rule," which contains many misstatements. I feel sure that your JOURNAL does not desire to misrepresent the facts, hence this letter to you. I am the Panama-Pacific Exposition Commissioner here and also Trade Commissioner for the State of New South Wales, Australia.

The opening lines of the article make the statement "that the labor unions have got about everything they want and that they have captured the governments of several of the states." This shows absolute want of knowledge of the position. It is true that the "Political Labor Party" is the governing power of the Australian Commonwealth and also in the states of New South Wales, Western Australia and Tasmania, but it is not true that this political party is a "Trade Unionist Party" and the suggestion is also equally untrue that the arbitration laws under which the hours and conditions of almost every industry are fixed were passed by Labor governments.

Arbitration laws have been in force in some of the states for 15 years and in the Federation as a whole, for seven or eight years, in each case long before the Political Labor Party had secured the reins of government. The arbitration laws were passed in the Australian parliament by the Deakin government, which was a government composed from the Protectionist Party and in the State of New South Wales by the See Government, also a Protectionist Party government.

We first tried voluntary arbitration; it did some good, but it had to be made compulsory to make it fully effective. The Federal Arbitration Court, which deals with the fixing of wages, hours and conditions in all industries extending beyond the limits of one state, consists of a Supreme Court judge, appointed for life by the federal government and whose decisions are never questioned from the point of view of their fairness.

Each side in any industry fully states its case to the board or court in any manner it pleases, by evidence or otherwise, and the board or court then fixes the conditions for the industry concerned, for three years. In every award, provision is made for overtime, and I defy your informant to point to any case that will bear out the statement about the ship being detained because the hour came to cease work before the last bar of copper was loaded. On the other hand, I can quote hundreds of cases where men have worked 20 hr. in one stretch to allow a ship to get away on time and such cases are recurring every day in any port you care to mention in the Australian Commonwealth.

The Socialists in Australia, who represent the extreme section of political thought, are a very small entity and invariably vote and work against candidates of the Political Labor Party. It is a fact that the Trades Unionists as a body were the originators of the idea of industrial arbitration, which you will admit is an appeal to calm judgment and reason as against the old brutal method of strikes, and are its greatest supporters and advocates to this day, but it is also a fact that the employers of labor in Australia would not go back to the old system on any account, as the arbitration awards give fixity of conditions which were never wholly in existence before.

NEIL NEILSEN.

San Francisco, Calif., Nov. 4, 1914.

Lead and Radio-Lead

The notes in the JOURNAL of Sept. 1 and Nov. 7 on "Lead and Radio-Lead" are interesting to me because some years ago I found an unexplained difference between lead made by different processes. There was then a certain brand of white lead made from leads produced in Carinthia and in the American hearth (in Missouri), and it could not be made from any other lead, American or foreign. The only difference was that the lead from which this exceptionally fine white lead could be made was produced in furnaces in which the slag was not melted. It was drawn off as a thick agglomerated mass.

When this slag was put into a shaft furnace and a thin-running slag made the lead was no longer fit for this especially fine brand of white lead. At that stage of the chemical game I could only guess that one of these leads was an allotropic form of the other, like palladium and allopalladium, which seem to be the same chemical element, but crystallize in different systems. It seems to me that the study of lead and radio-lead should begin with a determination of the difference between lead made with a solid slag and lead made with a fluid slag. I believe Dr. Chandler made a lot of analyses of these leads for the Atlantic White Lead Co. of that day and perhaps he would be allowed to contribute these analyses as a beginning of the investigation.

JOHN A. CHURCH.

New York, Nov. 7, 1914.

Prisoners of War

The editorial and the discussion which have appeared in the JOURNAL, regarding the use of prisoners of war as laborers, renders a recent article by Roger W. Babson in the New York *Sun* of peculiar interest. He appears to feel that the country making the best use of its prisoners should ultimately win, judging from the following:

> On the other hand the capture of large numbers of able-bodied male prisoners by any one country is a factor tending to prolong the war so long as these captures are more or less evenly balanced. Such prisoners are of value not so much in handicapping the enemy as in providing the country making the capture with workers for their factories and fields while their own men are at war. If Germany has 250,000 able-bodied prisoners these, without doubt, have been put to work to take the place of Germans at the front in mines, mills and public improvements. Considering the fact that these prisoners need not be paid and can be fed for a few cents a day, they are of much economic value in enabling nations to prolong the war.

A. A. NASON.

New York, Nov. 16, 1914.

Wisconsin Zinc Conditions

CHICAGO CORRESPONDENCE

The general feeling among mining men elsewhere, perhaps, is that the lead and zinc districts of Wisconsin and Missouri are inactive, with operations far below normal. This is not true in the Platteville, Wis., district, at least, as revealed by a recent trip. Certain mines have been closed, but in most cases this was because the orebodies were exhausted, and not because of unfavorable conditions of labor, spelter price, etc. In some cases, the places of these former producers have been filled by new mines and mills recently put in commission, and more new work is contemplated or actually under way.

The general sentiment of the mining men around Platteville is optimistic, a feeling based largely on the theory that the price of spelter will average 5c. per lb. for the next few years. If that price does prevail, mines can be opened, mills built and a profit made on operations in that district. And it should be remembered that in computing costs on a 5c. market, the possibility of lean years with spelter at 4¼ to 4¾c. has been considered as well as the higher prices, and discounted accordingly.

The Wisconsin operators are not having difficulty in selling their product, and this indicates that the smelters are still willing to add to the stock on hand. From this it is concluded that if the latter are willing to hold the bag, there is no good reason why production, exploration and construction should not continue at a fair rate. This is actually what is happening.

The following figures are interesting and indicative: Out of approximately 48 possible producers in the district, 27 mines are working today; 13 are closed, probably temporarily, i.e., their orebodies are not exhausted and resumption depends upon the market or local conditions; the other eight are doubtful, they may or may not be working, but if working, it is probably on a small scale. The following roasting plants are in operation: Linden Zinc Co., Linden; National Zinc Co., Cuba City; Campbell Separator, Cuba City; Empire Roaster, Platteville; Mineral Point Zinc Co., Mineral Point; Joplin Separating Co., Galena. The zinc-oxide plant of the Mineral Point Zinc Co., at Mineral Point, is also operating.

This year at least four new plants or mines were placed in commission. The New Coker mill of the Mineral Point Zinc Co., at Livingston, started to operate in October, as did also the North Unity Mill of the Vinegar Hill Zinc Co., at Day's Siding. More recently, the Wisconsin Zinc Co. started its mill at the Champion mine at Benton. The Frontier Mining Co. commenced to operate its Grotkin mill at Benton last summer. These are all new operations.

Other new construction is planned for the district. The Kissler mine, near Platteville, has sunk a shaft and will erect a mill in the near future. The ground at the Hird mine, near the Grotkin at Benton, has been drilled and will be worked. This means the construction of a mill there in the course of a year or two. The equipment required for these mills will include Blake-type crushers, rolls, elevating pumps, bucket elevators, belts, trommels, samplers, jig screens and pulsating devices. The mills and mine headframes in this district are constructed as a unit, and this means that usually new mine surface equipment is installed when a mill is built. This equipment would include a small electric hoist, pumps, sheaves, grizzlies, and possibly a small compressor. Electric power is used almost universally and motors would be required for the mill. The jigs are built on the ground. It is not unlikely that the Wisconsin Zinc Co. will build a new roaster, and this would be a plant of some consequence.

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White Island Sulphur Operations Destroyed by Eruption

A volcanic eruption is reported at White Island in the Bay of Plenty, about 35 miles off the coast of New Zealand, on or about Sept. 17. This disturbance, reported by a pilot of a passing ship, is supposed to have destroyed the works of the New Zealand Sulphur Co. and the 10 or 11 men at the property at the time of the eruption. The workings are said to have fallen into the crater, and the company's camp, situated about a quarter of a mile away, and its wharf are reported to have been buried. Readers of the JOURNAL may recall some excellent pictures of the crater in the issue of Nov. 1, 1913. About this time the sulphur-mining operation, which had been initiated by the White Island Sulphur Co., was taken over by the New Zealand Sulphur Co. The deposit has long been known in New Zealand, but the frequency of eruptions and the difficulty of obtaining workmen had deterred many from undertaking its exploitation.

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Chino Copper Co.

The report of the Chino Copper Co. for the third quarter of 1914 shows a production of 11,491,120 lb. of copper, divided into 5,087,750 lb. in July, 3,165,501 lb. in August and 3,237,869 lb. in September. Besides the copper contained in concentrates, there were 286,693 lb. contained in smelting ores shipped during the quarter. Reduction of output is due to a policy of voluntary curtailment which was inaugurated on Aug. 6, to the extent of decreasing operations and output to one-half normal capacity after that date.

Total tonnage of ore treated for the quarter was 390,000 tons, an average of 1239 tons per day. The average grade of the ore was 2.165% copper, and average extraction was 68.04%, corresponding to a recovery of 29.16 lb. per ton of ore milled. Concentrate production amounted to 31,220 tons containing an average of 16.276% copper.

Cost per pound of net copper produced in milling operations, after allowing for smelting deductions and without allowing credit for miscellaneous income, was 7.81c. During this quarter for the first time, the amount of gold contained in concentrates was sufficient to be given consideration in smelter settlements under contract terms, and net credits from this source amounted to 0.10c. per lb., thus reducing the net cost per pound of producing copper, after crediting gold value, to 7.71c. Cost of net copper per pound produced from both milling and shipping ores for the quarter was 7.74c. If miscellaneous earnings derived from various sources for the period were credited to the cost of producing copper, the cost would be reduced to 7.37c. per lb., this cost including administration, general and all other charges, as well as the regular charge applied to the extinguishment of mine development and stripping expense. Total income from milling profits, crude ore profits and miscellaneous incomes amounted to $566,195. Dividends paid amounted to $433,400, leaving a net surplus over dividend requirements of $133,095. Earnings were based on carrying price of 12.4344c. per lb. for copper, and the total amount on hand and in transit, sold and unsold, at the end of the quarter was 23,273,719 lb. Operations were free from interruption or unusual incident, except as to the curtailment of production already mentioned.

Gold and Credit

The question of gold shipments from New York to London, which, since the outbreak of the war, has been the chief disturbing factor in international finance, renders some remarks by J. A. Hobson in his book, "Gold, Prices and Wages," published in February, 1913, of peculiar interest. Mr. Hobson wrote:

> What the holder of a credit-note wants is a security that the full purchasing power it claims to represent shall be realizable. If a bank, or a government which he knows to be able to secure for its notes this purchasing power, issues them, they are to him "as good as gold," even though he is aware that gold could not be got for all of them. His final preference for gold, so far as he has one, is based upon some fear or doubt lest some other persons in the world, from whom he might wish to buy, may entertain some distrust of his credit-note, preferring gold. To that extent the freedom of its purchasing power would be limited. But the credit system stands in the last resort upon the confidence in the ability of the issuer to place the holder of a note in possession of such forms of real wealth as he requires, when he wants it, and in amount such as he expected to be able to obtain when he received the note. Gold is only a requisite to the credit system so far as it is useful to sustain or increase this confidence.
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> It is a conventional utility, a serviceable check on possible abuses of credit issue, but not in the strict scientific sense an economic necessity in the working of the credit system by which modern commerce is conducted. For international commerce, at any rate with backward countries, it may long be needed. But it ought to be no longer necessary even for international payments between members of advanced commercial nations. There is no reason why the Clearing-House system, which has dispensed with gold in the internal credit operations of the country, should not in the early course of time be extended in the shape of an International Clearing House, all balances on foreign trade between members of civilized nations being paid in Clearing-House certificates.
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> Such an extension, clearly thinkable, if not easily feasible, makes it evident that gold is not intrinsically essential to the manufacture of credit. The notion that some single valuable commodity must always stand as the background to sustain the credit system has no real validity. Gold, indeed, is not even now dependent for its position as money upon such general appreciation of its value as a commodity. Gold has, indeed, a high but very limited use for the arts. But this value could by no means support its pecuniary position. People do not ultimately "look to the gold" behind the credit-notes because they know that in it they would have something intrinsically valuable and serviceable. They do not say to themselves, "I will insist on five gold sovereigns instead of a Bank of England note, because I know that, if the worst comes to the worst, I can melt down my sovereigns and make ornaments or stop teeth with them." In fact, of course, any wide attempt to get industrial use out of sovereigns withdrawn from currency would soon defeat its end by driving down to a very low level the exchange value of gold for uses in the arts.

Ontario Ore Shipments

Shipments of ore and metals from Ontario, Canada, during the period of nine months ended Sept. 30, 1911, according to the Ontario Bureau of Mines, were as follows: Silver, 19,448,048 oz., valued at $10,082,229. Pig iron, 195,161 tons, valued at $6,111,215. Nickel, 18,085 tons, valued at $1,023,556. Gold, 196,934 oz., valued at $3,912,848. Copper, 11,585 tons, valued at 1,664,896. Cobalt and nickel oxide, 852,014 lb., valued at $454,-687. Cobalt ore, 95 tons, valued at $26,563.

Mohawk Mining Co.

The report of the Mohawk Mining Co., Mohawk, Mich., for 1913, shows a production of 5,778,235 lb. of copper, which was sold at an average price of 15.36c. per lb. The production in 1912, before the strike, was 11,995,598 lb. The profits for 1913 were $123,839, compared with $656,-435 for 1912. After paying dividends amounting to $500,000, a surplus of $521,155 was on hand at the end of the year. There were 395,100 tons of rock hoisted, of which 7.2% was discarded as waste, leaving 366,458 tons treated, which produced 8,018,000 lb. of mineral or 5,778,235 lb. of refined copper. This gives a yield of 15.76 lb. of copper per ton of rock stamped. The total cost of producing copper was 13.22c., made up as follows: Mining and milling, including transportation, 10.42c.; smelting, freight, and marketing product, $1.16c.; construction and strike expense, 1.64c. per lb.

Some tests were made with a Hardinge mill over an extended period and the results indicate that until increased power, and that at a lower cost per unit, is secured from the plant by utilizing the exhaust steam from several stamps in a low-pressure turbine, the best recovery would be effected by using Hardinge mills instead of chilean mills.

The following schedule of time was adopted on Dec. 1, 1913: For underground men: men leave surface at 6:15 a.m.; half-hour for lunch at noon, and reach surface at 3:45 p.m. Night-shift men leave surface at 8:30 p.m.; lunch at midnight for one-half hour, and reach surface at 5:30 a.m.

German Iron Trade

The iron trade of Germany, from all accounts obtainable, is at a low ebb, though the Krupp and other works making war material are extremely busy. The regular trade, however, is small, and the important Lorraine-Luxemburg district is said to be completely closed down. The export trade is cut off and there is nothing to take its place. The latest official figures we have received are for September, and in that month the make of pig iron was a little less than one-third of that reported in September, 1913. Iron and steel works—with the exception of those directly employed on war material—have lost many men who are in the army, but their services do not seem to be especially needed for the present. An effort is made to keep up appearances in the trade, but the evidence of the production figures is strong.

Steel Resumption

There has recently been in evidence a decided picking up in the operations of the steel mills. At Gary three blast furnaces, 12 openhearth furnaces, 215 coke ovens and all the rolling mills except the rail mill resumed Nov. 16 and gave employment to about 5000 men. More recently, the South Chicago plant of the Illinois Steel Co. resumed operations in rail mill No. 1 and the structural mill, giving employment to 2000 men that had been idle since spring.

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Tin Ore Equivalent to 84 Tons of 60% tenor, was produced in the United States in 1913. Most of this was taken out by the York Dredging Co., according to the U. S. Geological Survey. The consumption of the United States was estimated at 53,315 tons during the said period.

Editorials

The Porphyry Coppers

The reports of the porphyry copper-mining companies or the third quarter of 1914 have lately been coming in, nd are particularly interesting for what they show as to he effect of curtailment upon cost of production. Let it be noted, however, that the curtailment was not inaugurated until after the first month of the quarter had passed.

Utah Copper Co. milled in the third quarter 1.466,606 ons of ore, as compared with 2,006,157 tons in the second quarter. The average grade of the ore and percentage of extraction in milling were practically the same in the two quarters, being respectively 1.4356% and 68.13% s compared with 1.4573% and 68.44% in the second quarter. The average cost per pound of copper in the third quarter was 7.76c., compared with 7.539c. in the econd quarter. Messrs. MacNeill and Jackling in their report remarked that, considering the circumstances, the cost of production in the third quarter was quite satisfactory, "lower in fact than was to have been expected."

Chino milled 390,000 tons, averaging 2.165% copper, and yielding 68.04% in the third quarter, compared with igures of 587.900, 2.165%, and 66.89%, respectively, in he second quarter. The average cost in the third quarter was 7.81c., compared with 7.66c. in the second quarter. This was on milling ore alone. The payment for the first ime for some gold in the concentrates and the increased shipment of smelting ore made the average cost of all he Chino copper a little less in the third quarter than n the second quarter. However, the results from the milling ore alone are the ones upon which attention should be fixed. The important increase in the mill extraction is suggestive. Does this mean that a better result was obtained in driving things not quite so fast?

Ray milled 546,734 tons, averaging 1.691% copper, with a mill extraction of 67.17%, as compared with 761,-040 tons, averaging 1.786% copper, with a mill extraction of 68.69% in the second quarter. The cost of production per pound of copper in the third quarter was 8.819c., an increase of about 0.2c. over the second quarter. In this case there was not only a smaller tonnage of ore milled, but the ore was of lower grade and the percentage of mill extraction was lower. The cost of mining and milling per ton of ore was materially reduced.

Nevada Consolidated milled 599,126 tons of ore, averaging 1.52% copper, compared with 831,589 tons, averaging 1.38% copper, in the second quarter. The average cost per pound of copper was 9.59c., compared with 10.73c. in the second quarter. The improvement in the grade of the ore milled is, of course, an explanation of the reduced cost of production per pound of copper.

Miami has not yet published its figures, but it is understood that its cost of production in the third quarter was about as low as anything recorded previous to the curtailment. Here, again, there was an improvement in the percentage of mill extraction, and in this case the improvement was very great and is attributed largely by the management to the reduction in the intensity of the rate of milling.

Let it be noted that in giving these cost figures we have reference only to direct operating costs, no allowance for amortization of plant or interest on capital being included. It is evident from these figures that drastic curtailment has not greatly increased cost of production in any case, while in certain cases there have been decreases.

It would be easy from *a priori* reasoning to draw the deduction that such a result might be ascribable to the selection of a higher grade of ore than the average, or to the improved extraction in milling by reason of less intense operation, but the evidence that we now have does not warrant anything of that kind, although in certain cases those have been decisive factors. The only general deduction that is permissible, we think, is this: The porphyry coppers are conducted on so enormous a scale that even the smallest of them is far beyond the size of the unit of maximum efficiency. It is well known that in most kinds of mining and metallurgical work there is a unit of maximum efficiency, beyond which nothing is gained in the quotient by increasing the divisor. In the matter of fixed charges and general expenses, the quotient is, of course, directly affected by changes of the divisor, but in the cases of the porphyry coppers the divisors are always so big that the quotients are always small anyway, and the changes are but trifling. When the curtailment was inaugurated early last August, the question of its probable effect upon operating costs was discussed by mine managers with a good deal of fear and trepidation. It is gratifying to everybody, but especially to the managers and the stockholders of these companies, that the actual result has proved to be so much better than anybody expected.

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A Coming Revolution in the International Zinc Business

We have lately hinted several times about important developments pending in the zinc industry. Something more definite may now be revealed. The Australian production of zinc ore has heretofore gone to Germany for smelting. The war interrupted that business, and that interruption, temporarily very inconvenient to the Australian producers, inspired new plans, as a result of which Germany will lose this smelting business permanently.

Negotiations are now in progress between the Zinc Corporation and other Australian producers for a combination of their interests in the smelting of their output. Negotiations are further in progress whereby the American Smelting & Refining Co. will unite with these Anglo-Australian concerns for the erection of new smelting works. The Australian ore has been in recent years the largest single source of spelter in the world and the smelting of it has been the mainstay of the German ore-smelting business. The impending change will, therefore, constitute nothing less than an industrial revolution.

We understand that the terms practically have been agreed upon, but have not yet been signed, although consummation is expected shortly. The new smelting company will have something like 1000 tons of zinc concentrates to smelt daily, besides a large tonnage of lead concentrates. Certain seaports in Wales and certain seaports on the Atlantic Coast of the United States are being considered as places for the new smelting works. The conditions on each side of the Atlantic already have been carefully considered by the engineers of the projectors, and are now the subject of further consideration, no decision having yet been made. We think, however, that at present there is a leaning toward the American side of the Atlantic. If this should be the decision, the Panama Canal will have been a strongly contributing factor. If this development comes about, the United States will become the predominant factor in the zinc-smelting industry of the world, and New York may surpass London as a primary market for spelter the world over.

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Licensing Engineers

Hearings are being held at Pittsburgh, Harrisburg and Philadelphia on a bill which is to be introduced in the Pennsylvania Legislature providing that engineers must be licensed by a state examining board before taking charge of any engineering work in the state. The bill is general in its character and applies to all classes of engineers—civil, mining, electrical and mechanical. It has been prepared by a commission appointed a little over a year ago by Governor Tener, the members being Prof. John P. Jackson, of the State College; Samuel A. Taylor, George S. Webster, F. Herbert Snow and J. Murray Africa. Of these, Professor Jackson is the best known in the engineering world. Such accounts as we have seen of the hearings already held seem to indicate that engineers generally have not taken as much interest in the proposed law as might have been expected.

At Pittsburgh those who did appear were generally opposed to the bill, some urging that it is unnecessary and that it would impose unreasonable requirements upon engineers; others intimating that it would have a tendency to bring the engineering profession in Pennsylvania into politics, and expressing fear that the examining board might be too political in its constitution.

It is to be hoped that more interest will be taken in the later hearings and that engineers will take some pains to see that at least a good working law may be presented to the next Legislature, which, it is thought, will be very likely to pass any bill which may have the approval of the commission and the governor. Even those who are opposed to any enactment of the kind must see that if there is any probability of its passage it would be much better to have it put into reasonable and fitting shape, so that it may not be unjust or oppressive to the profession.

The licensing of engineers is not a new proposition, though we do not remember that it has ever been brought up before in Pennsylvania. Bills providing for such licenses have been before the legislature of New York several times, and though none has been passed, the probability that a law would be enacted has been so strong that the large engineering societies have taken the matter up, with a view to putting such law into the best possible shape, as we have said above. Of course, it comes under the police power of the state, and the legislature may prohibit unauthorized persons from acting as engineers in the design, construction and operation of buildings, mines, etc., just as it can—and does—prohibit unauthorized persons from acting as physicians, or in another grade, from operating steam engines and boilers.

The present tendency is to regulate all professions, and perhaps the wonder is that a class so prominent as engineers should have been exempted from special rules so long. In Pennsylvania, for instance, the mine foreman, the fireboss, and even the miner have to pass some kind of an examination and receive certificates before they enter on their work. It would seem, then, not unreasonable that the mining engineer, who lays out the mine, decides on its equipment of machinery and plans its ventilation, should be called on to prove his competence before proper examiners.

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Good Metallurgical Efficiency

The excellent work that has been done at the Granby smelting works at Grand Forks, B. C., during the last fiscal year, is revealed in the company's annual report recently issued. Last year 1,225,745 tons of ore were treated at this plant at a cost for smelting and converting of $1.28 per ton. This is slightly lower than the record of any former year, according to W. A. Williams, superintendent of smelting works. The metallurgical losses were the same as during the previous year, while the silica in the slag was higher. Careful metallurgical work and unremitting attention to details are also evidenced in the excellent operating record, which shows that out of a possible eight furnaces running 365 days, an average of 7.93 was operated last year. The superintendent, W. B. Bishop, and his staff are to be congratulated on these results, as are also the Granby stockholders.

Another interesting report of metallurgical efficiency comes from Cherryvale, Kan., where the Edgar Zinc Co. has three furnaces out for repairs after a campaign of eight years. This is something extraordinary in the annals of zinc smelting, and is an interesting testimonial to the good work of the late J. C. Dodd, a former manager of the plant, who built and operated these furnaces.

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The purchasing of military supplies by the European governments appears to be conducted in a singularly inept and inefficient manner. We understand that each one of the allies has its own purchasing commission at headquarters, and has its own subordinate commissions in this country. Instead of there being any effort to pool issues, the buyers for the respective governments actually bid up prices against each other. These buyers, moreover, do not seem to know how to go directly to the producers, from whom they can buy most cheaply, but employ middlemen, who are reaping great profits. Overtures about this military business come to the producers through some very peculiar quarters. If commercial business were done in this way, merchants would shrug their shoulders; that the military business is so conducted appears to be simply a case of stupidity. With the present organization of business in the staples, there is no need to pay big commissions to brokers and middlemen. Is the cost of the war so light that Great Britain, France, and Russia can afford to throw away money?

BY THE WAY

Part VII of the series of articles on Modern American Rock Drills is omitted for lack of cuts, and will appear n the JOURNAL of Dec. 5.

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In a recent issue of the New York *Times* there appeared on the first page an important announcement regarding a new type of submarine to be built for the United States Navy. In describing this wonderful fleet-submarine it is stated, "The motive power will be Diesel *nternational combustion* engines."

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The good story about the snakes of Ireland has some excellent paraphrases. One of the best is due to the late George W. Maynard, who told of the territorial secretary n the early days of Arizona, who received a voluminous blank form from one of the departments in Washington headed "Fish Statistics." The territorial secretary of Arizona was requested to fill this out. He returned the blank to Washington with the following indorsement: 'The last known fish in Arizona was seen about 10 years ago going up the dry bottom of the Hassayampa River, with a canteen under his fin, looking for water."

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At the meeting of the New York Section of the Mining and Metallurgical Society, Nov. 19, Prof. J. F. Kemp delivered a masterly address, reviewing the theories of ore deposition. In the course of this he genially referred several times to Prof. Joseph LeConte, as "Uncle Joe," and to Prof. John Newberry as "Uncle John." In takng up the important work of Prof. J. H. L. Vogt, of Christiania, Norway, Professor Kemp said that Professor Vogt was a dear friend of his, and he told of visiting him n Christiania. It appeared that Professor Vogt was the guide, philosopher and friend of all his students. They went to him with all their troubles, consulted him about getting married, and when necessary borrowed money of him. "Vogt, what kind of a professor are you?" asked Kemp. "Well," said Vogt, "there are two kinds of professors. One kind are privy councilors, the other kind are uncles.' I suppose I am an uncle." We may add that Professor Kemp is one of that kind, too. We are quite sure that when he is a little older, some of the young felows will be referring to him as "Uncle Jim."

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"Leeches," writes an Arizona engineer, "are not confined to the *genus Hirudo* mentioned in our zoölogies. There are other varieties; the mining and metallurgical eech, for example. Some operators do not contribute one ota to technical literature, yet they and their technical staffs scan closely the pages of all the technical journals for possible improvements or results of experiments which have been contributed by their confreres. But they recognize no obligation to contribute their share to this fund of technical experience. . . . Their church apparently eaches that it is more blessed to receive than to give." There are undoubtedly a few companies that operate on the principle of taking all and giving none, but the stigma ies, we believe, with the directors of these operations and not with the members of their technical staffs who are frequently restrained from announcing the results of their research or practice by the take-what-you-can-get-but-give-nothing policy of the company. However, there have been engineers and metallurgists who have had the courage to insist on their right to promulgate purely technical information, and we know of several instances where engineers declined to mortify themselves by asking information from other operators or visiting other works, while their companies would not reciprocate.

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The war recently raging around Antwerp brings to recollection many historical occurrences in connection with that city's varied existence, says the *Brass World*. In 1576 Antwerp was the richest city on earth and one of the strongest. The Duke of Alva, commander of Spain's conquering armies, made it his seat of power. His failure to pay his troops stationed at Alost caused a mutiny and in the autumn of that year several thousand Spanish soldiers entered Antwerp and sacked it. From Nov. 3 to Nov. 6, a scene of unimaginable horror was enacted. At the end of the fighting, the mutineers had slain 9000 of the city's citizens and soldiers and had seized $15,000,000 in money, jewels and other treasure. The conquerors found themselves enormously rich and proceeded to dispose of their wealth in many strange ways. For instance, one private soldier gambled away 10,000 gold pieces in a single morning. Another, more thrifty, forced an Antwerp goldsmith to fashion his stolen gold coins into a suit of armor, a sword, scabbard, buckles, etc. Anticipating the popularity of a black-nickel finish, he had his armor, gilt-and-guilt-begotten, painted black to look like iron, so that he would not be robbed. When, months later, he tried to sell his precious armory, he found that the goldsmith had made an alloy and had kept for himself most of the gold. Thus has mind always triumphed over matter and a little knowledge of metallurgy proved to be profitable.

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Our British friends who have been anxiously peering upward to discern the new Zeppelins that the "Most Dangerous Spy" has described to them, may be relieved by some common sense and scientific knowledge expressed by Sir William Ramsay, who says in a letter to the London *Times*: "Reports founded on statements in a book named 'The Secrets of the German War Office' are current that new Zeppelins are to be launched by the Germans, containing a gas 15 times lighter than hydrogen, and made of a metal as rigid as steel and three times lighter than aluminum. As regards the first statement, little would be gained by filling an airship with a gas of no weight at all, if such a gas were possible. The buoyancy of a balloon is due to the replacement of air by a gas, hydrogen, 14½ times as light as air. If the imaginary gas had no weight at all, the buoyant power would be increased only to 15½, instead of 14½. As for a metal existing of which the density is only one-third that of aluminum, chemists would agree that it is in the highest degree improbable that such a metal exists. There are excellent reasons for believing that no light metal remains to be discovered." Some critical persons may be disposed to say that sodium (sp.gr. 0.97) is about one-third the density of aluminum; potassium (sp.gr. 0.865), less than one-third; lithium, about one-quarter. But none of these is of any great strength, resistant to corrosion or of good working qualities. We would go miles to see a potassium-sheathed Zeppelin hit a first-class rainstorm.

PERSONALS

Karl Eilers has returned from an extended trip of inspection through the West.

Ex-Senator W. A. Clark, of Montana, recently visited his Sunset mines near Wallace, Idaho.

H. E. Tuttle, assistant general manager of the Edgar Zinc Co., has resigned that position.

Arthur Feust, superintendent of the Cedro mine in Nicaragua, is returning to the mine from New York.

R. B. Lamb has returned from Renfrew County, Ont., after examining molybdenite deposits, and is now in Cobalt.

George O. Argall and Gilbert Rigg have been elected to membership in the Mining & Metallurgical Society of America.

Morris B. Evans is in charge of construction of the new cyanide plant of the Javali & Escandalo Mining Co. in Nicaragua.

A. G. Burrows, of the Ontario Bureau of Mines, has returned to Toronto after several months in field work in the Porcupine gold district.

Cyril Knight, assistant provincial geologist of Ontario, has returned to Toronto after spending the season mapping pre-Cambrian areas north of Lake Huron.

W. B. DeWitt, for several years foreman at the Queen stamp mill, Sheep Creek, B. C., has leased the Ore Hill and Summit gold properties, situated in the mountains a few miles above Sheep Creek.

C. Vey Holman, of Caribou Gold Mines, Nova Scotia, formerly state geologist of Maine, has been elected a life member of the Association of Harvard Engineers. Mr. Holman was a member of the class of 1882 of Harvard College.

Erskine Ramsey, vice-president and chief engineer of the Pratt Consolidated Coal Co., was recently injured at the launching of the first coal barge of his company near Tuscaloosa, Ala. He is reported to be making a good recovery.

J. P. Lake, formerly with the San Carlos mine, has succeeded George Fairbairn as manager of the Babilonia Gold Mines, Ltd., in Nicaragua. He has started the new cyanide plant working the old tailings dump, while the mine is being unwatered.

J. D. Galloway, assistant to the provincial mineralogist for British Columbia, has returned to Victoria after having spent the greater part of the field season of this year investigating mining conditions in country through which the Grand Trunk Pacific Ry. passes.

E. Gautard arrived in New York recently from Paris. He was formerly superintendent of the Schneider Works, Creusot, France, where most of the French heavy armament is made. At present he is consulting engineer to that company and is empowered to make purchases.

Dudley Michel, instructor in First Aid to the Injured for the British Columbia Department of Mines, who has been engaged in his duties among metal miners at a number of mines in West Kootenay and Boundary districts, recently went from Rossland to Kimberley, East Kootenay.

W. B. Bishop, superintendent of the Granby Consolidated Co.'s copper-smelting works at Grand Forks, B. C., has gone to the company's new smeltery at Anyox, Observatory Inlet, to take charge of copper-smelting operations there during the absence for a time of T. Wakely A. Williams.

Walter Harvey Weed, who purchased the Horace J. Stevens "Copper Handbook" business, following the death of Mr. Stevens, and has continued the business at Houghton, Mich., since that date, has determined to move the office of publication of the "Handbook" to New York and the work now is under way.

Prof. Robert H. Richards will be tendered a complimentary dinner in Boston on Nov. 27, in recognition of his 50 years' service as a devoted alumnus and teacher of the Massachusetts Institute of Technology, and in expression of the respect and affection in which he is held by the corporation, faculty, and alumni of the institute.

W. G. Trethewey, discoverer of the Trethewey and Coniagas silver properties at Cobalt, has joined the airmen's corps for service in the British expeditionary force. Mr. Trethewey has been a liberal subscriber to war relief funds and has placed his yacht, on which he was cruising in the Mediterranean when the war broke out, at the disposal of the Admiralty.

Owing to the consolidation of the Raritan Copper Works with the Anaconda Copper Mining Co., the latter's special laboratory at Perth Amboy, will be closed and Dr. Edward Keller, for 22 years the metallurgical representative of the company, will take charge of the sampling and chemical departments of the Raritan Copper Works. Mr. Andrews, heretofore in charge of the chemical department, has been placed in charge of the casting-room of the works.

OBITUARY

Otto Koehler was shot and killed at San Antonio, Tex. Nov 12. He was 58 years old, born in Germany, and had lived in the United States 40 years. He made a fortune in the brewing business at San Antonio, a large part of which he invested in Mexican mines.

James Ray Whipple died at Niles, Calif., Nov. 7, aged 41 years. He was born in Alameda County, Calif., graduated from the University of California in 1903, and immediately went to Alaska, where he was connected with the Eagle, the Kensington and the Perseverance mines, finally becoming assistant manager of the Alaska Gastineau Mining Co. He was in charge of the construction of that company's mill at Sheep Creek until September when illness compelled him to go to California for treatment. He was well known in Juneau, where he had lived for 11 years and was highly esteemed by his friends and associates.

SOCIETIES

Society of Chemical Industry—A meeting of the New York Section was held at Rumford Hall, New York, Nov. 20. The program for the evening was: "Manganese Steel," by John H. Hall; "Titanium and its Effects on Steel," by George F. Comstock.

Canadian Mining Institute—A meeting of the Toronto Branch was held at the Engineers' Club, Oct. 31. The following officers were elected for the ensuing year: Chairman, A. J. Young; secretary, R. E. Hore; executive committee, F. C. Loring, Dr. W. G. Miller, C. E. Smith, D. A. Dunlap, Jas. McEvoy, H. E. T. Haultain and J. P. MacGregor.

American Institute of Mining Engineers—The first meeting this year, of the Chicago Section, organized last winter, will be held on the first Friday in December at the Chicago Engineers' Club. The principal subject of the meeting will be the potash and carnotite industries as affected by the war H. W. Nichols, assistant curator of geology, Field Museum of Natural History, Chicago, is secretary and treasurer of the section.

American Institute of Chemical Engineers—The annua meeting will be held in Philadelphia, Dec. 2-5, with headquarters at the Hotel Adelphia. The meeting will include business and technical sessions and visits to chemical plants. Among the papers scheduled which are of especial interest are the following:

"Ore Flotation, a New Hydrometallurgical Development." Illustrated by demonstrations of working models. Dr S. P Sadtler and S. S. Sadtler.

"Hydrometallurgical Apparatus and Its Use in Chemical Engineering." John V. N. Dorr.

"The Chemical Industries of Japan." Illustrated with lantern slides. Jokichi Takamine.

"Feldspar as a Possible Source of American Potash." Dr Allerton S. Cushman and Dr. George W. Coggeshall.

American Mining Congress—The Utah Chapter of the American Mining Congress meeting at the Commercial Club, Salt Lake City, Nov. 13, adopted an appeal to the United States government protesting against the making of copper contrabrand of war. The meeting was presided over by George H. Dern. R. C. Gemmell presented the resolution, which approves a resolution adopted by the Commercial Club on Nov. 12, in which is set forth the great loss and injury already suffered on account of the inability of copper producers of the state to export copper, owing to war conditions existing in Europe, and the disaster which will ensue to the entire people of the state of Utah, if such conditions shall continue; the government of the United States is requested to use its good offices to assure to the producers of copper the right to export the same in neutral ships to neutral ports. A copy of the resolution has been sent to the Secretary of State.

Editorial Correspondence

BUTTE—Nov. 19

The Exposition at San Francisco, as well as that at San Diego, will present excellent mineral exhibits from Montana. Manager E. P. Mathewson, of the Washoe works, was to leave for California, Nov. 21, to make arrangements for installing them, and also the exhibit of the Anaconda company in the main building at San Francisco. The Anaconda company will show all the stages and processes of copper production, concentration and smelting. W. A. Clark will have an exhibit covering the zinc industry in all its details and the East Helena smelting plant will show its materials and products.

The Unions are showing renewed activity. A committee of three of the Butte Mine Workers' Union has been calling at some of the mines, advising miners to pay up their dues, but using no violence or threats. Mining companies do not allow the committee to approach the shafts, but on the night of Nov. 11 the committee met the miners on the railroad track some distance below the North Butte mines as they were going on shift. The men were not stopped but the committee spoke to each as he passed. In the same manner a number of men going to work at the Anaconda mines were accosted. The committee also visited the Leonard mine, where the same method was employed. The miners spoken to made no comment and most of them did not reply to the suggestions offered. The old union of the Western Federation, at a meeting held in Butte, Nov. 17, addressed a resolution to President Wilson asking for Federal supervision of mining. The President is urged to recommend at the forthcoming session of Congress the enactment of a law declaring coal and metal mines and smelting plants, engaged in interstate commerce, to be public utilities charged with the public interest, and providing that whenever a dispute shall arise between an employer and his employees in these industries, upon application of either party, a representative of the Department of Labor shall proceed to take charge of the property and operate it in strict compliance with the state laws, paying wages obtaining at the inception of the dispute, accounting for all receipts and expenditures, but making no remittance to the employer until the dispute shall be adjusted, when, if any increase shall be granted the employees, it shall apply from the inception of the dispute.

Railroad Developments in Montana contain elements of interest to the mining industry. It is reported that the work of electrifying the Milwaukee from Harlowton, Mont., to Avery, Idaho, started last spring, but discontinued in July, will begin again at once. It is stated that the contract for the work between Deer Lodge and Three Forks has been let to the Montana Power company, 114 miles out of the total of 485 to be electrified. At the time work was stopped a number of jurisdictional labor disputes had arisen. The question was brought up as to whether or not men who were employed in digging post-holes and placing the posts in position were entitled to the wage scale paid electricians or should come under the head of the workingmen ordinarily employed in such work. The difficulty was recently put up to the electricians and straightened out. The completion of the line between Deer Lodge and Three Forks by next spring will be followed, it is expected, by the extension of electrification to the rest of the division. It is reported also that electrification of the Great Falls terminals will follow.

Control of the Gilmore & Pittsburgh road in Montana and Idaho has been obtained by the N. P. This road recently completed is said to have cost $15,000,000. Its purchase gives the Hill system a less expensive and quicker route to San Francisco. The plan is to build south from Butte to Armstead through the Wise River country, over the Grasshopper Range into Idaho and then meet the Gilmore & Pittsburgh tracks. From the southern end of the Gilmore & Pittsburgh an extension is to be built to the Western Pacific, which is controlled by the Hill interests and which takes the Hill freight across Nevada, and then connection is to be made with another Hill line to San Francisco.

Madison County is experiencing a mining revival. Mining men have turned their attention to the possibilities of developing the mineral resources in Goodrich and Bear Gulches, eight miles north of Twin Bridges and in the little camp of Rochester, 12 miles northwest of Twin Bridges.

The Rochester Camp has the Watsecca mine, in years past a producer of gold-lead ore, with a credit mark of more than a million dollars. Owing to water troubles at depth, this pioneer producer was closed down nine years ago, with large ore reserves in the lower workings. The Corbin Copper Co. of Butte ceased operations six months ago on account of the water problem. Rumors assert that negotiations are under way for the purchase of these two properties and the holdings of several other claim owners.

In Bear Gulch the properties developed by Messrs. Higgins and Bielenberg have shown the presence of gold, copper, silver and lead ores, requiring the installation of a modern amalgamating and concentrating plant. The indications are highly promising and point towards the making of a great producer within a short time. The Florida-Giant Mining Co., under the management of C. M. Lane, is developing another promising property, showing large bodies of high-grade gold ores for the treatment of which a cyanide plant is now being installed. Among the stockholders of this company is J. B. Foraker, son of Senator Foraker of Ohio. The Moffat Tunnel company is pushing development work at its property under the supervision of Joe Moffat. An extensive tonnage of copper ore has been blocked out.

The Goodrich Gulch district also has come into the limelight, rich gold ore being extracted from a narrow vein on the Little Goldie claim, operated by Messrs. M. R. and Joe Ostronick. This has started development work on several other quartz properties along and near the gulch. The Grand View Mining Co., headed by H. Schmidt and associates, is driving a long tunnel on its property on Bald Mountain at the head of the gulch. Goodrich Gulch, besides its quartz properties, contains a large area of placer ground. The estate of N. Vallentine, of New York, and L. G. Adams and Frank C. Lavigne, of Spokane, own 21,000 ft. along the bed and rim of the gulch. In addition to the present equipment $25,000 will be spent next season to start production on a large scale. This placer mining enterprise is the work of Mr. Lavigne, a successful mine operator of high repute.

SALT LAKE CITY—Nov. 19

In the Suit brought by Utah Copper against Salt Lake County, the United States circuit court of appeals, at St. Paul has reversed the decision of the local Federal court, according to which the company was granted judgment of $29,000 for taxes paid under protest. The court of appeals has remanded the case for a new trial, unless within 60 days the company shall accept $1766 as satisfaction of the judgment. Utah Copper, in 1912, sued the county treasurer for recovery of $36,000 in taxes alleged to have been paid on an excess assessment on the net proceeds of mines, made by the state board of equalization. The company contended that the cost of improvements at the Magna and Arthur mills, and the cost of stripping, new rights-of-way, etc., should be deducted from the gross proceeds of mines, to arrive properly at net proceeds before levying assessment. The county held that these costs were in the nature of permanent improvements, adding to the intrinsic value of the property. Another suit of the same nature, for $31,000 for taxes paid under protest in 1913, is pending between the company and the county. Taxes for 1914 have also been paid under protest.

SEATTLE—Nov. 18

At Nome a good deal of complaint has been voiced over the failure of some of the operators to pay their men. In some cases this seems to have been caused by the failure to extract enough gold wherewith to pay and in others it is the result of a disinclination to give up any proceeds once obtained. Some men have not been paid at all, others have a part of their wages owing; one man has $1000 due him. A certain dredge is reported to have made an extraction of $160 for the season but this may be too high. It is stated the promoters of this enterprise intend to sell stock on the Outside this winter.

The Government Railroad in Alaska will pay for itself according to Thomas Riggs of the Engineering Commission. he states that exclusive of coal which may be hauled for the army and navy and for private consumption, the proposed road would carry enough other freight and passengers to pay for the entire cost of the project. The figures on possible freight, carefully compiled by the members of the Commission, when embodied in the report, will doubtless have their effect next year, when it is expected that a fight will be developed in Congress against the appropriation of the $35,000,000 necessary to complete the construction. Fairbanks alone, according to Mr. Riggs' figures, will provide more than 15,000 tons of freight, exclusive of coal. One of the greatest possibilities for freight development, he stated, is the haulage of coke for a smelting plant that probably will be constructed as soon as such coke is available. The Prince William Sound ores furnish all the fluxes necessary for successful smelting operations and the installation of a reduction plant and a railroad will relieve the independent miners from the excessive transportation charges incurred in carrying their ores to Puget Sound. Many low- and medium-grade mining properties which are now inoperative would then become producers.

A New Bunk House of the Alaska-Juneau is about finished in Last Chance Basin. The house was erected by the A. W. Quist company, of Seattle, and nothing looking toward the comfort of the men has been overlooked. It is three stories in height with shower and tub baths and toilets on each floor. The rooms are all 12x12 ft. and contain two beds each, of iron hospital style, equipped with springs, mattresses, pillows, pillow cases and comforters. Each room has two windows and a transom, and is furnished with shelves, clothes hangers, tables and chairs. A small rug is placed on the floor in front of each bed. Steam heat and two lights with 10-ft. extensions, allowing for individual reading lights, are in each room. The company furnishes everything, including changes of bed linen twice a week and a full janitor service, at an average price of $4 per month for each man. The floors in the halls are covered with linoleum. Separated from the main building by a few feet are the heating plant and change room and the kitchen and dining room. The dining room is 25x53 ft. and will seat about 125 men at a sitting, which will accommodate all the men occupying the bunk house at present. The kitchen is large and commodious, with plenty of light, and as everything is off the floor, it can be kept perfectly clean. It is equipped with a three-oven Lang hotel range. Opening off the kitchen is a large pantry and storeroom. The heating plant is in a separate building 24x66 ft., with a concrete foundation. It is equipped with a 36x75-in. grate, American Ideal boiler, which will furnish hot water for the baths and for heating purposes. The change room is situated at one end of the heating plant building and will be equipped with individual lockers. A large breakwater is being constructed just above the bunk house to keep Gold Creek from flowing under the house and making it damp. The house is fitted with a sprinkler system for fire protection.

At Fairbanks many outfits are preparing for winter work. The lower end of Fairbanks Creek will be especially busy, a number of operators taking out winter dumps, with others preparing to opencut next summer. On 21 Below, McNamara & Polson will prospect all winter, and if conditions warrant, will work the ground extensively next season. At the mouth of the creek, Mike Stiepovich has just completed a three-mile ditch, and will put an opencut plant on his ground in the summer. On 15 Below, the Number Fifteen company expects to take out a good-sized dump. Stewart, Larson & McGillivray, on 18 Below, have started prospecting and in the spring will put on a big crew of men. Wilhelm (Bill) Gertz and partner, on 8 Below, will take out a dump during the cold months. On the same claim, the McClellans will also work all winter. On the upper end of 7 Below and the lower end of 6 Below, Ludwig Johnson is prospecting, with a view to putting in an opencut plant. While there are no operators on 5 Below at the present time, several people are reported to be looking over the property, and may put a plant on the ground within a short time. John Griffin and Charles Grille are going to opencut on 4 Below next summer. On 3 Below, John Hermansen, during the winter, will take out a pillar left by Charles Larson. On 2 Below, John Griffin and Charles Grille are prospecting with a hand-drill, preparing for opencut work. Jacobson & Pearson, on 2 Below bench, are reported to be preparing to take out a dump. On discovery, there will be four different outfits working. Anderson and Coal Oil Johnson, Ed Johnson and John Shrivers, Charles Wilde, and John Green and partner will take out dumps. Eagan & Griffin have contracts already for 3000 cords of wood, and expect to land a few more before there is enough snow on the ground to haul it. They have sublet one contract for 500 cords to P. H. Thelin. In addition to the wood to be hauled for the placer operators, Eagan & Griffin have a contract for 700 cords to be delivered to Crites & Feldman, the quartz men.

RENO—Nov. 19

Sentenced for Arson at Tonopah, Nov. 16, after confessing, Boris Thomassen was given 20 to 21 years in prison. Thomassen confessed setting the fire that destroyed the Nevada Theater and numerous other buildings, Oct. 29. He is a member of the I. W. W. His confession and dictograph records, taken while he was confined with other suspects arrested at the same time, it is stated, implicate several other members of the organization.

Prospecting in Nevada looks rather attractive now, especially since certain minerals, of which there is a limited supply in this country, have increased in value. Heretofore, prospecting has been confined almost exclusively to gold, silver and copper, and over most of the state has been carried on for these only superficially, higher-grade deposits alone being worked. As proof of this, there may be cited the recent gold discovery four miles north of Tonopah and the revival of the old mines of Aurora, now being worked for low-grade ore. Southern Nevada should be an exceptionally good field in which to prospect for the precious metals, and prospecting has been stimulated recently by the discoveries of platinum in gold ore. Systematic prospecting for zinc, which is being produced in important quantity in one district, should disclose many other deposits of commercial grade. Mercury is being produced in Nye County and ore has been found in several places in Humboldt, Mineral and Nye Counties; in fact, a mineralized belt extends from Humboldt into Nye, which should be carefully prospected. The early reports that the price of antimony would rise considerably led to the immediate resurrection of one old mine and the discovery of a new deposit, said to be of commercial grade and to be exceptionally free from harmful impurities. It is doubtful if the value of manganese has ever been thought of by prospectors in Nevada. The search for potassium salts has not been abandoned by the U. S. Geological Survey, and efforts in that direction are also being put forth by individuals. The latter will undoubtedly be encouraged by the success of American Trona in California. Large deposits of barytes, marble, building stone, lime and shale for cement, etc., are known to exist, but for these there is no local market and transportation facilities are inadequate. For the same reasons, no doubt, iron has been neglected, but in this case the means of transportation would be forthcoming if ore in sufficient quantity and of required grade were found While the probability of finding good coal is not great, the reward would be so substantial that more effort might be profitably expended on this form of prospecting. The rewards to prospectors in Nevada in the past have been great, but the field is still so large that future efforts, if applied along systematic and scientific lines, should meet with equal success.

HAILEY, IDAHO—Nov. 19

The Wood River district in general is thriving. The Pulaski Mining Co., operating the Noonday properties near Ketchum, has just completed the test run of the new mill designed by J. M. Callow and built by the General Engineering Co. of Salt Lake City. It was accepted and is now off for a steady run. There is about two years supply of ore in sight The gold is recovered in the form of concentrates on Wilfley tables and vanners. Crushing to 20 mesh is accomplished with a ball mill. The capacity is 25 tons of ore a day. The Independence Mining Co. has closed down for the year, leaving the orebodies in better shape than at any time in the history of the property, after the season's extraction of silver-lead ore. The mill operated steadily and the concentrates averaged 65% lead, 110 oz. silver and $15 gold. Superintendent Allen got disgusted with the market for metals, and deciding to shut down rather than to sacrifice his resources. A new shaft is being sunk from the 500 level, an underground station having been cut. Progress for 150 ft. shows a continuous streak of ore from 18 in. to 4 ft. in width, more than half of it first-class.

Leasers on the several old properties in the Smoky district are all in from their season's work, leaving their product mostly on the dump and in the bins. Zinc is the predominant metal there, and its recovery is easy, since it is a clean sulphide, but the market was too rapid and the boys lay down and started a watchful waiting game; they are taking the winter for it.

It is understood that engineer Robert T. Tustin has, after considerable delay, been able to conclude a bond and lease on the famous Crœsus gold and copper mine, four miles south of Hailey. This property has been a large producer, and on the 700 level there has been encountered a vein parallel to the gold vein but dipping opposite to it, i.e., to the north. It shows lead-silver ore, varying from 2 to 12 ft. between the walls, and accompanied by massive siderite. The 800 and 850 levels have been opened on this vein and stoped for a part of the way; the bottom of the 850, the lowest working in the mine, was recently sampled by some engineers, one of whom let slip the word that for a distance of 185 ft., the track was torn up in order to cut trenches every 5 ft., and that the average width of the streak for the entire distance was 11 ft. a good part of it first-class ore, carrying besides the usual percentage of silver for each unit of lead, from $2 to $6 in gold. It is reliably stated that the foot-wall discovery of the continuation of the Crœsus gold vein, on the 800 level indicates virgin territory east of the shaft between the 400 level and the discovery on the 800. A serious disturbance occurred at the 400 level and desultory work failed to reveal the continuation of the vein on its dip; this was offset to a great extent by the coming in of the lead vein. It was while working on the latter that the gold vein was recovered on the 800. A fair sampling has, according to report, showed an exceedingly high average tenor. The gold is contained in a tough pearly quartz accompanied by iron pyrites. The Kilpatrick brothers, of Beatrice, Neb., own the controlling interest in the Crœsus. The property is equipped with a modern mill operated by electric power. It is stated that an offer for the property of $250,000 was refused at one time, and it is supposed that Mr. Tustin, who is a keen buyer, has had to meet that price or something like it. It is stated that a full crew will be put on duty for 24 hr. a day, beginning about Dec. 1.

The Minnie Moore Mines Co., at Bellevue, under the management of Irvin E. Rockwell, has operated its mill during the year on low-grade silver-lead-zinc ores from the Queen shaft, making a successful separation of the two metals, shipping a 44% zinc product and a 60% lead product carrying 80 oz. of silver. It is stated that but for the entanglements of title surrounding a minority interest in the group of claims, an attempt would be made to put the property on a substantial basis. Much will depend also, it is stated, on the future of the zinc market, since the product will not yield expenses and a profit without a normal price for the concentrates. In the meantime the operation has been closed indefinitely.

Development work on the Eureka Development Co.'s properties in the Bullion district has been continuous during the summer and will be continued throughout the winter. It is in charge of W. A. Wilson, of Salt Lake City. This property when producing yields high-grade silver-lead ore. Explorations are being directed toward other possible oreshoots to the east of the main vertical shaft, toward the old Idahoan ground, which was one of the famous producers of the Wood River region during the '80s, when the Bullion district as a whole yielded almost $20,000,000 in silver and lead in about six years. The Mayflower, Jay Gould (formerly owned and operated by the gentleman of that name) Bullion, Red Elephant, O. K., Durango and some smaller groups all faulted within 300 ft. below grass roots and were abandoned during the silver panic. Since then no persistent attempt to open up these properties has been made until Mr. Wilson tackled the Eureka which, however, lies on a vein system parallel to these great producers and on the foot-wall side.

DULUTH—Nov. 21

The Hill Interest plans for the Hill holdings continue to attract attention. It is rumored, with some apparent foundation, that M. A. Hanna will act as the Great Northern's sales agent. It is the intention of the Hill organization to push development work so that the ore tonnage hauled by the Great Northern will suffer no shrinkage.

HOUGHTON—Nov. 21

The White Pine is exceedingly rich, according to the stories coming from the miners working there. Miners who were transferred there from the Calumet conglomerate say that in some respects the White Pine is even better than the conglomerate, considered the richest lode in the district. The Calumet officials, however, do not show any undue excitement or enthusiasm. They point out that while the lode is rich, it is faulted and broken and worst of all, it is exceedingly narrow. Furthermore the mining is expensive. On the other hand the assays show increasing richness with depth. The White Pine work is attracting attention to other territory in the vicinity. Some exploration work is being done about nine miles southwest of the White Pine on the property of S. L. Smith, of Detroit, and according to reliable information, the diamond-drilling shows pretty good results.

Calumet & Hecla has practically established an employment bureau that will operate for both the parent company and all of the subsidiaries. Its main office will be at Calumet in an extensive addition to the main office of the Calumet & Hecla, which is now being erected, and which will contain as well the offices of the electrical and motive department. The application of the workmen's compensation law in Michigan and of other laws on physical requirements make the employment of new men a much more serious matter at all mines than in the old days when a man simply called at the captain's office and if the captain had enjoyed his lunch was pretty sure to get a job. This new central employment bureau will keep complete card records of all of the men at work at all of the mines under its jurisdiction. These will be on file and when any mine needs men for special work, they will be available.

Water Shipments of copper will cease by the first of December, with the close of navigation on the Great Lakes. The freighter "North Sea" will clear before that date with close to 6000 tons of copper. In the month past the cleanup of refined copper from the docks of Portage and Torch Lakes has been the most unusual for fall that this district ever saw. All summer long the smelting yards and the docks were loaded with ingots; the supplies were larger than have been carried in years. And early in the fall there was no evident intention of shipping the metal. Now practically every available pound of copper that can be dug up is being started for Buffalo. This last cargo may have some difficulty in getting through, as the ice already is forming in the upper lake channels. Local authorities on the metal situation assert positively that every pound of metal shipped from Houghton has been sold and that none is going into storage. Orders for immediate delivery came with a rush while the price was under 12c., with practically all purchases for domestic consumption. Some of the companies report that in addition they already have orders booked for December, January and even February.

MARQUETTE—Nov. 21

A Tax Conference, called by the Crystal Falls Taxpayers' Association, will be held at Marquette, Dec. 15, to protest against the attempt of the Michigan State Grange to saddle upon the iron and copper mines of the Upper Peninsula a tonnage-tax law. Measures to combat the proposed legislation will be outlined. Each of the mining counties will be represented by delegates, as will the several commercial clubs and similar organizations. The Upper Michigan legislators will be in attendance also. The Crystal Falls association was originally organized to protest against the relative taxations on mine and general property at Crystal Falls. It was brought into being because the general taxpayers insisted there was discrimination in favor of the mines. That the association is now taking the lead in the forthcoming conference is significant as showing that not all the opposition to the tonnage tax comes from the mines. The sentiment against it is well diffused among all classes of taxpayers. For this there are two reasons. The man who has even a superficial knowledge concerning the mining industry realizes the practical difficulties in the equitable application of the tonnage-tax principle without the incurring of an expense for administration that would be prohibitive. Again, the general taxpayer naturally objects to a plunge into conditions that would mean an entire revamping of the present system. There has been, of late years, a fair equalization of the tax burden in the mining counties, and it is to be doubted whether, even at the expense of the mining companies, the lot of the general taxpayer would be improved by the levying of a tonnage tax. The opposition to the proposal in Upper Michigan extends from the mining companies even to the granges in many of the counties. Its widespread nature will, it is hoped, be given due weight by the remainder of the state.

CRYSTAL FALLS—Nov. 21

Disastrous 1914 was especially disastrous for the Crystal Falls-Iron River region, the high phosphorus ore characteristic of these districts finding little demand. Nevertheless a good deal of construction and development work was carried on.

The Hill Top adjoins the old Crystal Falls mine on the east. It was taken over early in 1914 by the [illegible] Iron Co., of Cleveland, and a contract let to J. H. [illegible], of [illegible], Minn., to mine and ship 25,000 tons during the season. The ore not proving up to grade, only about 6000 tons was taken, this from an open cut, and work was suspended.

The Warner mine shaft was sunk an additional 200 ft. this year and some drifting on the orebody done. The work showed the ore to improve with depth both in quality and quantity. Some crosscutting of the formation was done on the bottom level. But after work had been carried on for some months the pumps were pulled and the mine allowed to fill with water. The property needs new equipment for proceeding with the work, but it was no doubt due to the condition of the market that [illegible] was [illegible] at this time.

The Bates mine of the [illegible] Iron Co. has had an extensive experience with water problems [illegible] has carried [illegible] development [illegible] way. A little mining has also been done, but no shipments have been made from the property as yet, although a good deal of ore is being carried in stock. Considerable diamond drilling has been done underground, but no information can be had as to the results of this work.

Of the Davidson mines, No. 1 has been worked in the usual manner throughout the year. Shipments were made during the first six months of the season, but not from stock. A new Nordberg electric hoist has been installed. Some underground drilling has proved a new lense of ore south of the original formation. This shaft is now wholly electrically equipped, including an air compressor, hoist and pumps. Work at No. 2 went on in about the same way. This shaft was sunk 100 ft. and some development work was done. This is one of the few shafts sunk on an incline, the shaft following the dip of the ore lense. This was done to avoid the extra cost of cross-cutting to the orebody.

Oglebay-Norton, in the Crystal Falls-Iron River region, has done little work this year. The Chatham mine was worked in January only. A small shipment was made from stockpile and the mine was kept free of water. At the Berkshire also mining was carried on in January only. A little work was done on the new hoisting shaft and a new changehouse was completed. Shipments of 21,400 tons were made. The pumps ran all year. The Bristol, which has been the heaviest shipper and the most actively worked mine in the Crystal Falls field, was worked the first five and one-half months of the year only. Sinking the shaft 100 ft. was the only development work done. Shipments from stock consisted of about 150,000 tons. The mine has been kept pumped out and the machinery has been all overhauled.

Pickands-Mather has worked its Caspian steadily all year and mined about 300,000 tons. This is one of the largest orebodies in Iron County and is the first mine in this district to be worked on the top-slicing system, in common use on the Mesabi range. A large amount of ore is carried over in stock. It will be necessary to close the property for a time to repair and retimber No. 1 hoisting shaft. The Fogarty saw no active mining this year. In July a surface cave let one level fill with sand and gravel, and this took several months to clean up. Shipments were small, all from stock. Some diamond drilling was done underground, the holes all going over to the east. It is generally understood that the results were satisfactory and a large deposit of ore shown. A drill has since been set up on the surface to check the results of the underground drilling. The Bengal was idle throughout the year. A small 11,000-ton stockpile was shipped, the steel headframe was housed, a small timber-shaft completed and the mine pumps kept running. The Baltic was also idle. A stockpile of 44,000 tons was shipped and the pumps were kept running.

At Amasa, the Hemlock mine, one of the old mines of Iron County, has for years been the principal source of revenue for the little hamlet of 700 people. The work at the mine this year consisted in taking out some pillars and floors and removing a portion of the ore that can be obtained from the Michigan mine on the south. This work will be completed in the early part of 1915. Some shipments were made, those from stock being only enough to make room for that hoisted from underground. January or February 1915, will see the end of the Hemlock mine for all time. This was one of the first Lake Superior iron-ore investments of Pickands, Mather & Co., if not the first. It has produced an ore of peculiarly good character for fixing and fluxing purposes, its low phosphorus and moisture contents finding for it a ready market at all times. The Hemlock will have produced, all told, 2,150,000 tons.

The Porter mine is the original find in Iron County of the Longyear-Hartley interests and was discovered by diamond drilling about four years ago. It is in Sect. 22, T. 44 N. R. 33, about three miles south of Amasa. It is said to contain 1,000,000 tons of high-grade ore, much of it of bessemer quality. A vertical shaft 5x15 ft. inside timbers has been started at the south end of the orebody; it is said that the surface consists of about 70 ft. of sand and gravel, and no trouble is expected in reaching the ledge. Only a small and temporary plant is now installed. The property is in charge of M. E. Richards, general manager.

Of the Wickwire mines, the Cortland was worked only during the first five months of 1914, the work consisting of some exploration and a little mining of ore remaining in floors and pillars. The shipments were 17,699 tons. When the work was completed, the equipment was all removed and the lease surrendered. At the Homer, the work consisted of completing the erection of mine buildings and equipment. The steel headframe and the fireproof brick buildings with steel-girder roofs are all substantial and modern. The mine is electrically equipped throughout. An initial shipment of 9700 tons was made, but development work on the orebody and a crosscut to the McGovern orebody to the west comprised the work carried on underground. Only a small crew is employed at present. This is probably the wettest mine in the group north of Iron River. A large flow of water was encountered while sinking this shaft and some trouble was experienced with quicksand. This tract of land was diamond drilled by the Niagara Mining Co., a subsidiary company of Rogers-Brown, and was then sold to the Wickwire company for a large cash bonus. It gives promise of being the best property of the Wickwire company in the district. At the Wickwire mine, the shaft was sunk 100 ft. and additional crosscutting and drifting carried on at the new level. The mining consisted of taking out some pillars and floors. Shipments of 18,700 tons were made from mine and stock, and some ore is still in stock. A little diamond drilling was done underground in the search for new orebodies. The Virgil was idle all year. Some diamond drilling was done from surface to check up underground ore measurements. The stockpile was cleared up with shipments of 10,300 tons.

Corrigan-McKinney at the Armenia mine, two miles east of Crystal Falls, completed in June the taking out of the remaining shaft pillars. The property is now dismantled and all ore is shipped. At the Baker some ore was mined during the first half of the year and shipments of 122,000 tons have been made. The Tobin was idle all year. The shipments from stock amounted to 55,000 tons, with a small amount still remaining. The Great Western, headquarters for Corrigan, McKinney & Co., on the Menominee and Gogebic ranges, was also idle all the year. The company offices, warehouses, shops and laboratories are maintained here. A shipment of 11,000 tons was made from stock, but a large amount still remains in stock. It is said this will be consumed by the owners in the large Cleveland plant now nearing completion. The Dunn, the oldest active mine in the Crystal Falls district, has now reached a vertical depth of 1800 ft. It was worked in a small way all year, the principal work being the sinking of the shaft 200 ft. and drifting to the orebody. A small production was hoisted and shipped, as well as some ore carried for some time in stock. At the Tully the underground work has consisted in sinking No. 1 shaft 100 ft. deeper, developing the new level in a small way, driving a rock crosscut to No. 3 shaft and raising in the rock to meet this shaft, which is finally in solid ledge and completed. This work has taken two years and necessitated overcoming many obstacles; it is an accomplishment of merit. The installing of permanent hoisting equipment and additional boilers, the erection of a new headframe at No. 1 shaft and the building of a number of new dwellings for employees constitute the new work at this mine for the year past. Shipments of 49,000 tons were made, some from mine direct and some from stock.

The Rogers mine of the Munro Iron Mining Co. (Rogers-Brown) has probably the largest orebody in Iron County opened up to the present time, and it is in a virgin field situated on Sect. 29-43-34. The property is surrounded by the White, the LeRoy, the Michaels and the Blair, all of which have been well drilled and have shown large quantities of ore of good quality, demonstrated to extend down for 1800 ft. The Rogers was the first to sink a shaft and open up the ore, and had to resort to reinforced concrete in going 120 ft. to the ledge. Development of the orebody has proceeded at a moderate rate, since the water encountered was much greater than ever known before in the vicinity. The flow now ranges between 3700 and 4000 gal. per min., and there seems to be no let-up at the present time. The Rogers is well equipped in every respect, buildings and machinery being all of permanent kind, and all the equipment based on an output of 600,000 tons a year. The mine made its first shipment this year, sending forward 27,000 tons. The system employed to win the ore will be top-slicing, necessary on account of the great width of the orebody. No new equipment was added this year, the only additions being in the way of dwellings for employees. Diamond drilling to the southwest of the Rogers on the White continues to show this ore basin to be larger than ever. One drill was employed here all year. The Hiawatha was worked at the usual rate for the first nine months of the year, when a mine fire in the slate hanging wall forced the east side of the mine to be bulkheaded. Early in October all active mining was suspended. Shipments were made from mine product the first six months of the shipping season and some shipments were made from stock. A new lift of 125 ft. was sunk and a small amount of drifting and crosscutting was done. The Chicagon was also worked for nine months, shipping the usual production. The sinking of the hoisting shaft another 125-ft. lift was the only work of note.

The Mining News

ALABAMA

TENNESSEE COAL & IRON (Ensley)—After shutdown of several months, except for week of visit of Iron & Steel Institute, steel mill was to go into full operation Nov. 23 for one week.

ALASKA

AS DELEGATE to Congress from Alaska, Wickersham was elected by 2000 plurality over Bunnell.

MATANUSKA COAL port tests carried on at Bremerton Navy Yard concluded Nov. 13. Were made on board armored cruiser "Maryland." No reports to be made until steaming trials at sea are completed.

HUGHES & EVERMAN (Fairbanks)—Operators will open, during winter, large block of ground on upper Engineer Creek; estimated to run $1 per sq.ft. Small winter dump will be taken out.

BERING DREDGING CO. (Shelton)—Company operating on Kougarok River below mouth of Taylor Creek, using hydraulic lift, will next season install dredge at mouth of Henry Creek. J. Mathews manager.

SOLOMON DREDGE (Solomon)—This boat, J. A. Mallock manager, has worked out all its ground and will probably move next season. Dredge has averaged about 60,000 cu.yd. per month; is driven by steam generated by crude oil. Cost of handling gravel about 14c. per cu.yd.

SEWARD DREDGING CO. (Solomon)—Dredge on Solomon River did little work this season owing to alterations found necessary. New engines of Diesel type installed, together with other improvements which will greatly reduce operating costs. Dredge in active operation since 1905. Webb & Hall owners.

BROWN & CO. (Fairbanks)—Paystreak, believed continuation of rich paystreak worked by Jack Prest and others on Hands-Across-the-Sea ground, found in shaft of this company. Many dollar-pans taken from face and $30 nugget recently obtained in pan. Ground on upper Vault Creek, owned by Winterbottom & Anderson.

HANDS-ACROSS-THE-SEA ASSOCIATION (Fairbanks)—Jack Prest, whose lease on this claim was successful during season just closed, recently disposed of interest in lease to Beattie & Martin, well known Vault Creek operators who will sink two new shafts and take out large winter dump. Ground 200 ft. deep, runs $6 to $8 per sq.ft. of bedrock. Paystreak averages 9 ft. thick, 60 ft. wide.

CRITES & FELDMAN (Fairbanks)—Operators purchased Willis five-stamp Hendy mill on Chatham Creek and removed it to their property on right limit of Moose Creek, tributary of Fairbanks Creek. Several cleanups made to date reported satisfactory. Air drills and steam-driven compressor also purchased. Mine has large reserve of ore developed, opened by two adits, each more than 500 ft. long, and several shallow shafts. Ore from upper adit dumped directly on mill grizzly, that from lower adit will require elevating. Planned to install small steam winch to haul mine cars up short incline.

ARIZONA

Cochise County

CALUMET & ARIZONA (Bisbee)—Directors have determined upon payment of Christmas dividend. Action based on general belief that worst is over so far as metal situation is concerned and fact that C. & A. production has been sold for two months ahead. Said that at no time in history of property has supply of commercial ore been assured equal to that uncovered last few months. Company officials are practically determined upon stock-issue plan to finance recently acquired Cornelia property.

Gila County

MIAMI (Miami)—Company has answered with general denial, allegations contained in bill of complaint of Minerals Separation, filed against it about a month ago.

INSPIRATION (Miami)—Now reported production should begin about March. Capacity of mill 10,000 tons, governed for some time by hoisting capacity. No decision made on use of license held to operate flotation plant under Minerals Separation patents. Understood some ores may be leached.

Pima County

SAN XAVIER MINE (Twin Buttes)—This mine, belonging to Empire Zinc, continues to keep about 30 men at work on development only. No ore, either zinc or copper, shipped for some time. Reported immense tonnage blocked out.

TWIN BUTTES MINING CO. (Twin Buttes)—Meeting of directors held in Tucson recently. President W. A. Barber, of Sheboygan, Wis., and Past-President David S. Rose, of Milwaukee, Wis., present. Intentions of company in regard to future operations of property not made public.

PAYMASTER (Twin Buttes)—This old-time producer of southern Arizona again operated on small scale by leasers. Property has produced several hundred thousand dollars' worth of lead-silver ore. Mr. White, leasing on one claim of group, has two carloads of high-grade ore ready for shipment.

BAXTER-ROSSI GROUP (Twin Buttes)—Bush & Baxter, leasing, continue to open up high-grade copper ore. This is new strike, blind lead encountered while doing assessment work and promises to be one of the biggest strikes in district. Ore found a few feet below surface widens out with depth and value increases. Shipping car a week, maximum quantity allowed by smelter

Santa Cruz County

ORO BLANCO DISTRICT unusually quiet, little mining going on. William Partridge working on claims of J. S. Andrews, taking out some rich gold-copper ore; has made one shipment to smelter, with another car about ready.

CALIFORNIA

Amador County

KENNEDY (Jackson)—Moving pictures taken underground by direction of Charles H. Dunton, gathering mineral exhibits and having pictures made for display at Panama-Pacific Exposition. Said that gold brick containing $17,000, representing seven days' production of mine, will also be shown

Butte County

OCHER DEPOSITS near Stirling may be reopened. Application for samples received by Eugene E. Foren, formerly foreman of mine. Property operated several years ago; material produced of good grade

Calaveras County

BOWLING GREEN (Vallecito)—New hoist and mill recently installed in successful operation under management of Luke Sanguinetti. Large body of pay gravel disclosed. Thirteen-day cleanup produced 61 oz.

Kern County

LAST CHANCE CAÑON, about 25 miles northeast of Mojave, reported showing evidence of placer mining development. Several years ago district attracted attention, but was abandoned at time of big strike at Randsburg, which developed Yellow Aster

Nevada County

UNION HILL (Nevada City)—Mine unwatered, sinking in progress. Property was operated by L. B. Doe and others, who spent large amount in unsuccessful development. Recently bonded to new company, which, under superintendence of A. D. Cox, is putting it in order to resume development. Shaft will be deepened 300 ft. before drifting begins

Tuolumne County

MOHICAN (Sonora)—Mine closed down temporarily because of too much water. Pumps will be installed, and as soon as mine is unwatered, development will be resumed.

CUB BEAR (Etna)—Property located on Cow Creek being developed in a practical way; 500 tons extracted. Purposed to continue work through winter and to increase extracted ore to 1000 tons before installing mill. Property owned by Siskiyou syndicate.

COLORADO

Boulder County

GOLD HILL MINING CO. (Rowena)—New concentrating and cyaniding mill placed in operation. Is at portal of Craig Tunnel, equipped with 30 stamps, Wilfley tables, tube mill for regrinding and continuous decantation system of cyaniding. Concentrates will be reground and cyanided. Mill will have capacity of about 100 tons.

UNITED STATES GOLD CO. (Sugar Loaf)—Main shaft of Livingston mine being unwatered, first and second levels now open. As fast as made accessible, levels cleaned out and repaired. They extend northwesterly into Sphinx property. Expected that extension of levels will develop ore ranging in value from $40 to $60 a ton; attempt will be made to reopen famous "Potato Patch" oreshoot. Estimated that Sphinx and upper workings of Livingston will yield large supply of milling ore. Steel for new Herreshoff roaster arrived and machinery in process of erection. Materials for fireproof building on ground and they will be completed as soon as roaster is in place

Clear Creek County

ONEIDA-STAGG MINING & MILLING CO. (Freeland)—Company now successful in securing enough cyanide to operate for six months mill which has been in readiness several weeks. Working force being organized and mill will be placed in commission in near future. About 5000 tons awaits treatment

Lake County

RED LIGHT district of Leadville reported wiped out by fire morning of Nov. 19. Heavy damage, old-time wooden shacks burning readily.

San Miguel County

JUNTA (Telluride)—Mill repaired and 30 stamps dropping on ore from Orion and Wasatch properties in La Junta Basin. Arrangements made to carry on development throughout winter.

SUFFOLK (Ophir)—Following recent examination of mine and dumps, leasing company organized to take over property and operate mine, tramway and mill. Average grade low, but small margin of profit expected

TOMBOY (Telluride)—Building for new cyanide plant completed and being painted. Much of machinery installed. Riveting of steel cyanide tanks now in progress. Plant will increase recovery from ores from Montana property.

BLACK BEAR (Telluride)—Lower terminal of new tramway finished and work in progress on upper terminal in Ingram Basin. Construction will be completed in about 30 days. Old workings of mine being cleaned out and repaired.

San Juan County

BIG GIANT (Silverton)—Contention tramway extended to this mine in Arastra Gulch and property will soon be in active operation. Old workings have been cleaned out and retimbered where necessary. Recent development has opened considerable milling ore. New compressor installed.

AMY TUNNEL (Silverton)—Crosscut tunnel will be advanced 700 ft. to develop Belle group in Maggie Gulch. Tunnel will cut main vein at considerable depth. This vein over 20 ft. wide in places and surface prospecting indicates it will yield large tonnage of cyaniding ore. D. R. Jones superintendent

IDAHO

IDORA (Wallace)—Shoot of galena ore reported encountered in raise into Tuscumbia property on Sunset Peak.

ROCKFORD (Mullan)—Another contract for 100 ft. drifting let. At depth of 800 ft. company driving to catch vein uncovered above.

REINDEER-QUEEN (Mullan)—Important strike of chalcopyrite milling ore reported. Adapted to flotation process, gangue heavy spar.

MICHIGAN

Copper

CALUMET & HECLA (Calumet)—New dredge laid up for winter after cutting channel through sand piles up to classifying house. Work demonstrated that dredge will meet all requirements and do its work satisfactorily. A quarter section of No. 2 regrinding plant in commission for some time, working satisfactorily.

SUPERIOR (Houghton)—Fire at surface plant will stop all production for month or six weeks. Entire wooden structure over boilers and compressor plant destroyed; fully covered by insurance. Rebuilding started at once. Boilers and compressors loaded on cars and shipped to Calumet for overhauling at C. & H. shops. All married men of Superior force will be put at work on reconstruction of plant. Figured one boiler can be fired within month and hoisting started from stopes already opened.

WINONA COMPANY (Winona)—Capt. John Broan, head mining captain for Winona and King Philip mines, now working 35 of best miners on tribute. Sending five cars per day to Point Mills plant of C. & H. Rock runs 22 lb. copper to ton, at least 30% better than average of Winona during regular operations. Captain and men figured out a living from 17 lb. per ton, more than elated over conditions. Supt. Seeber giving 70 of men employment in woods cutting hardwood for shipping to Stratton Hardwood Handle Factory at Atlantic.

Iron

JONES FURNACE—Sample of first product analyzed showed only 1.6% manganese, while slag contained about 10%. It was hoped product would contain enough manganese to be classed as spiegeleisen.

VANADIUM ore reported in Michigan. John Thompson, of Chicago, has put crew of men to work, 35 miles northwest of L'Anse, on a vein said to carry vanadium. Vein has thickness of 24 in at surface. Mr. Thompson in search of manganese ores when he made discovery. First vanadium ore found in Lake Superior country.

LAKE ANGELINE (Ishpeming)—Sixty men laid off Nov. 14, but most of them placed at work again Nov. 23 on short time. All employees will now work only about two-thirds time. By spring ore in mine will be taken out and property closed down. Was thought all work would stop by first of year, but by working the men shorter hours time is extended. By spring new mine of company at Iron Mountain Lake will be bottomed and many of the men will be transferred there to start drifting and raising.

MINNESOTA

Cuyuna Range

ARMOUR NO. 2 (Ironton)—By decision of district court, H. J. Kruse recovers $16,381 from Chester D. Tripp, representing one-half of royalties paid on Armour No. 2 mine, operated by Rogers-Brown Ore Co. Trial previously mentioned in "Journal." Kruse was formerly superintendent for Rogers-Brown on Cuyuna and Tripp was president of company. Both have severed connections since litigation started.

Mesabi Range

LA RUE (Nashwauk)—Considerable retimbering will be done in No. 3 shaft, one crew working all winter on this work. At mill some experimental work will be done on one of new Wetherbee concentrators. Large settling basin will also be constructed for mill waste.

MISSOURI—KANSAS—OKLAHOMA

GALENA ROYALTY CO. (Galena, Kan.)—Company struck another good zinc prospect in drilling on Muir land. Company fast developing tract of land; as soon as good drill holes are found they are subleased to miners who sink shafts and mine on royalty. Company has several tracts to drill.

CLERMONT (Galena, Kan.)—A. G. Barton, of Galena, has taken over mill and 10-acre lease held by Snyder Bros., of New Richmond, Ohio. Clermont was formerly good producer, but mines for some time have not been paying. Mr. Barton comes as practical mining man, and after making repairs on mill and applying up-to-date methods to running mines believes they can be made to pay

HARTFORD MINES (Galena, Kan.)—Company sinking mill shaft to encounter lower run of ore struck in drilling at 276 ft.; struck the body of ore in shaft recently, still sinking in it; ore high-grade 10 to 12% as hoisted. Deepest mining in Galena district, indicates what many contend, that there is lower run of good ore, which, however, will require heavy machinery and capital to mine. George Elliott, superintendent.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT (Butte)—Supt. Hopkins, of company's Elkhorn mines, reports finding vein of good copper ore in working tunnel just beyond 1000-ft. mark. This is third vein cut in course of driving double-track tunnel. No one of three known to outcrop on surface.

POLARIS (Dillon)—Twenty-one tons high-grade copper and silver ore shipped to Anaconda by Corbet & Bowman, listed at $90. This old mine, 40 miles northwest of Dillon, has history. Several fortunes spent in exploiting group of claims without dollar's worth of ore to the good. Company now working recently struck rich vein and expects to make it paying property.

Fergus County

BARNES KING (Kendall)—According to preliminary statement from Superintendent McGee, production of North Moccasin mine for October shows increase in receipts over September. From 3955 tons of ore mined and milled, approximately $30,000 worth of gold bullion taken, increase per ton of $1.18. Report shows better ore being encountered. Cost of mining and milling something over $4 per ton, leaving net profit of about $13,000. At company's Piegan-Gloster mines near Marysville, work gone on steadily; mill will be ready for operation in January. Old boilers and steam plant in shape and can be utilized if found impracticable to get electric power this fall.

Jefferson County

MONTANA-RADERSBURG MINING CO. (Radersburg)—Articles of incorporation of this company to operate Summit mine, 10 miles northwest of Radersburg, in Elkhorn Mountains, filed in Helena, Nov. 11, by A. E. Spriggs, of Helena, and associates. Shaft down 530 ft. Electrical equipment will be installed at once and 100-ton concentrator erected to treat ore in sight. Company incorporated for $300,000, has $100,000 in treasury; $75,000 of this set aside for working capital.

Silver Bow County

EVELINE (Butte)—This old mine said to have produced more than $500,000 worth of gold and silver in '80s, but idle since 1893, purchased by W. A. Clark. Understood price was about $25,000. Mine lies north of west-side reservoir of Butte water company.

PILOT-BUTTE (Butte)—Vice-President Jahn reports to stockholders that conditions are highly satisfactory. In addition to large copper-ore reserves, company also has big deposit of zinc and silver ores which will be treated in Timber Butte mill. Drifting on copper vein 15 to 20 ft. wide in progress. Shaft vein carries same grade of ore width of 5 ft. During course of development, 20 cars of ore per month are shipped. No decision in pending controversy with Anaconda yet rendered by court, in consequence of which, company decided to prove this vein by raising on it from 1800-ft. level or from point where two veins meet.

NEVADA

Douglas County

GOLDEN GATE (Gardnerville)—Mill resumed operations recently for run of considerable duration.

Elko County

CYANIDE PLANT, it is stated, will be added to concentrating plant now in operation at Good Hope. Concentrating plant will be entirely remodeled. Good-grade antimony ore recently discovered in this district.

Esmeralda County

JUMBO EXTENSION (Goldfield)—Drifts on 1017-ft. level driven for length of 130 ft. on 7-ft. shoot of ore assaying $100 per ton, according to statement of J. K. Turner, engineer-in-charge. New raise being lifted from this level. Stoping being done on intermediate above 1017-ft. level; smelter controls show ore assays $65 to $70 per ton. In addition to high-grade ore, large tonnage of milling-grade ore developed, especially on 700-ft. level, where considerable work is now under way. Milling-grade ore left on dump for future treatment. Present daily production 50 tons. Gross earnings for October estimated $101,500.

Humboldt County

CONDITIONS IN ROCHESTER good. Winter supplies arriving in good time; Codd railroad, delayed by unforeseen difficulties, will be completed by time big mill is ready to operate; time of many lessees extended, and milling-grade ore can be mined at profit as soon as milling plant is in operation.

STAR PEAK (Mill City)—Contract for 400 ft. of tunnel driving to be let. Raises from 90- and 140-ft. levels being lifted to surface. Winter supplies being hauled to mine and extensive snow sheds, connecting bunk- and cook-houses, blacksmith shop and dump, being built. In spring, capacity of mill and tramway will be increased and tailings, now impounded, treated by cyanidation.

Mineral County

RAWHIDE producing steadily and considerable development work under way. Nevada New Mines Co. treating 60 tons daily, ore said to assay $22 to $30. National Milling Co. treating 35 tons daily. Several properties under development and some shipping-grade ore being mined. Placer mining in old Squattertown and on Grutt Hill.

AURORA CON (Aurora)—Mill recently started after alterations, again closed for further changes. Stated large amount of clay in ore causes excessive sliming; treatment of this slime in milling process not yet satisfactorily solved.

NEW MEXICO

Bernalillo County

GALENA KING (Albuquerque)—Work resumed at mine south of Coyote Springs after suspension of two months. Company developing by tunnels, contemplates erecting mill. E. N. McCloskey president.

Grant County

CHINO COPPER COMPANY (Hurley)—Company experimenting with flotation; unit installed and in operation treating slimes.

EMPIRE ZINC (Hanover)—Work begun Nov 17 on two-compartment shaft for Thunderbolt Mountain property. Trestle to be erected across Hanover Gulch and Santa Fé railroad in construction of tramway to property.

McGEE MINES (Fierro)—Camp established in Shingle Cañon, two miles above Fierro by T. B. Fisher and associates. Will work lead-zinc property under lease and bond. Other small zinc properties in region being operated.

B. V. N. MINING CO. (Silver City)—Company being incorporated to work Silver Hill mine at Pinos Altos, on extension of Langston. Messrs. Bettes, Vinot and Noble, of Silver City, N. M., incorporators. Company purposes drifting to end-lines of claim, extending No. 4 tunnel and later sinking shaft.

OREGON

MAMMOTH MINING CO. (Sumpter)—Liens for labor and supplies filed against this company, amounting to over $1500. Last year mine was worked by Mr. Bodelson under lease.

BAKER GOLD MINES CO. (Sumpter)—Company has leased Last Chance from Cornucopia Mines Co., has equipped mine with machinery and will begin extensive operations soon.

FLAGSTAFF MINE—Operations renewed on this property, idle for some time. John G. Cleary of Boston, representing owners, after spending few days at mine returned East. Stated company would do extensive work.

SEWELL (Holland)—Company of Salem and Portland men has purchased this mine, on Althouse Creek. Represented by Gregor, Collard & Buckmann, who have had property under working bond for some time. New vein of fine copper ore reported found by new owners, orebody showing entirely across face of tunnel. Expect to begin immediate shipments to smelters.

SOUTH DAKOTA

MOGUL (Terry)—Merrick conveying weigher installed in cyanide plant. Experiments being made with canvas bags for clarifying solution from Dorr thickener tanks before sending it to zinc boxes. Mill operating steadily at about 150 tons daily capacity.

HOMESTAKE (Lead)—Work proceeding rapidly on installation of new hoisting plant, electric generating station and boiler plant. Engine house at B. & M. shaft, built of brick, with steel roof, practically finished. All machinery and structural steel for shafthouse and headframe delivered. Erection will begin shortly. Foundations, retaining walls and side walls for concrete electric generating station complete and roof girders being erected. At boiler plant, finishing touches being put on extensive foundation work, number of shafts sunk to hardpan and later filled to top with concrete.

TENNESSEE

TENNESSEE COPPER (Ducktown)—Reported London mine, closed Aug. 15, will be reopened about Dec. 1.

UTAH

Beaver County

MOSCOW (Milford)—Ore recently opened in main drift from 800 level of main shaft thought to be extension of shoot in Back vein in old workings 400 ft. higher up. Expected connections between old and new workings will be completed in month; 800 level of new workings corresponds with 1100 of old. During October 15 cars of high-grade silver-lead ore shipped from above and below 800 level of old workings.

Juab County

VICTORIA (Eureka)—Working forces reduced and shipments curtailed. Report denied that operations are to be suspended.

EAGLE & BLUE BELL (Eureka)—Large station on 1700 completed Nov. 16 and drifting started to north. Between 75 and 100 tons of ore shipped daily.

CENTENNIAL-EUREKA (Eureka)—Winze being sunk on vein, which carried gold at surface; 270 ft. lower down tunnel being driven to cut vein at greater depth.

KNIGHT-CHRISTENSEN MILL (Silver City)—Contract given to Traylor Engineering & Manufacturing Co., of Allentown, Penn., for exclusive manufacture and sales agency of patented machinery used in Knight-Christensen process.

EAGLE & BLUE BELL (Eureka)—New station on 1700 being cut, and drifting will soon be started to reach ore north of old workings on 1500, and to make connections with winze sunk in ore from that level. High-grade silver-lead ore being shipped; October output 61 cars.

CHIEF CONSOLIDATED (Eureka)—Repairs to shaft completed, and new guides being put in. Development work being done on 1400, 1600 and 1800 levels, where number of strong fissures are being drifted on. Said to be possibility of Chief acquiring old Scotia in western Tintic, owned by Boston & Tintic Mining Co.

MAY DAY (Eureka)—Thirty cars silver-lead ore taken from lease in Chief Consolidated ground and ore followed back into May Day ground, where it is 3½ to 4 ft. wide, and about 12½ ft. high. Drifting being done, and as much as possible left standing. No ore of this character being shipped at present, though a little zinc from 300-ft. level is being mined and marketed. Griggs-Carter-Castleton cyanide plant still operating on low-grade ore, and reputed to be making small profit.

Salt Lake County

UTAH CONSOLIDATED (Bingham)—Working forces reduced 50%, but this has not materially affected tonnage. Regular shipments of lead ore being made, though output of copper is less.

CARDIFF (Salt Lake)—Recently opened orebody drifted on for 130 ft. with ore still in face. Winze sunk from upper workings in ore is about 200 ft. ahead. Strike considered one of most important made in the Cottonwoods in recent year.

Summit County

DALY WEST (Park City)—New mill started, expected daily output will shortly reach normal. Hoist for main shaft arrived.

SNAKE CREEK TUNNEL (Park City)—During October 328 ft. driven, with two shifts working. Progress slow owing to hard rock and low air-pressure. Both igneous rock and limestone cut, some of latter exceedingly siliceous. Two small orebearing fissures cut. Much of rock impregnated with pyrite.

WASHINGTON

MILL to be built by operators of Rich Bar and Golden King gold-mining properties near Oroville. Will cost $25,000 and have capacity of 50 tons. Machinery being bought. Developments in camp favorable. Rich Bar working 6-ft. vein. Golden King has 130-ft. shaft, to be continued to 500 ft., has 9-ft. vein. Coaba mine also to begin operations soon.

HECLA COPPER-SILVER (Chewelah)—Company shipped from Spokane four-drill compressor, 85-hp. boiler, 25-hp hoist and small electric-lighting plant. Will sink 200-ft. shaft and drift about 200 ft. J. C. Argall president, Fred F. Foster general manager.

CANADA

Ontario

VIPOND (Schumacher)—Mill producing $25,000 a month. Refinery will be built.

ALEXO (Porcupine)—Nickel mine has resumed shipments to Mond Nickel Co.

FOLEY-O'BRIEN (South Porcupine)—Mine will install small plant to replace that destroyed by fire.

CANADA REFINING & SMELTING CO. (Orilla)—Plant for treatment of high-grade Cobalt ores expected to resume operations.

TEMISKAMING (Cobalt)—Mill started Nov. 16 at half capacity after 3½ months' shutdown. Mine has 5000 tons broken ore in stopes.

CART LAKE (Cobalt)—Company operating Gould lease has exhausted orebodies, but will continue development. Has produced only 130,000 oz.

McKINLEY-DARRAGH (Cobalt)—New high-grade vein developed to depth of 55 ft. estimated to run 7000 **oz.** per ton for width of 4 in.

KERR LAKE (Cobalt)—Further draining of lake suspended until spring, as heavy mud proved more difficult to handle than expected.

JUPITER (Schumacher)—Mine under option to McKinley-Darragh being developed at 400- and 475-ft. levels, both new. Results satisfactory and McKinley-Darragh expected to exercise option.

GOLDFIELDS (Larder Lake)—Mine closed for indefinite period. Marks final cessation of operations in district. Company will, however, continue to operate hydro-electric plant which supplies Huronia company with power.

CROWN RESERVE (Cobalt)—Rich stringer cut on Silver Leaf near Lawson boundary. Silver Leaf under lease to Crown Reserve and receives 65% of net returns. Directors will again cut dividend probably to 12%; now [illegible] a year.

DOME (South Porcupine)—Extensive campaign of diamond drilling previously announced, now beginning. Six drills will be operated, five on surface and one under ground, and whole known orebody 1700 ft. long and 400 ft. wide will be systematically drilled in 100-ft. blocks, with object of finding if mill can be further enlarged at once so as to increase profits and cut down costs.

Yukon

YUKON FREEZEUP at Dawson came late this year, morning of Nov. 15. Unusually mild and uniform weather for last two months, little snow.

MAYO CAMP will be active this winter. McWhorter silver properties on Galena Creek will ship 1000 tons to riverbank at Mayo. Placer mines will also be busy.

YUKON GOLD (Dawson)—Hydro-electric plant on Twelve-Mile River closed down Oct. 25 after longest and most successful season. Last dredge to shut down out of company's fleet of eight was No. 9, on Eldorado.

MEXICO

Sonora

NORTH TIGRE (Esqueda)—This mine, adjoining Tigre mine on north, leased to United Mines Co.; [illegible]-ton mill just completed. Company purchasing power from Tigre.

CENTRAL AMERICA

Nicaragua

JAVOLI & ESCANDALO MINING CO. ([illegible])—Company intends to [illegible] [illegible] [illegible] plant. Ignacio O'Reardon, general manager, purchasing machinery in New York. Morris B. [illegible] in charge of construction.

SOUTH AFRICA

EAST RAND PROPRIETARY [illegible] [illegible] whites and 17 natives being hoisted [illegible] fell to bottom of shaft, over [illegible] ft. [illegible] natives killed, the others injured. [illegible] [illegible] warrant issued for arrest.

The Market Report

METAL MARKETS

NEW YORK—Nov. 25

Copper, lead, spelter and tin have all been stronger this week, general improvement in the demand for consumption being the governing factor.

Copper, Tin, Lead and Zinc

Copper—The advance has gone further through the influence of continued good buying for domestic consumption, together with some export business. On Nov. 20, and again on Nov. 23, there were sharp advances between the beginning and end of the day. Domestic consumers have entered into contracts so far ahead as February. During the last day or two, reports have been current of 12¾c., regular terms, for copper. In fact, that price has been reported as realized, but only on deliveries in Europe and on some distant deliveries here. During the last two days copper has been freely available at 12⅝c., regular terms, and the sales effected have averaged about 12½c., net cash, New York. Thus, near the end of November the copper market finds itself on the same basis as at the end of July, but with a 50% curtailment in production. The sales during our last week of record have been large, but not so large as in the previous week. From 20 to 30 millions of pounds is probably a reasonable estimate.

Business among the brass makers and rollers of sheet copper is reported very good. Some improvement is reported from the wire drawers.

The copper producers have not relaxed their efforts to obtain through the State Department a recession by Great Britain from its previous position respecting copper shipments to neutral countries. An important brief by Dr. Moore has been filed and pressure is being exerted from several quarters where the restriction of copper production has been felt keenly.

Base price of copper sheets was advanced ½c. Nov. 19 to 17c for hot rolled. On Nov. 23 it was advanced ½c. more, and is now 17½c. per lb. for hot rolled and 18½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is 13@13½c. per lb., carload lots at mill.

The Union Minière du Haut Katanga, which formerly had its general offices in Brussels, now has them at the offices of the Tanganyika Concessions, Ltd., in London. The production of the Katanga mines is now at the rate of 1000 tons a month, and arrangements are being made to start work on the new smelting plant as soon as possible.

Tin—The market has resumed its advance; spot and nearby material is very scarce, and is held at a considerable premium. A good consumptive demand developed for future deliveries, which were quoted about 2c. per lb. below spot. The close is firm.

Receipts of Bolivian tin ore and concentrates at Liverpool in October are reported by H. A. Watson & Co. at 1481 tons; Nigerian, 29; South African, 50; total, 1560 tons, equal to 944 tons metallic tin.

Tin output of the Federated Malay States in October is reported at 60,869 pikuls. For the 10 months ended Oct. 31, the total was 41,537 long tons in 1913, and 40,321 in 1914, a decrease of 1216 tons this year.

Lead—The A. S. & R. Co. raised its price to 3.90c., New York, on Nov. 19. Independent producers were not taken so much by surprise this time, contraction in the New York-St. Louis differential having foreshadowed a further advance. By the same mark the failure of the differential to remain quite so narrow as previously indicates that no further advance by the leading interest is expected right away. A good business has been done right through the week, the total tonnage reported being fairly heavy. Some interesting export business has been going on. One producer reports an order from South America for the first time. Corroding lead is now commanding the full premium of 10 points.

Spelter—A moderate business is reported as having been done every day. The demand was larger than last week and the aggregate of transactions was larger, which explains the further slight advance. Otherwise there is nothing new to report. Some export business was done, and on Nov. 25, the London price advanced to £25⅝, which was regarded hopefully for the market here.

Exports and Imports of Metals other than iron in the United States nine months ended, Sept. 30, as reported by the Bureau of Statistics, Department of Commerce:

Metals:	Exports 1913	Exports 1914	Imports 1913	Imports 1914
Copper, long tons	320,595	305,177	140,851	110,691
Tin, long tons	1,006	543	36,977	34,055
Lead, short tons	38,476	49,711	48,475	17,556
Zinc, short tons	8,136	24,946	5,856	838
Zinc in ore, short tons	5,132	140	10,440	5,664
Nickel, lb	21,862,707	21,474,688	35,601,333	28,197,471
Antimony, lb.	63,620	27,109	12,810,829	11,665,698
Aluminum, lb.	44,535	18,939	19,655,571	11,831,103
Quicksilver, lb.	54,022	27,000	....	....
Platinum, oz.	1,191	143	91,944	60,683

Copper, lead, nickel and antimony included metallic contents of ore, matte, etc. Exports included reëxports.

DAILY PRICES OF METALS

NEW YORK

Nov.	Sterling Exchange	Silver, Cts. per Oz.	Copper: Electrolytic, Cts. per Lb.	Tin: Cts. per Lb	Lead: New York, Cts. per Lb.	Lead: St. Louis Cts. per Lb.	Zinc: New York, Cts. per Lb.	Zinc: St. Louis, Cts. per Lb.
19	4.8750	49¼	11.95 @12.05	32¼	3.90	3.77½ @3.82½	5.15 @5.20	5.00 @5.05
20	4.8788	49⅛	12 @12¼	32½	3.90	3.77½ @3.82½	5.15 @5.25	5.00 @5.10
21	4.8788	49	12⅛ @12¼	33	3.90	3.77½ @3.82½	5.20 @5.25	5.05 @5.10
23	4.8825	48¾	12.20 @12.40	33¾	3.90	3.77½ @3.82½	5.20 @5.25	5.05 @5.10
24	4.8988	49⅜	12⅜ @12⅝	34	3.90	3.77½ @3.82½	5.20 @5.25	5.05 @5.10
25	4.8850	49¾	12⅜ @12⅝	34½	3.90	3.77½ @3.82½	5.27½ @5.30	5.12½ @5.15

The quotations herein are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Nov.	Silver	Copper: Spot £ per Ton	Copper: Spot Cts. per Lb.	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos.	Lead: £ per Ton	Lead: Cts. per Lb.	Zinc: £ per Ton	Zinc: Cts. per Lb.
19	22⅝	53¾	11.70	54	*	135¾	135	18¾	3.97	25¼	5.49
20	22¾	54¼	11.79	54½	*	136¼	136	18⅞	3.99	25¼	5.49
21	22 11/16	.	.		. . .				.		.
23	22⅝	55¼	12.00	55½	*	139½	138½	19¼	4.18	25¼	5.49
24	22 13/16	55⅜	12.04	55⅝	*	140	138½	19¼	4.18	25¼	5.49
25	23	55¼	12.00	55⅜	*	142¼	140¼	19⅛	4.16	25⅜	5.57

*No quotations

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26¼c. = £25 = 5.44c.; £50 = 10.88c. Variations, £1 = 0.21¾c.

Other Metals

Aluminum—The market is more active and demand seems to be improving. Current quotations are firmer, at 19@19.50c. per lb. for No. 1 ingots, New York.

Antimony—There has been a moderate business and prices are firm. Ordinary brands—Chinese, Hungarian, etc.—have sold at 13¾@14½c. per lb. during the week. Cookson's is quoted at 17@17½c., and 18c. is now asked.

Quicksilver—Business has been steady, but not especially active. Representatives of the California producers quote $52, and importers report sales at about that figure.

Nickel—Ordinary forms—shot, blocks or plaquettes—are 40@45c. per lb., according to size and conditions of order. Electrolytic nickel is 5c. per lb. higher.

The export of nickel ore and matte from New Caledonia, also of chrome ore, has been prohibited by a recent decree. Special exemption from this decree may, however, be granted under conditions to be determined by the French Ministry for the colonies.

Gold, Silver and Platinum

Gold—The $100,000,000 gold pool in support of exchange transactions is being gradually closed up and the money returned to the subscribers. Of the total amount, only $25,000,000 was actually paid in.

Iridium—Supplies are still rather below the demand and the position of the market is unchanged. Most sales are on private terms.

Platinum—The market is quiet and is a little lower, with considerable range in prices. Current quotations are $44@46 per oz. for refined platinum; for hard metal, $48@53 is asked, according to quality.

Silver—The market has been firmer the last few days owing to some fresh orders, the origin of which is not known here at present. No speculative interests as yet seem to be taking hold of the situation.

Gold and Silver Movement in the United States, 10 months ended Oct. 31, as reported by the Department of Commerce:

	Gold		Silver	
	1913	1914	1913	1914
Exports	$74,563,059	$207,998,150	$53,896,586	$42,452,890
Imports	51,590,693	45,876,812	29,968,758	20,340,603
Excess, exports	$22,972,366	$162,121,338	$23,927,828	$22,112,287

Exports of merchandise for the 10 months were valued at $1,662,685,841; imports, $1,548,429,652; excess of exports, $114,256,189. Adding the excess of gold and silver makes the total export balance $298,489,814 this year.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Nov. 21

The base price paid this week for 60% zinc ore was $44 per ton. The base price offered for 80% lead ore was $45@46 per ton. No sales of lead ore were reported.

SHIPMENTS WEEK ENDED NOV. 21

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	4,014,420	....	172,000
Year	148,951,710	4,444,950	30,146,750

Shipped during week to separating plants, 3,871,340 lb. zinc ore.

JOPLIN, MO.—Nov. 21

Blende, high price $47; assay base, 60% zinc, $42@44, metal base, 60% zinc, $41@43; calamine, base, 40% zinc, $21@23; average, all grades of zinc, $40.78 per ton.

Lead, high price $49; base, $42@47 per ton of 80% metal content; average, all grades of lead, $44.64 per ton. Lead offerings advanced $5 per ton at the week-end.

The production of this district continues about 1500 tons per week short of an average output.

SHIPMENTS WEEK ENDED NOV. 21

	Blende	Calamine	Lead	Values
Totals this week.	10,252,620	824,440	1,711,030	$261,050
Totals this year..	462,646,550	35,016,770	79,963,600	11,499,210

Blende value, the week, $215,490; 47 weeks, $9,224,820.
Calamine value, the week, $10,370; 47 weeks, $410,700
Lead value, the week, $38,190; 47 weeks, $1,862,690.

*

On Sept. 30 there were 286 furnaces in blast in Great Britain, against 290 on June 30. The average number in blast for the quarter ended Sept. 30 was 281, being 12 less than in the previous quarter.

IRON TRADE REVIEW

NEW YORK—Nov. 25

There is no question that there is a growing confidence in the iron and steel markets and a better feeling, though actual changes have not been great.

In some lines orders begin to come in more freely, though buyers are close about prices and want their orders filled at low figures. Some manufacturers are inclined to hold back, believing that a reduction in wages must come and that still lower quotations will be possible. Structural-steel business is improving and there is more demand for bars and wire. In export business, some fair orders have been placed and others are under negotiation, with a prospect of resulting business.

Pig-iron buying is better, and demand is gaining both for small and large lots. In Eastern territory there is a noticeable call for foundry iron; in the West the demand is more for basic pig. Prices do not advance, but they are more firmly held than for some time past, at the present level.

Efforts are being made to arouse apprehension about the supply of ferromanganese, but users do not seem to be disturbed, and material is available at recent prices.

PITTSBURGH—Nov. 24

The improvement in sentiment that has been so marked since the early days of November, in sharp contrast with the hopeless feeling that characterized September and October, has not been accompanied thus far by any noticeable increase in the buying of steel products generally. There has been no further decrease in steel buying in the past two or three weeks, but as the mills have lately been running partly on old business their operations have had to be curtailed further, and the steel industry as a whole is now operating at only about 35% of its capacity, against fully 40% the first week in November. The present percentage of operation is the lowest in the history of the steel industry. Some improvement in buying is generally expected within the next fortnight or so, but no great increase is to be looked for before the turn of the year.

Steel prices have continued to decline slightly here and there, and the general level is as low as at the low point just three years ago, the lowest level for steel prices since 1898. Wire products are quotable on the basis of $1.55 for nails, the market before the recent advance, the advance never having been paid on any considerable tonnage. Plates are down to 1.05c., and shapes and bars are not firm at 1.10c. Railroad spikes are down to 1.35c. Sheets are easy at 1.80c. for black and 2.85c. for galvanized, with contracts for first quarter being made on this basis.

The leading interest has sold over 100,000 boxes of tin plate for export in the past few days. The Carnegie Steel Co. yesterday made an initial shipment of 2000 tons on an order for 10,000 tons of 3¼-in. steel rounds for shipment to France, and the Jones & Laughlin Steel Co. has an open order for similar material that may amount to an equal tonnage.

Pig Iron—The heavy buying reported lately from the Buffalo district has not extended to this district, except to the extent that the American Steel Foundries has bought 7500 tons of basic, and foundry iron consumers [illegible] interest, without putting out many definite inquiries. The steel foundry purchase was for shipment December to March inclusive to Alliance and Sharon, the price delivered Sharon being $12.75, indicating a basis of $12.50, Valley, for all the iron. There is a rumor that Cherry Valley furnace at Leetonia may be blown in Dec. 1. We quote: Bessemer, $13.75; basic, $12.50; No. 2 foundry and malleable, $12.75@13; gray forge, $12.50@12.75, f.o.b. Valley furnaces, [illegible] higher delivered Pittsburgh.

Ferromanganese—The steel [illegible] about the [illegible] of steel [illegible] requirements [illegible] reports of English [illegible] on the alloy [illegible]. Ferromanganese is quoted at $68, [illegible] subject to [illegible] of shipment, while [illegible] lots could be had at between $68 and $[illegible], Pittsburgh.

Steel—Pittsburgh mills have [illegible] somewhat on billets and sheet bars [illegible] as low as the Youngstown mills [illegible] for prompt and [illegible] first quarter. We quote the market [illegible] billets and sheet bars [illegible] Pittsburgh or Youngstown [illegible] that.

FOREIGN IRON

Pig-Iron Production in Germany in September was 518,184 metric tons, against 1,590,849 tons in September, 1913. For the nine months ended Sept. 30 the total make was 14,455,886 tons in 1913, and 11,996,652 in 1914; a decrease of 2,459,234 tons, or 17% this year.

Steel Production of Germany, seven months ended July 31, in metric tons.

	Basic	Acid	Total
[illegible]	6,281,431	58,816	6,340,247
[illegible]	4,141,811	207,976	4,349,787
[illegible]	142,412	64,420	206,832
[illegible]	..	54,021	54,021
[illegible]	.	63,789	63,789
Total	10,565,654	449,022	11,014,676

The total number of steel works reported in July was 242. Steel production was not reported monthly previous to the present year.

British Imports and Exports of Iron and Steel nine months ended Sept. 30 are valued by the Board of Trade returns as below:

	Exports	Imports	Excess
Iron and steel	£33,976,229	£9,582,502	Exp. £24,393,727
Machinery, hardware, etc.	39,228,065	10,944,129	Exp. 28,283,936
Totals	£73,204,294	£20,526,631	Exp. £52,677,663
Totals, 1913	87,290,799	23,108,534	Exp. 64,182,265

Quantities of iron and steel exported were 3,724,606 long tons in 1913, and 3,179,726 in 1914; decrease, 544,880 tons. Quantities imported, 1,611,493 tons in 1913, and 1,467,512 in 1914; decrease, 143,981 tons.

IRON ORE

One cargo of Swedish ore is now afloat for Philadelphia, but it is understood that no more will be shipped for a time.

Hearings before the Interstate Commerce Commission on iron rates from Lake Erie ports to furnaces in the Pittsburgh and Wheeling districts have been postponed.

Hearings are going on before the Interstate Commerce Commission on protests against the 60c. rate now in force from mines in the Lake Superior region in Minnesota to the upper ports.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 206,314 short tons; shipments, 210,387 tons. Shipments of Greensburg and Upper Connellsville districts, 30,464 tons.

Coal passing through the Sault Ste. Marie Canal for the season to Nov. 1 was: Anthracite, 1,827,211; bituminous, 11,323,334; total, 13,150,545 short tons, a decrease of 3,561,457 tons, or 21.3%, from last year.

Coal and Coke Tonnage on Pennsylvania R.R. lines east of Pittsburgh and Erie, 10 months ended Oct. 31, in short tons:

	1913	1914	Changes
Anthracite	8,711,723	9,205,279	I. 493,55
Bituminous	42,662,163	40,346,167	D. 2,315,99
Coke	12,012,363	8,324,007	D. 3,688,35
Total	63,386,249	57,875,453	D. 5,510,79

Coal Production of Austria nine months ended Sept. 30, in metric tons:

	1913	1914	Changes
Coal	12,333,017	11,700,541	D. 632,47
Brown coal	20,612,130	18,337,727	D. 2,274,40
Coke	1,909,235	1,771,938	D. 137,29
Briquettes	326,683	304,762	D. 21,92

Of the briquettes reported this year 163,399 tons were made from brown coal or lignite.

SAULT STE. MARIE CANAL

Freight passing through the Sault Ste. Marie canals in October was 7,740,055 net tons. For the season to Nov. 1 the total freight reported was: East bound, 36,398,565; west bound, 14,375,115; total, 50,773,680 short tons, a decrease of 20,218,888 tons, or 28.5%, from 1913. The number of vessel passages in 1914 was 17,065, giving an average cargo of 2975 tons. The mineral freight included in the totals was, in short tons excepting salt, which is in barrels:

	1913	1914	Changes
Coal	16,712,002	13,150,515	D 3,561,457
Iron ore	44,710,520	30,297,986	D 14,412,534
Pig and m'f'd iron	340,970	211,936	D. 129,034
Copper	77,492	60,584	D. 16,908
Building stone	6,181		D. 6,181
Salt, bbl	693,685	651,256	I 47,571

CHEMICALS

NEW YORK—Nov. 23

Arsenic—The market is quiet, with little business forward. Quotations are about $4 per 100 lb. for both spot and futures.

Copper Sulphate—Business is moderate and the market is quiet and unchanged. Current quotations are $4.35 per 100 lb. for carload lots and $4.60 per 100 lb. for smaller parcels.

Nitrate of Soda—There is nothing doing in nitrate this week. Prices are nominally unchanged at 1.85c. per lb. for November and December and 1.87½c. for 1915 deliveries.

Imports and Exports of Chemicals in the United States, nine months ended Sept. 30, in pounds:

	Imports		Exports	
	1913	1914	1913	1914
Arsenic	5,615,876	3,171,867	66,000	700
Bleach	17,429,019	29,185,862	13,260	12,654
Potash salts	37,217,581	25,065,751	1,000,277	481,655
Acetate of lime		..	57,261,340	41,514,968

Exports include reëxports of foreign material. Imports of soda salts are not given in quantities; values were $242,374 in 1913, and $460,023 this year

STOCK QUOTATIONS

The quotations given below are all established since Nov. 10, except the following: Argonaut, Brunswick, Boston & Corbin, Cedar Talisman, Chollar, Con. Nev.-Utah, Corbin, Golden Cycle, Iron Cap, Mutual Mining, Puebla S. & R. Co., Savage, Standard Silver Lead, Stratton's Independence. In general, the stock markets have shown improvement during the week:

COLO SPRINGS Nov. 23

Name of Comp	Bid.
Acacia	.02¾
Cripple Cr'k Con	007
C. K. & N	03
Doctor Jack Pot	07½
Elkton Con.	39½
El Paso	80
Findlay	007
Gold Dollar	02
Gold Sovereign	07
Golden Cycle	‡1 00
Isabella	11¼
Jack Pot	06
Jennie Sample	02
Jerry Johnson	02½
Lexington	003
Old Gold	01
Mary McKinney	35
Pharmacist	009
Portland	1 04
Vindicator	1 08½

SALT LAKE Nov 20

Name of Comp.	Bid.
Beck Tunnel	.04¼
Black Jack	02¾
Cedar Talisman	‡ 00½
Colorado Mining	08¾
Crown Point	‡ 00½
Daly-Judge	4 10
Gold Chain	06
Grand Central	62
Iron Blossom	1 10
Little Bell	10
Lower Mammoth	.01¼
Mason Valley	25
May Day	08
Opohongo	‡ 01½
Prince Con	16
Silver King Coal'n.	2 35
Silver King Cons	1 15
Sioux Con.	01½
Uncle Sam	02
Yankee	02

SAN FRANCISCO Nov 23

Name of Comp	Bid.
Comstock Stocks	
Alta	05
Belcher	70
Best & Belcher	05
Caledonia	30
Challenge Con	04
Chollar	‡ 02
Confidence	15
Con. Virginia	12
Crown Point (Nev.)	.29
Gould & Curry	01
Hale & Norcross	01
Mexican	29
Occidental	85
Ophir	10
Overman	14
Potosi	01
Savage	‡ 05
Sierra Nevada	06
Union Con.	06
Yellow Jacket	38

Name of Comp	Bid
Misc. Nev. & Cal	
Belmont	4 37½
Jim Butler	69
MacNamara	02
Midway	05
Mont.-Tonopah	‡ 37
North Star	17
West End Con.	55
Atlanta	31
Booth	04
C.O.D. Con	04
Comb. Frac.	10
Jumbo Extension	1 .65
Pitts.-Silver Peak	34
Round Mountain	38
Sandstorm Kendall	08
Silver Pick	10
Argonaut	‡2 50
Brunswick Con	‡1 50
Central Eureka	20
So. Eureka	‡1 80

TORONTO Nov 23

Name of Comp	Bid.
Bailey	01½
City of Cobalt	30
Coniagas	5 00
Peterson Lake	28
Right of Way	02
T. & Hudson Bay	25 00
Timiskaming	.10½
Wettlaufer-Lor.	03½
Big Dome	6 20
Dome Exten	06½

Name of Comp	Bid.
Foley O'Brien	15
Hollinger	18 50
Imperial	‡ 00½
Jupiter	11¼
McIntyre	25
Pearl Lake	.02
Porcu. Gold	.06
Preston E. D.	.01
Rea	10
Seneca Superior	1 50

N. Y. CURB Nov 23

Name of Comp.	Clg.
Beaver Con.	22
Big Four	05
Blue Bell	03
Braden Copper	5¼
B. C. Copper	50
Buffalo Mines	62½
Can. Cop. Corpn.	1 25
Can. G. & S.	03
Caribou	10
Chambers Ferland	12
Con. Ariz. Sm	31¼
Cons. Nev.-Utah	‡¼
Coppermines Cons	1¼
Davis-Daly	75
Diam'field-Daisy	05
Ely Con.	01
Florence	43
Goldfield Con.	1 50
Greene Cananea	23
Kerr Lake	4¼
La Rose	¾
McKinley-Dar-Sa	62
Mines of Am	2 18¾
Mutual Min., pf	‡2½
Nevada Hills	27
New Utah Bingham	‡¾
Nipissing Mines	5¼
North Star	19
Ohio Copper	09½
Oro	09
Puebla S. & R	‡¾
Stand'd Oil of N.J.	387
Stand'd Silver Lead	‡1 1/16
Stewart	1¼
Tonopah	7
Tonopah Ex.	54
Tonopah Merger	37
Tularosa	¾
West End Ex	01
Yukon Gold	2¼

BOSTON CURB Nov. 23

Name of Comp.	Bid.
Bingham Mines	‡ 04¼
Boston & Corbin	‡ 25
Boston Ely	5
Butte & Lon'n Dev	27
Calaveras	1
Calumet-Corbin	11
Chief Cons.	70
Corbin	‡ 90
Cortez	‡.10
Crown Reserve	74
Eagle & Blue Bell	82
First Nat. Cop.	1 3/16
Houghton Copper	-
Iron Cap Cop., pf	‡14 75
Majestic	20
Mexican Metals	18
Nevada-Douglas	50
New Baltic	75
Oneco	‡ 30
Raven Copper	10
Smokey Dev.	15
So. Lake	11
Tonopah Victor	17
Trethewey	14
United Verde Ext	11

LONDON Nov 11

Name of Comp.	Clg		
Camp Bird	£0	6s	6d
El Oro	0	11	6
Esperanza	0	8	9
Mexico Mines	4	0	0
Oroville	0	7	6
Santa Gert'dis	0	10	0
Stratton's	£0	0	6
Tomboy	1	0	0

The Engineering and Mining Journal

VOLUME 98 DECEMBER 5, 1914 NUMBER 23

The New Zinc Smeltery at Langeloth

By W. R. Ingalls

SYNOPSIS—A description of a new zinc-smelting works near Pittsburgh, Penn., that is about ready to be put in operation. The plant is built right over a coal mine which supplies the fuel. The gas producers, roasting furnaces and smelting furnaces are of the Hegeler type. The methods of handling material in the works are chiefly mechanical.

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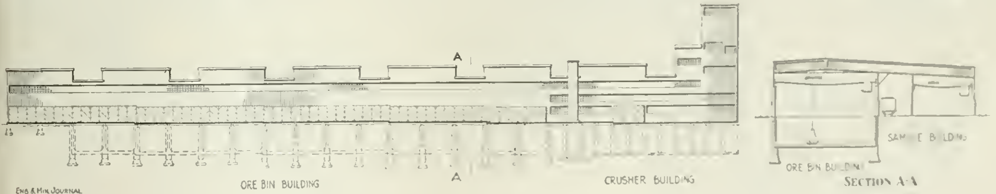
The American Zinc & Chemical Co. is about completing a new zinc-smelting works at Langeloth, Penn. The American Zinc & Chemical Co. is a subsidiary of the American Metal Co., Ltd. The works have been designed and built by Nicholas L. Heinz, general manager of the company. Mr. Heinz was formerly with the Matthiessen & Hegeler Zinc Co., at La Salle, Ill.

The zinc-smelting industry during the last 10 years has steadily been marching eastward. Several large works have lately been erected in the Illinois coal field. The Grasselli Chemical Co. has been operating at Clarksburg and Meadowbrook, W. Va., for a good many years, using natural gas as fuel. The American Zinc & Chemical Co. is the first concern to come so far east as Pittsburgh and build a works to use coal as fuel.

Langeloth, which is a new town, is situated a few miles from Burgettstown, about 30 miles west of Pittsburgh, on the Panhandle railway, one of the Pennsylvania lines. The Pennsylvania has built a branch to Langeloth, known as the Langeloth branch, and it is understood will continue this branch farther, making connection with Wheeling, W. Va.; therefore, Langeloth is expected soon to be on the main line from Pittsburgh to Wheeling.

The industrial regions in the vicinity of Pittsburgh and Wheeling constitute the largest center of spelter consumption in the United States. In this region, also, there is a large demand for sulphuric acid, which is required by the galvanizers and tin-plate makers for their pickling liquor, and also is needed by the refiners of petroleum. There is, furthermore, a good market for lead in this vicinity, and lead-smelting facilities are already available, while additional facilities are to be found on the Atlantic seaboard; therefore lead- and silver-bearing residuum can be marketed without incurring any unnecessary carriage. It is as cheap, perhaps cheaper, to bring zinc, lead and sulphur to Pittsburgh in the form of ore as in the form of finished products. The determinative factor is, of course, the existence at Pittsburgh of a high grade of bituminous coal.

The Langeloth smeltery is built right over a coal mine, the company having acquired a large acreage comprising the Pittsburgh seam, which is here 5 ft. in thickness, together with other workable seams, making a total thickness of 10 ft. of coal, which are opened by a shaft only 90 ft. deep. The company is developing its coal mine upon modern lines, and contemplates the marketing of its lump coal and the use of the slack for its own smelting purposes. The latter will be delivered from the mine directly into the bunkers of the smeltery.



Side Elevation

Section A-A

Profile and Section of Ore Bin and Crusher Building

The situation chosen for the smelting plant is unique, being on the top of a hill, from which the ground slopes away in most directions. The topography is uneven, and a good deal of excavation and concrete work had to be done. The disposition of the several departments has been made upon a broad scale; therefore it is unlikely that a cramped condition will develop through any future growth of the plant that can be imagined.

The General Plan

From the metallurgical standpoint, Langeloth is a magnified and modernized La Salle, the roasting, [illegible] and distillation departments following closely the Hegeler designs, but with improvements in details. The plant at present under construction comprises two roasting furnaces and four distillation furnaces, but the layout calls for four times the present number of each. At the time of my visit (Oct. 10) one roasting furnace, together with the connecting sulphuric-acid department, was in operation. The pottery was completed and the manufacture of retorts had just been begun. The distillation furnaces were well advanced, one of them indeed being so far along that it could be put in operation on short notice if desired.

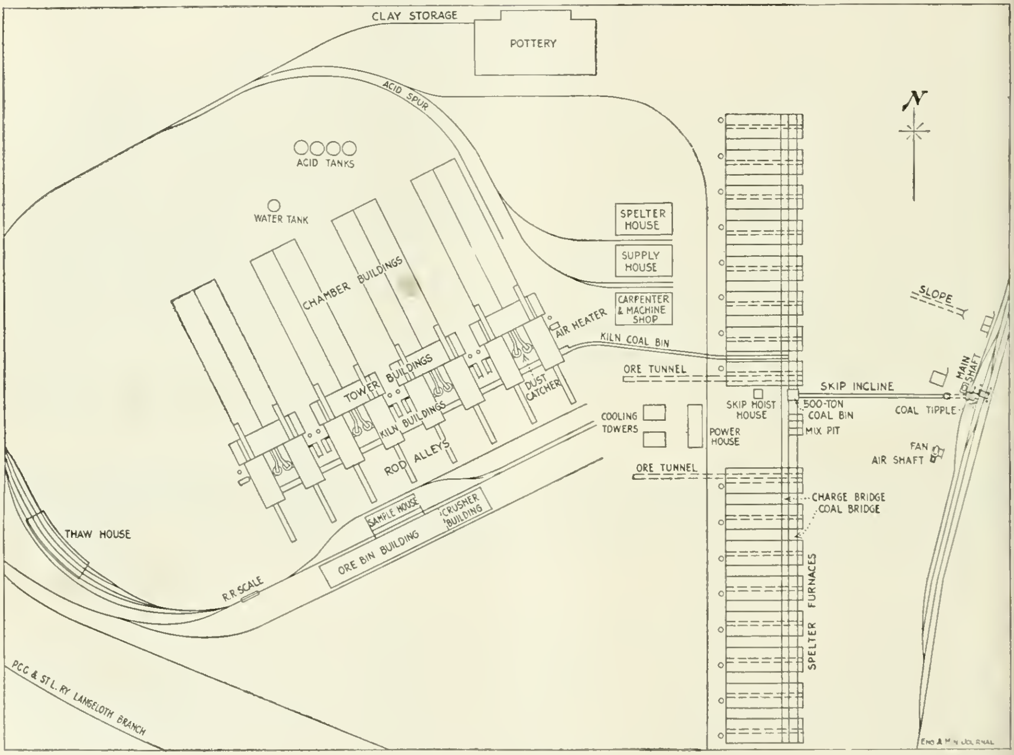
The arrangements for receiving, storing and handling the ore supplies are decidedly better than are to be found in most zinc smelteries. The ore is unloaded from the railway cars into deep bins of reinforced concrete, these bins being built on a side hill, which permits a great depth to be obtained. The row of bins is spanned by a traveling crane, and the distribution of the ore in the bins and the reclamation from them are done by means of a grab bucket. This crane and bucket takes the ore to the crushing and sampling mill, which is of large and thoroughly modern construction. This mill is designed for the handling of both lump ore and fine ore. The ore is dumped upon a very capacious grizzly, the coarse passing to a jaw crusher and the fine to rolls. For the drying of the ore before screening, there is a Ruggles-Coles cylindrical drier, the gases from which pass through a sheet-steel dust-collecting chamber before being discharged through the chimney. The mill is provided with modern methods for sampling.

The Roasting Furnaces

The roasting department comprises two Hegeler muffle roasting furnaces of the standard design. Each furnace is double, seven hearths high, the individual hearths being 6 ft. 1 in. by 80 ft. Consequently the furnace has a hearth area of 6813 sq.ft. Only the lower three hearths are muffled. These furnaces are of extraordinarily massive construction. The interior arches, which are built with a considerable spring, are laid with tongued-and-grooved brick. Above each row of skewbacks is laid a line of heavy projecting brick, which carries the weight of the rabble and keeps it entirely off the hearth. The hearth paving is, of course, free to rise or fall with the arches.

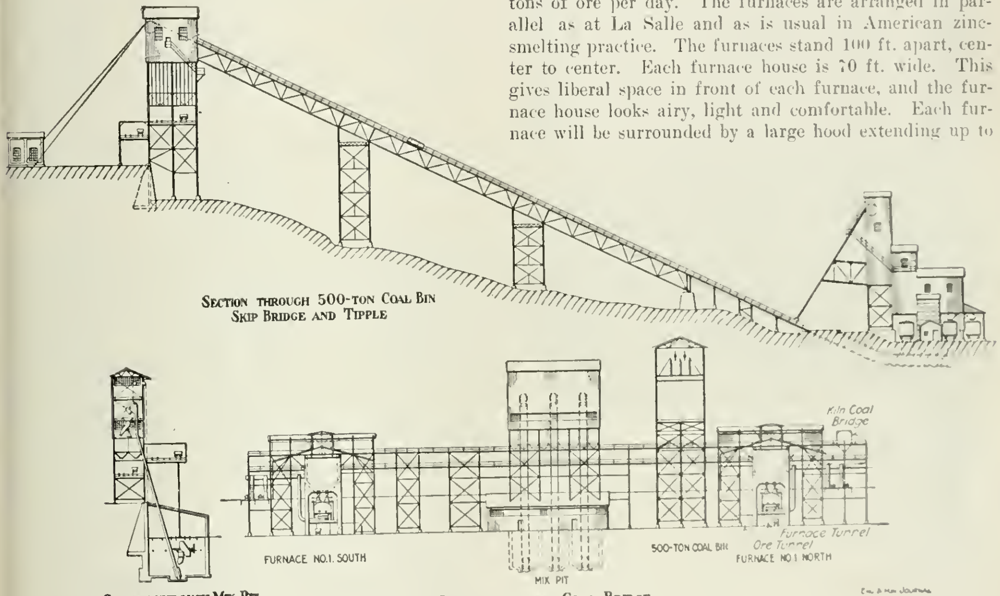
The rake rods are jointed in sections, permitting easy replacement of any part. They are pulled and shoved by connection with an endless chain, following the fashion originally introduced at Peru, Ill. The time of raking each hearth is registered automatically in the office, enabling the roasting operation to be supervised at headquarters.

Each furnace has a gas producer, 9x15 ft. The boshes of this producer are water-cooled. The gas from these producers burns in the flues under the fifth, sixth and



General Plan of Works

seventh hearths, the secondary air being introduced through ports in the sidewalls of the furnace. From the combustion flues the gases pass through a U-pipe stove and thence to the chimney. Their temperature upon leaving the furnace is 800° C.; upon arriving at the chimney, 200° C. The air required for the combustion of the ore passes first through the U-pipe stove, wherein it is heated to 400° C.; thence it passes through flues under the sixth and seventh hearths, alternating with the combustion flues, wherein it is heated to 700° C.; thence it passes through flues and ports in the middle wall of the furnace into the muffles. The air supply is forced into the furnace by means of a Sirocco fan. The preheating of the air and the construction of the furnace generally give very good results in the matter of fuel economy.



Section through 500-ton Coal Bin Skip Bridge and Tipple

Section through Mix Pit

Section through Coal Bridge

Profile and Section of Coal Bridge

The furnace roasts about 55 tons of ore per day, or about 16 lb. per square foot of hearth area, using about seven tons of coal, or about 13%. The roast gas contains about 4.5% SO_2 by volume and reaches the Glover towers with a temperature of 380° C.

Sulphuric-Acid Department

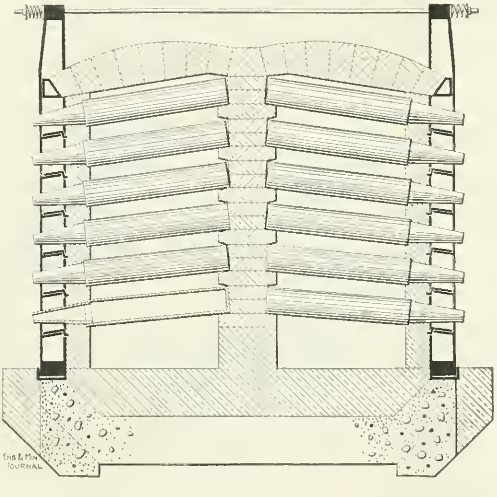
The gases leaving the roasting furnace pass through a centrifugal dust catcher, which is 30 ft. in height and 26 ft. in diameter inside. From here the gases pass to the Glover tower, which is 14x14 ft. in section and 40 ft. in height. The gases leaving the Glover tower pass through 10 lead chambers, which have a total capacity of 360,000 cu.ft. Then, from the chambers the gases go through three Gay-Lussac towers, 14x14x40 ft. All the towers are filled with special brick. The gases are forced through the acid chambers and towers by means of two 54-in. fans, made of hard lead (90% lead and 10% antimony), motor driven. The above mentioned towers and chamber space are for one roaster only; therefore, each roaster has one Glover tower, three Gay-Lussac towers and 10 chambers with 360,000 cu.ft. of chamber space. The acid is elevated to the tops of the towers by means of cast-iron acid eggs; each egg holds seven tons of acid. The dust chambers are set directly over the tunnel which runs underneath the roasting furnace, and are hoppered to one point so that they are very easily cleaned.

The Distillation Furnaces

The distillation furnaces now under construction at Langeloth are four in number. They are Hegeler furnaces, each comprising 864 retorts, six rows high. The retorts are cylindrical, 8 in. in diameter inside. Each furnace is expected to have a capacity for smelting 20 tons of ore per day. The furnaces are arranged in parallel as at La Salle and as is usual in American zinc-smelting practice. The furnaces stand 100 ft. apart, center to center. Each furnace house is 70 ft. wide. This gives liberal space in front of each furnace, and the furnace house looks airy, light and comfortable. Each furnace will be surrounded by a large hood extending up to the monitor on the roof, as at La Salle. The spaces 30 ft. wide between the respective furnace houses are roofed in.

Each furnace is fired with gas from a Hegeler producer 9½x22 ft. At the gas-inlet end, the middle wall stops short of the end wall and is reduced to a thin edge, the purpose being to divide the gas between the two combustion chambers. At the chimney end there is a wall of checker-work, just in front of the main end wall of the furnace, by the closing of the openings of which the current of the combustion gases may be controlled to some extent. From the furnace the combustion gases pass through a Rust boiler (vertical tubes) of 525 hp., and from the boiler they pass to a brick chimney 125 ft. high, 6 ft. in diameter (inside) at the top. Standing by each chimney and connected therewith is a down-draft kiln for annealing retorts. Each boiler is provided with a firebox for the direct combustion of coal, enabling use to be made of the boiler when the distillation furnace is cold, for repairs or otherwise.

The air for the combustion of the gas in these furnaces is delivered by a No. 6 Sirocco fan (one for each furnace), which has capacity of delivering 27,000 cu.ft. of air against 5 in. of water. The air main extends longitudinally over the furnace in the middle, branches conducting air to the front of the furnace, where it is blown in through ports in the wide front pillars between every section of 24 retorts. A new feature of this furnace is the flat roof-arch laid at a slope corresponding with the slope of the retorts. Inasmuch as such an arch will not give upon expansion, but will transmit a full thrust to the skewbacks, the upper ends of the buckstaves are connected with the tie-rods through springs, so as to allow for expansion in the usual manner of many metallurgical furnaces of similar construction. The buckstaves are of cast iron. Their footings have a ball-and-socket joint, permitting movement in any direction. In the construction of the front wall, pillars stand on pillars. Every other pillar has a piece of heavy steel wire baked in it. The ends of this wire are bent around the flanges of the buckstave, holding the pillar to the buckstave.



Transverse Section of Distillation Furnace

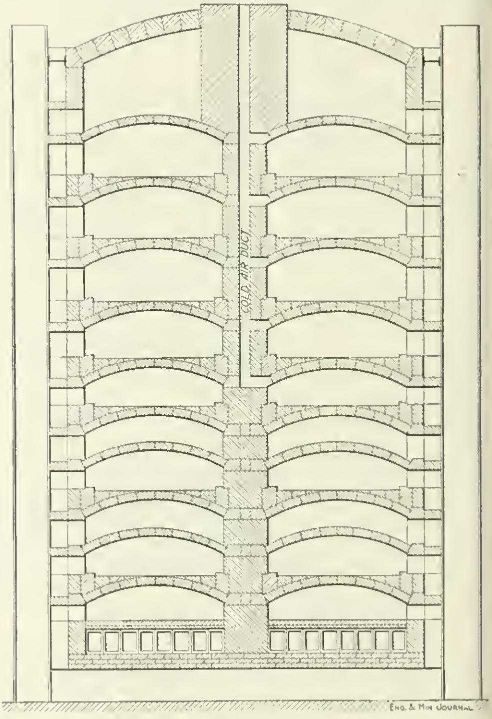
The ash pockets in front of the furnace are unusually commodious. It is contemplated that they will not be completely emptied at any one time, but that enough residuum will be left in them to prevent any updraft in front of the furnace. In the floor of the furnace house are several chutes for the immediate disposition of broken retorts. The tunnel beneath the furnace is large.

Power Plant and Pottery

The power plant of the works is of 2000-kw. capacity, developed by turbine-generator sets, the steam coming from the waste-heat boilers of the distillation furnaces. Both alternating and direct current are available. The production of power will be greater than required by the works itself, and it is contemplated that a considerable surplus will be sold to a local street-railway line.

The pottery is an unusually spacious building. I the manufacture of the retorts, chamotte from Cresson Penn., and plastic clay from St. Louis, Mo., are used i the proportion of about half and half. The clay i crushed in edge-runner mills of ordinary construction The clay is pugged in a Wettengel pug mill, and the retorts are molded by a Wettengel hydraulic press. Th condensers are made by the well known Garrison machine The drying rooms are heated by steam pipes beneath th grated floors upon which the retorts stand, the moist air passing away through galvanized-iron ducts.

In this brief sketch of an interesting plant, I hav scarcely touched upon the character of the construction which in the main is brick and reinforced concrete, no upon the system of handling material through the works. Speaking generally, there is large storage capacity between the several departments; therefore, it is hard to imagine how an interruption of work in any one would interfere with the operation of the other departments. The mouth of the coal mine, which supplies the fuel, is at the foot of the hill on which the works is erected, the coal being sent up over a long, inclined trestle, the top of which is at such height that delivery may be conveniently made to any department of the works. The car running up this trestle delivers into a 500-ton bin. In starting up this system, one man, a green hand, raised coal at the rate of 150 tons per hour.



Transverse Section of Roasting Furnace

In the layout of the works there has been no servile adherence to the theory that the material ought to pass from one department to another by gravity, disregarding the fact that the elevation of material to a moderate height costs but a trifle per ton. An attempt to conform to the conditions of gravity often results in a cramped condition of the works. At Langeloth the several departments have been laid out with broad spacing, and where it has been necessary to elevate material, the problem has been approached boldly, levels being created where they were desired. Thus the ore is brought to the roasting furnaces through a tunnel beneath them, and is elevated to the top of the furnaces by means of a large substantial belt elevator for each furnace. The belt elevator delivers to a drag conveyor which carries the ore to the feed hole in the top of the furnace, the ore experiencing its final drying during this movement.

Not far from the works the company is building a model town for the housing of its employees. The late Jacob Langeloth was greatly interested in this town and remembered it substantially in his will. It is expected that this town will embody all the best ideas for promoting the comfort and welfare of the working men, and being situated in a pleasant farming country, there are unusual opportunities. A description of this must be deferred, however.

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Limestone Production and Its Uses

By Edwin C. Eckel*

Limestone is one of the most important raw materials among the mineral products available for modern industry. This would be more readily understood if the total limestone output of the United States, including all the stone used for various purposes, were to be reported as a unit. In the past this has not been done, owing to the inconvenience of the computations necessary; and to the fact that in some cases only approximate results can be secured. But in the course of revising a volume on cementing materials, it has seemed desirable to attempt to place the matter on a reasonably clear footing, and the following results are thus made available.

In the official statistical volume of the U. S. Geological Survey, a portion of the total limestone output is reported under the head of "stone," and of this portion part is given in long tons, part in short tons, and part merely by value. Another portion of the total is, of course, represented by the figures given in another chapter under the head of "lime," where the lime produced is reported in short tons. A third portion of the limestone output is implied, though not stated, by the figures given in still another section under the head of "portland cement," for both portland and natural cements use limestone as a raw material. Other smaller portions of the total appear as raw materials or adulterants in other industries.

It is, of course, possible to make quite close approximations to the quantity of limestone represented by the actual output of lime, portland cement and natural cement. It is further possible to make approximations, though necessarily somewhat less accurate, as to the tonnage of stone represented by the values given for the building stone output. The last step, the conversion of these figures into the same unit, is merely a matter of arithmetic.

The official statistics relative to the stone industry during 1913 have appeared on the day that this is written, and have been recalculated and added to figures already prepared for the 1912 output of various types of limestone. In the table following, therefore, we are prepared to furnish data on the total quantity of limestone quarried in the United States during the two years 1912 and 1913, and on the subdivision of this total output according to its main types of utilization. It is the first time that estimates of this character have been presented; and, of course, they are merely approximate. But they are close approximations, and most of us would prefer a prompt diagnosis to a precise post-mortem.

TOTAL LIMESTONE OUTPUT AND USES, 1912-1913; SHORT TONS

Utilization	Short Tons 1912	Short Tons 1913
Crushed stone for road metal, ballast, concrete	33,122,642	35,169,528
Blast-furnace flux	22,613,420	25,335,476
Raw material for portland cement	18,500,000	20,720,000
Burned into lime directly	6,300,000	6,435,000
Rough and dressed building and paving stone	3,700,000	3,300,000
Sold crude, mostly burned into lime by buyer	2,000,000	2,000,000
Raw material for natural cement	150,000	135,000
Total limestone output, short tons	86,386,062	93,085,004

The preceding table enables us, for the first time, to form some definite idea of the relative importance of the different utilizations of limestone in the United States during recent years. So far as can be determined, only about 4% of the total output of limestone and marble is used as building stone, decorative stone, curbing and flagging, etc. Adding to this the crushed stone used for road metal, railway ballast and concrete aggregate, we see that all of the physical utilizations of limestone, taken together, absorb about two-fifths of the total output. The remaining three-fifths goes into uses in which the chemical properties of limestone are the important factors.

As to these chemical utilizations of limestones, we can see that about one-quarter of all the limestone quarried is used as blast-furnace flux and that about one-fifth of the total is used as raw material in the manufacture of portland cement. Almost exactly one-tenth of the total is burned into lime and used in that form for one purpose or another.

The statistics which are available do not enable us to go back very far in the past history of the limestone industries, for it is not until recently that even fairly accurate estimates as to some lines of utilization are obtainable. But it seems clear that for at least a decade past there has been a progressive increase in the relative importance of the chemical uses of limestone, as compared with the purely physical utilizations. If it were not for the growth of the crushed-stone industry, the disproportion between the two main classes of use would have been still more striking, for, so far as we can learn there has been little proportionate increase in the structural uses of limestone for many years.

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Precipitation of Alumina in Presence of Fluorides

In presence of fluorides, alumina is not completely precipitated by ammonia, according to H. Cavaignac, in *Comptes rendus*. Thus, from a solution of ammonium-aluminum fluoride, ammonia precipitates only [illegible] to 98.6% of the alumina at the ordinary temperature, [illegible] less than half that at 100° C. In addition the precipitate is contaminated with entrained fluorides.

Men and Machinery of the Comstock--The Combination Shaft

By G. W. Dickie

SYNOPSIS—Some of the problems involved in making piping as well as pumping machinery for pressures running up to 2150 lb. were especially interesting before the days of steel castings. Large air chambers were required and special pumps were designed for giving the necessary supply of air to them. The "burial" of a $46,000 two-stage air compressor, which antedated all others by 15 years, was ordered by Mr. Fair. The first Pullman car. The building, testing and starting of the hydraulic plant for three great shafts.

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Time was an important element in our contract with the Chollar, Norcross and Savage mines, so we did not lose any in starting. There was nothing new or novel to the engine part, except size, and details for parts of it were in the shop within a week after signing the contract. It is unfortunate that all the plans for this work, including a complete set of drawings and photographs that I had collected, were destroyed in the great fire of 1906, as some illustrations for this article would have added much to its interest. I will, however, give as clear an account of this work as I can, and of what we had to go through and how we finally succeeded.

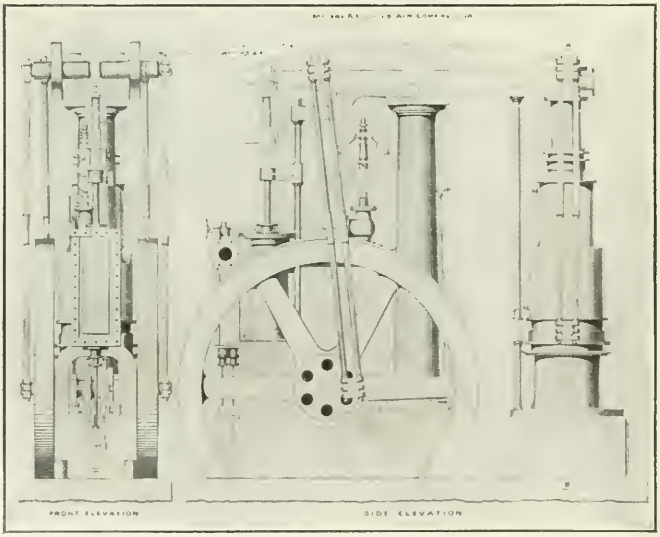

Fig. 1. Dickie's Compound Air Compressor

I was 32 years of age when this work began, and a year later, when all was operating as specified, my hair was as gray as it is today.

There were no steel castings made then and no solid-drawn steel tubing; we had to build this great work with the materials available, which were iron castings and forgings. The pig iron we had was of good quality; it did not pay to ship any but the very best iron to San Francisco, for at that time the freight from the East or Great Britain by sailing ship was $12 per ton. Such being the quality of the iron, we could depend on 18,000 lb. tensile strength for the castings, and I decided on 3000 lb. per sectional inch as the working load on all cast-iron work, with such reinforcing as special shapes required. Thus for the air pressure accumulator, the inside diameter of which was 30 in. and working pressure 1000 lb. per sq.in., the thickness both of walls and of the flanges was 5 in.; the flange belts were $1\frac{1}{2}$ in. diameter, 5 in. pitch; the faces of the flanges rabbeted into each other inside the bolt lines; the joints were copper gaskets. This type of joint was used throughout all the hydraulic work.

A Power Pipe Pressure of 2150 Pounds

The power pipe that stood vertical in the shaft was 10 in. diameter, and 1000 lb. pressure at the top and 2150 lb. at the bottom, being $1\frac{5}{8}$ in. thick at the top and $3\frac{1}{2}$ in. thick at the bottom. The 12-in. return pipe, with no pressure at the top and 1150 lb. pressure at the bottom, had a thickness of $\frac{5}{8}$ in. at the top and $2\frac{3}{8}$ in. at the bottom. All bends and elbows with a radius less than five times the diameter of the pipe were thickened correspondingly on the inside of the curve. We annealed all pipe castings in the hydraulic system. To provide against shock at the ends of the stroke and to absorb it, we had three air chambers at the back end of the pump station at the 2400-ft. level, one for each of the pumps. On the descending column we fitted recording pressure gages at each 100 ft. to determine if there should be water rams at any point. These enabled us to ascertain the cause of two breaks that occurred in the pipes, one at the 1800-ft. level and the other at the 1200-ft. level.

The charging of the air chambers and the great air-loaded accumulator at the surface involved the necessity of designing a special air compressor, and as the pressure at the pumping station was 2150 lb. per sq.in., we had to devise something that would deliver air at 160 times the atmosphere, at Virginia City. I had been working on a type of air compressor that would compress in two stages with a compound engine, and determined to make a smaller model of this compressor to be used for the hydraulic-pump system. I fortunately have a lithograph, Fig. 1, of a larger one made at this time, which I will use to illustrate what I made to charge the air chambers. This was made many years before compressing in two stages came into general use.

In the small one, made for the Chollar, Norcross and Savage shaft, the steam cylinder was 8 in. diameter with a stroke of 24 in.; the rams, which were stationary, the cylinders sliding over them, 7 in. diameter for the lower and 2 in. for the upper one. On the up-stroke the air was taken through the valve in the head of the lower fixed ram; on the down-stroke this air was compressed through a valve into the upper part of the cylinder. It was then at nine atmospheres. On the next up-stroke this air was compressed until the valve in the lower end of the upper ram opened, which it did at 2150 lb. pressure and at about 2 in. from the end of the stroke, and delivery was made into the receiver. This small compressor gave excellent results with little trouble; it was run about two hours each day to supply all the air required.

THE CROWN POINT COMPRESSOR

We built at this time a large compressor, of which the above was the model, and I think it would enliven the narrative to tell here the story of the Crown Point compressor. The Crown Point mine had been long under the control of the Bank of California crowd. It needed a new and large compressor, and I urged its management to order one of my new compound type, which it did. It was to have two beams—a double arrangement, as shown in Fig. 1. The high-pressure steam cylinders were to be 18 in. and the low 36 in., with a stroke of 42 in. The air rams were to be two lower rams 26 in. diameter and two upper rams 14 in. diameter, with a capacity of 2000 cu.ft. of free air per min., compressed to 80 lb. per sq.in. pressure. The flywheels were arranged as shown in Fig. 1.

We completed this compressor in four months and had it set up and tested in the shop, a fine foundation having been built for it at the Crown Point mine. Just about the time that we were ready to take it down for shipment the Bonanza crowd got control of the Crown Point mine. Mr. Taylor, president of the Risdon Iron Works, came to the office one morning in great trouble and called me into a private room to inform me that the enemy were in control at Crown Point and it was all up about the compressor.

"Now," said he, "you seem to be on better terms with Mr. Fair than any of us, and I want you to go up to his office and see what you can do about it." So to Mr. Fair's office I went with great trepidation, for he might be in a bad humor, in which case I had little chance of accomplishing anything. I found him in his office evidently elated over the Crown Point business. When I entered he said heartily, "Be seated, Mr. Dickie; now what can I do for you, my son?"

"Mr. Fair," I said, "I have come up to see you about the new compressor for Crown Point. It is all ready and has been tested in the shop, and I thought you might like to come down and see it run before we ship it."

"But," he replied, "I do not want that compressor."

That remark made me feel rather down-hearted, so I ventured cautiously to extol the virtues of my compressor, and said, "Mr. Fair, why don't you want that compressor; it will be more economical than any compressor now on the Comstock by at least 30 per cent."

Then he let me in on some of the economics of mine control by replying, "Now, my son, you've got it. We have got control of that mine, so that if we can't get metal out of her we can put wood into her; we are selling Crown Point 80 cords of wood per day and an economical compressor will cut down our sales."

"Mr. Fair," I said, "the foundations are all complete and the holding-down bolts in place, ready to receive the compressor, and you cannot afford to leave it incomplete, so you had better let me ship it, especially as a great many mining men are anxious to see how it will turn out."

"Now, my son," he said, "you had better not say anything more about it; we are not going to take that compressor." "Then," said I, "what are you going to do about our contract?" "Oh, you have a contract have you? Robert, where is that contract with the Risdon for a compressor? Ah, my son, here it is, $46,000. It seems to be all right. Robert, make out a check to the Risdon Iron Works for $46,000 on Crown Point account."

BURYING A NEW IDEA

"That's all right," I said, "but what are we to do with your compressor?" "How big is this thing, my son?" I told him about 20 ft. long, 17 ft. high and 8 ft. wide. "Well, my son, it's pretty big—too big to bury it standing up, as you get into water pretty quick down at your place, but dig a nice hole and lay it on its flat. You can go down 9 ft., and cover it up carefully; no headstone, I want your compressor to have a nameless grave and we'll say no more about it."

So ended the chance for a real two-stage compressor, and it was 15 years before anyone else built a compound compressor. Passing some time ago the site of the old Risdon Iron Works, I came across one or two parts of the old Crown Point compressor; probably no one but myself could identify them. In those days we had some rather strange experiences in our endeavors to advance science and engineering.

Reverting to the matter in hand—the great hydraulic pumping plant for the Chollar, Norcross and Savage Combination shaft—good progress was made with the work. Within one month from signing the contract, details of all the principal parts were in the shop and the engine cylinders were in the foundry. Foundation plans had also been made and sent to Mr. Regna at Virginia City, where work was begun on them. The estimated weight of this plant was 1175 tons, but it finally ran a little over 1200 tons. A special testing outfit was made so as to have the testing done thoroughly and without loss of time. In order to insure ourselves against the danger of porous castings, all parts that were to be under the high pressures were carefully cleaned and pickled to remove all scale, then filled with liquid resin, and placed in an oven, 100 deg. F., where twice the working pressure was applied to the resin. After this they were subjected to an hydrostatic test of two and one-half times the working pressure. In no case was there any sign of the water finding its way into any porous parts in the metal.

A modification was made in the first plan for the hydraulic pumps, whereby the operating valves were worked by rams outside the valve box. The valves were operated by a floating lever in such a way that when one valve was seated it became the fulcrum for the lever lifting the other. By this means there was no danger of one valve leaving its seat before the other was seated. The small valves, which got the name at the mines of the "piano" valves, were worked by rams on an oscillating shaft actuated by adjustable tappets on the pump rams. These worked perfectly from [illegible]

Erecting the Great Pumping Plant

In about six months' time the great bulk of the work had been delivered at the mines and erection began. The best men we had were employed in this work. Andrew Moore, son of Joseph Moore, of the Risdon Iron Works, had charge of the erection of the engine. Charley Matheson, the underground foreman at the shaft, was in charge of the work in the shaft, the pumps at the 2400-ft. station, and of all handling of heavy parts, whether in the shaft, underground or at the surface. In due course I was notified that a start would be made on a certain day, and that I had better come up, and as I wanted to go carefully over the whole work before a start was made, I at once left for Virginia City.

At that time we left San Francisco on the five o'clock boat for South Vallejo, 28 miles up the Bay, and thence went by train via the Central Pacific to Virginia City, arriving there at nine o'clock the following morning. The first Pullman car was built for this service. Mr. Pullman was a close friend of Mr. Requa; they had mined together as young men. I met the Pullmans several times at the Requa home, in Virginia City.

This special Pullman reserved for passengers to Virginia City was named "The Silver Palace," from the fact that the columns from the ends of the seats to the roof and the curtain rods extending between them were all silver plated, and we all thought it the finest thing possible on wheels. There was one stateroom in this car, and as my time was needed at the works as well as at the mines (for I remembered Sir William Armstrong's advice about a wet nurse), I thought it best to secure the stateroom for a month. During the next three months I slept 88 nights in that stateroom—a pretty good record. Arriving at Virginia City at nine o'clock in the morning, I would be at the mine till four o'clock in the afternoon, then rest up and go to dinner, leaving in the Silver Palace at six in the evening for San Francisco, arriving there at nine the following morning. I would be at the works all day, leave on the boat at five, have dinner on the way to Vallejo, get to the mine next morning, and so on day after day for three long months.

Pumping 2000 Gallons a Minute

We made a good start about eleven o'clock. The great engine made a fine appearance, making about four strokes per minute. As soon as the stroke was properly adjusted, the pumps below were started and in less than an hour water was being delivered at the Sutro Tunnel at the rate of 2000 gal. per min. We were just beginning to have a safe feeling about everything when a Y-piece, where the discharges from the four pumps came together into one pipe leading to the air accumulator outside, burst, and the upper half of it, weighing about 1000 lb., went whizzing past my head and through the roof of the engine house. The roar of the air from the accumulator was fearful.

The engine behaved just as I figured it would. It kept moving just as it had been doing, the differential gear keeping the lead and admitting just steam enough to turn the engine over. Upon examination of the broken Y-piece, I saw at once where the mistake had been made. The large area where the two pipes joined had not been properly reinforced. I telegraphed immediately for another Y-piece and gave instructions how to make it. Next day at San Francisco I found the new piece ready to be cast, and in the evening it was finished and tested and ready to go up on the boat I went with. The new piece was at the Combination shaft by half past ten o'clock, nearly as soon as I got there myself. The engine was started and pumping by half past two o'clock.

As everything seemed to be going all right, I went back that night. No telegram was received all day, I slept very well on the train all night, found things working well in the morning, and no one had any suspicion that there was any trouble ahead. That day I examined the pipe lines in the shaft and found a heavy fluctuation in the pressure in the pressure pipe at the 1600-ft. level. Returning to the surface, I said to Mr. Requa that there was great danger at that point and suggested that we slow down to 1000 gal. per min., and I would order an air chamber fitted at that point. The engine was slowed to 2½ strokes per min., and I went back that night scheming all night as to how to arrange the air chamber.

When I got to the works I had it all worked out in my mind and had decided to fit an air chamber at the 2000-ft. level, as well as the 1600. In 10 days we had this work all ready, during which time I was at the mines and works on alternate days. Many a day I sat in the station at the 2400-ft. level and wondered what would happen if anything burst in there, with half a mile of vertical pipe above it, the contents of which, if let loose, would work havoc all around. But nothing happened and we took courage.

Troubles from Foundations

When the air chambers had been fitted and charged, we set the engine speed for 2000 gal. per min. But our troubles had not yet ended, for after everything had run well for two weeks, the foundation under the vertical pipes at the 2400-ft. level suddenly crushed, due to some movement in the rock. The lower section of the pressure pipe broke, causing a general destruction of the other pipes in the shaft. Fortunately the pumps were uninjured, but we were much disheartened, though thankful that no one was hurt. Charley Matheson was in the pump station at the time of the accident and managed after the first shock to get to the valve on the bulkhead at the Savage drift and shut off the water. By that time the Savage mine had been almost cleared of water. When all this occurred, I was taking my bath, getting ready to return to San Francisco. This bath was not only a great pleasure but an absolute necessity. It was followed by at least 15 minutes' rubbing with alcohol in order to get my skin to fit.

The sinking pump of the beam engine was not injured and in half an hour this engine was taking care of the water in the shaft. Mr. Requa was much disheartened and I was trying to encourage him, though not feeling very strong myself. We went to his home to talk it over and I decided to stay with him that night. While we were in the living room waiting for dinner, Mr. Requa lifted a book from the table. It proved to be a handsome copy of the New Testament. Handing it to me he said, "See if you can find any comfort in that. Read the first verse you see." I opened it casually and read the first verse on the right-hand page. "Let us not be weary in well doing for in due time we shall reap if we faint not." "Now," said Mr. Requa, "let us see. I believe that 'well doing' covers all attempts to drain the Comstock and we had better not get weary just yet. We will cut off telephone connections and go to dinner."

Next morning we got out a plan for a better foundation for the water column in the shaft; we also put in supports every 400 ft. in the shaft, which clamps below the pipe flanges with the supporting bolts set up on spiral springs, so as to reduce the load on the foundations below. New pieces were made for those broken and in two weeks the pumps were again in operation. And although there were some other minor troubles that developed and had to be fixed, the pumping plant did not stop again for more than an hour or two at any time, until finally the Virginia and Gold Hill water-works supplied water at a less cost than the wood fuel and the engine was shut down, a 10-in. pipe from the water-works attached to the accumulator taking its place. This was the final act in the efforts to drain the Comstock and it set, at 3000 ft., the limit of depth that could be reached by any plant the mines could afford.

THE LOYALTY OF THE MEN

The men of the Comstock were not easily discouraged and they did wonderful things. Not only were the men at the head directing these things men of brains and character, but those who carried out their plans in the steam and heat a half mile underground were also men of strong natures and unyielding courage—men of a make and kind of stuff that one could not get to serve him today. I have been in a pump station many a time with only a pair of drawers, socks and miners' boots on, with nothing to do but think when a drop of water from the roof would raise a blister. I found it very severe and I wondered at the grit of the men working under such conditions and giving the best they could give to the work, the success of which they all had at heart. I sometimes meet Charley Matheson and notice that when we talk about the big hydraulic pump his eyes sparkle and his muscles get tense and he says: "It was a great work, Mr. Dickie, and I would like to do it again."

The Savage, and with it the Chollar and Norcross, being flooded, the companies concerned had to face either abandonment or the construction of a pumping plant of more power than any hitherto erected on the Comstock. The general pumping scheme that I had been advocating was impossible because the Bonanza Mines had little water to contend with and controlled all the sources of wood supply from which all the other mines got their fuel. A plan I proposed to use the power in all the surplus water of the Virginia and Gold Hill water-works by using it to operate hydraulic pumps on the lower levels discharging through the Sutro Tunnel also failed of support for the reason that the same people owned the water-works and they preferred to sell wood rather than water. For another mine, I had proposed a hydraulic pumping plant of 700 gal. per min. capacity and that plan was used by me to illustrate my proposition. I am able to present this scheme, see Fig. 2, which has already been fully described in this article.

The proposition of the Chollar, Norcross and Savage was that I should design for them a hydraulic pumping plant that would enable them to pump, if necessary, from the 3200-ft. level 2500 gal. per min., discharging the water pumped at the Sutro Tunnel level and returning the power water to the surface to be used over again. Here was a proposition big enough to satisfy the ambition of any young engineer. I undertook to have the plans ready in one month.

PLANS FOR A HYDRAULIC PUMPING PLANT

Owing to the necessity of keeping the opposition off the scent, I had our chief draftsman, Mr. Sherholtz, come to my home and stay there till the plans were ready for presentation. Mr. Sherholtz was the best man I ever knew for getting an idea pictured visibly on paper. He did not fail me that time.

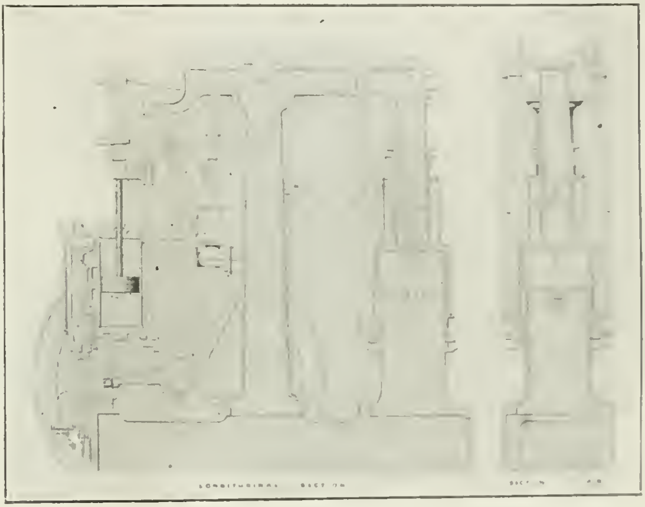

FIG. 2. LONGITUDINAL AND CROSS-SECTIONS OF PUMPING PLANT

I decided to depart radically from the plan I had first presented as a type and determined that the surface engine should be a direct-acting, compound, condensing, Davey differential engine having a 45-in. high-pressure cylinder, an 88-in. low-pressure cylinder and a stroke of 14 ft.; the plunger pumps were to be eight in number, four being on each side of the crosshead; the pump rams were 7½ in. diameter: four were on the suction stroke while four were on the discharge stroke. At full power the engine was to make 10 double strokes per minute or a mean piston speed of 280 ft. per min. The discharge pressure was to be 1000 lb. per sq.in. The air pump was set vertical and operated from a tail rod and bell crank, the diameter of the pump was 36 in. and the stroke 12 in. The discharge from the air pump was into a cooling pond, about three acres in extent and arranged with dividing [illegible] so that the water circulated around for nearly a [illegible] before [illegible] back to the injection pipe. The steam valves were of the double-beat type, and to have perfect control, the subsidiary and pause cylinders of the differential gear had a stroke of 20 in. The whole was mounted on a massive base plate, 10 ft. wide, 68 ft. long, and 5 ft. high, which was cast in three sections and weighed complete 112,000 lb. The arrangement of the cylinders was the same as described in a previous article, the high-pressure cylinder being nearest the crosshead and the low-pressure piston having two piston rods which worked in tubes cast on the side of the high-pressure cylinder. All the piston rods were 8 in. diameter. The low-pressure piston had a door through the center large enough to pass the high-pressure piston through, so that that piston could be removed without disturbing anything else. The crosshead worked in slides on the upper part of the bedplate; the pump rams, four on each side, two facing each way, were outside the guides; the width over the pump bodies was 12 ft.

To eliminate as far as possible any shock, I decided to do without a weighted accumulator and substitute an air cushion, which took the form of a huge air chamber. This was erected outside the pump house and was mounted on a large bedplate 12 ft. square, supported on a great block of solid masonry. The chamber itself was 30 in. diameter inside with walls 5 in. thick and was made in 10 sections, each 8 ft. long, so that the height of the complete chamber, or tower, was 80 ft.

In working, the water in this tower was normally at a height of about 10 ft. above the base, its height being known by having three ½-in. pipes run from it to the gage board in the pump house, where there were test cocks on the pipes. The pipes were set at 9, 10 and 11 ft. above the base of the tower; thus there was usually 70 ft. of air in the tower. A special small air compressor was provided for charging this tower, and some 10 other air chambers were installed in the shaft and at the pumping stations.

The power pipe extending from the great air chamber down the shaft to the 2400-ft. station was 10 in. diameter and the return pipe 12 in. diameter; the two pump discharges were each 12 in. diameter and terminated at the Sutro tunnel. The pump station at the 2400-ft. level was 23 ft. wide and 98 ft. long with two lines of pillars, making three compartments each 7 ft. wide. In each of these compartments I installed a hydraulic pump of the Davey type with some modifications necessary on account of the high pressure under which we had to work, which, at the 2400-ft. level, was slightly over 2000 lb. per sq.in. I adopted the Davey type of hydraulic pump because it had been well tried and proved to be an excellent arrangement for underground work. Fig. 3 is an elevation and plan of this hydraulic pump. The novel point in the design was the method of applying the force of the water power directly on, or rather within, the pump plunger through a fixed hollow ram; this enabled all the packing to be done by outside stuffing-boxes, which was an important point, especially in pumping dirty or gritty water, such as is always the case in quartz mining. The valves were all operated directly by the water pressure and gave a clear straight opening for the water. Fig. 3 is from a lithograph I made of the pump and shows it as submitted; in making the final details some changes were made in the method of working the valves.

Before the above plans were quite ready, some information as to what I was doing got to the outside and methods were used to prevent the adoption of the hydraulic scheme. One day a note was sent me requesting me to call at a certain office in San Francisco where I would find something that would be of interest to me. I went and found an empty office with an envelope having my name upon it. Inside was an unsigned check for $75,000 and an intimation that if I would promise to go to Europe for three years and enjoy myself, a good name would go on the check. That was in a way quite a temptation, but it was also a compliment to my ability and an incentive to my determination to see the hydraulic scheme through. I went on with my work, my plans were adopted, and the big pumping plant ordered. This work, of course, went to the Risdon Iron Works.

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Colorado Fuel & Iron Co.

This company owns extensive iron ore and coal properties in Colorado, New Mexico and Utah, and blast furnaces, steel works and rolling mills in Colorado. The report is for the year ended June 30, 1914.

The capital liabilities include $34,235,500 common stock; $2,000,000 preferred stock; $45,158,000 bonds. Stocks were unchanged during the year; the funded debt was diminished by $108,000 bonds retired or exchanged.

The president's report is entirely devoted to a history of the coal-miners' strike, and a consideration of the causes leading up to it. It is a careful and well considered statement of the company's side of the case. So much has been written about the strike that is not necessary to repeat this statement here.

The production statement for two years past is as follows, in short tons:

	1912–13	1913–14
Iron ore mined	853,878	614,039
Limestone mined	485,756	376,226
Coal mined	4,091,667	2,428,992
Coke made	784,627	535,274
Pig iron made	416,467	268,883
Finished iron and steel	458,521	352,929

Of the total coal mined in 1913-14, commercial sales absorbed 877,761 tons; 588,883 tons were used at the company's plants; 962,348 tons were used in making coke. The average consumption of coal to one ton of coke was 1.798 tons; or, stated conversely, one ton of coal produced 0.556 ton of coke. The large decrease in production resulted from disturbed industrial conditions, and is, of course, shown in the earnings, as given below.

The income statement for the year is as follows:

	Earnings	Expenses	Net or Deficit
Iron Department	$12,085,037	$10,515,749	Net $1,569,288
Fuel Department	5,717,988	6,213,506	Def. 495,518
Total	$17,803,025	$16,729,255	Net $1,073,770
Add outside income, interest, etc.			577,477
Total income			$1,651,247
Bond interest			$2,021,103
Taxes			293,580
Sinking funds and miscellaneous			242,533
Total charges			$2,557,216
Deficit for the year			$905,969

Miscellaneous charges include $18,168 for prospecting, $43,016 for equipment renewal and $55,128 for insurance, personal injury and sociological purposes. The gross earnings for the year show a decrease of $6,512,863, as compared with 1912-13; the expenses a decrease of $3,966,366; and the net earnings a loss of $2,546,497. Those losses were due almost entirely to the coal miners' strike.

Modern American Rock Drills--VII

By L. O. Kellogg

SYNOPSIS—Pluggers are now largely of the automatically rotating type. The Jackhamer is the best known of the class. A new machine brought out by the Sullivan company uses water for cleaning the hole bottom and may be used with some new types of mountings. The Chicago pneumatic nonrotating plugger does not differ in the drilling end from the ball-valve stoper of that company. The McKiernan-Terry rotator also is not essentially different from the rotating stoper. The Cleveland "Mucker" has a small, separate transverse engine to effect the rotation.

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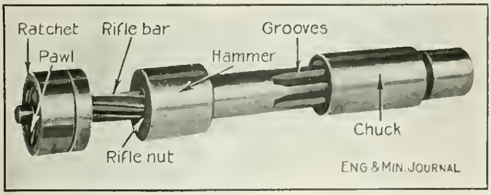
The automatically rotating plugger machine is rapidly displacing the older types in all fields to which the plugger is applicable. For that reason, no attempt will be made here to describe the nonrotating pluggers, except in one instance where a machine has been lately developed.

A plugger is not essentially different from a stoper. In many designs, one machine can be transformed into the other by merely changing over its telescope feed for the handle, or *vice versa*. In general, however, the plugger uses hollow steel, into which either exhaust air, live air or water is thrown for clearing the bottom of the hole. It is more common to use steel with a lug or collar on it, or else steel with a cone-ended shank, than to use an anvil block. In the rotating models, frequently some device is applied to the front head, which grips the steel and permits its being churned up and down in the hole. The cylinder and front and back heads of the plugger are substantially the same as in the stoper. But in the case of the rotating machines, the front head becomes more elaborate, as it is required to house part or all of the rotating mechanism.



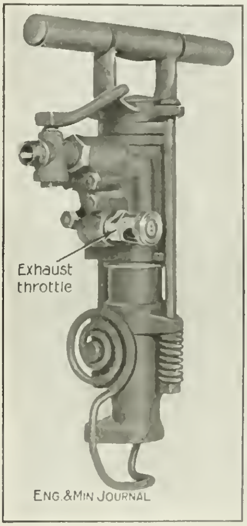
The Jackhamer Hammer and Rotation

Rotation in general, so far as the machines have appeared on the market, may be said to be effected in two ways. Either part of the reciprocating energy of the hammer may be translated into rotary motion and communicated to the drill steel, or else a separate small engine may be used for the purpose. In the former case, a ratchet and rifle bar are employed as in a piston machine. The rotating mechanism will be described more in detail in the several machines. The valve actions on the plugger machines correspond to those on the stoper, save that the valveless plugger is usually a small nonrotating drill. The handle of the plugger may be a single central grip or it may be extended to the side so as to give a grip for each hand.

Another feature of difference between plugger machines and stopers should be noted—it lies in the control valve. Since air is not required for a telescope feed in the plugger machine, it is not necessary that the valve be so designed and the arrangement of air passages be such that the telescope feed can be actuated without allowing the drill to reciprocate. For this reason, a simple throttle valve is all that a plugger machine usually needs.

The Ingersoll-Rand Jackhamer

The Jackhamer has come to be regarded as the type of self-rotating plugger drill in this country, inasmuch as it was the first machine to attain any considerable commercial success, although not, strictly speaking, the first on the market.



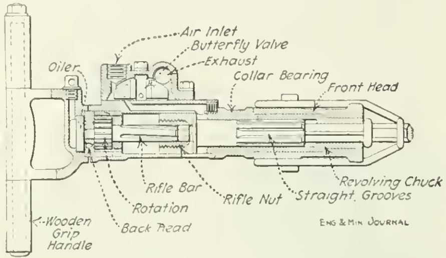
The Jackhamer

The Jackhamer is actuated by a butterfly valve, and the control and distribution of the live air and exhaust are effected just about as they are in the butterfly-valve piston-machine previously described. Air is admitted through a simple throttle-valve set between the air hose and the valve chest, and not constituting an integral part of the machine. The valve chest is bolted to the cylinder. The air passages, which are contained in the cylinder shell, are not shown in the drawing. The hammer or piston in general resembles the hammer of the Leyner machine, having a large-diameter portion and a smaller projecting portion. The large portion is hollow and carries a rifle nut, which engages with a rifle bar in the rotation at the top or back of the machine. The forward end of the small portion is grooved, and the grooves are engaged by projections from a sleeve or chuck in the front head. The steel is held in the other end of this chuck, and the rotating motion of the hammer is thus communicated to both chuck and steel. Between the cylinder shell and the front head is a collar bearing for the ungrooved portion of the hammer projection. Front head, piston bearing, cylinder and back head are all held together by two through-bolts furnished with helical springs on the front-head end.

The steel used is commonly hexagonal in section and is hollow. The shank end is collared, and no anvil block is used; the hammer strikes directly on the shank of the steel. The exhaust of the machine to the valve chest is supplied with a special throttle valve, shown in the photograph of the exterior of the drill. By throttling the exhaust, live air is allowed to blow through the machine and down the drill steel, so as to clean the hole of cuttings with more force than when the exhaust air only is used

The operator, by occasional intermittent throttling, thus can keep his hole entirely clear. The rotation mechanism, set next to the back head, is of the same type as that used on the Leyner machine.

In the back head is the lubricating device. It consists of a hollow disk, in which a porous filling material can be placed, the end being closed with a perforated brass plate. This lies between the oil chamber and the rotating mechanism, and operates automatically to filter the oil from the chamber and give it up to the cylinder under the variation of pressure in the back of the cylinder. The chamber itself is filled through an oil hole stopped with a screw plug.



THE JACKHAMER

The usual type of handle is that shown, provided with wooden grips; while rotation is automatic, the handle is required to lift the machine and steel from the hole. The spring device in the front or lower end is intended to grip the steel below the collar and permit of its being moved up and down with the machine. It can be swung up and out of the way when not in use. It is of service for churning the steel in the hole to prevent sticking.

The length of the machine is 18 in., the cylinder diameter is 2¼ in., the stroke is 2 in. and the weight is 40 lb.

THE SULLIVAN ROTATOR

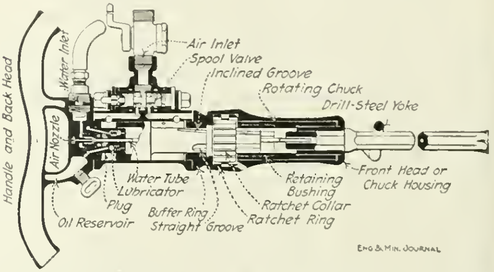
The Sullivan automatically rotating plugger machine, recently offered to the public, is based on a model that appeared some eight years ago, but that was laid aside in favor of the then more popular nonrotating types. The present model embodies some novel features, not the least interesting of which are certain mountings which assist the machine to drill horizontal or approximately horizontal holes.

The machine resembles the McKiernan-Terry and the Jackhamer in obtaining rotation for the drill steel by reciprocation of the piston. It differs, however, in obtaining its rotation directly from the piston itself instead of from an independent rifle bar. The result is a compact and simple rotating plugger. The longitudinal section shows the machine equipped with a water attachment. It is also furnished without the water attachment. The valve action, rotation, steel holder, shell and front head being practically the same, no further description of this nonwater-using model is required here.

The Sullivan rotating plugger uses the Sullivan three-spool valve with enlarged central spool, as described for the Liteweight piston machine. The valve chest is of the side-rod pattern, with slotted bushings. The valve action is substantially the same as in the piston model. The drawing shows the main supply and exhaust ports. Certain crossports which control the valve are not illustrated. Further description is unnecessary.

As stated, the rotating mechanism is all contained in the front head. In the small forward-projecting portion of the hammer are milled two straight grooves and two helical or inclined grooves. Projections in the ratchet collar engage the inclined grooves. On the working stroke of the hammer, the ratchet collar slips on the pawls in the surrounding ratchet ring and is allowed to rotate; the piston is not rotated. On the back stroke, the pawls of the ratchet ring catch the ratchet teeth and prevent the ratchet from rotating; the inclined grooves on the piston are forced to follow the projections on the collar, and the piston is rotated a certain amount. The ratchet ring contains roller pawls held in by flat leaf springs, as in the standard Sullivan type of rotation.

The straight grooves on the piston engage projections on the inside of what is called a retaining bushing, which is screwed into the chuck itself. This communicates the rotation of the piston to the chuck. In the forward end of the chuck is inserted a bushing to receive the drill-steel shank. This bushing is a ground press fit, and revolves with the chuck, at the same time forcing the steel to rotate. The shank is usually hexagonal, with the chuck bushing made to correspond. The chuck itself revolves inside a housing which is brought back over the front of the machine so as to protect the contained moving parts to the fullest extent against entering dirt.



SULLIVAN ROTATING PLUGGER

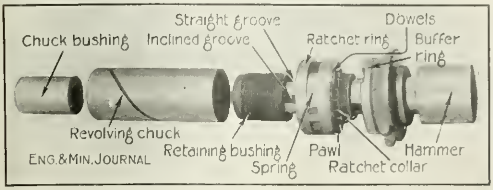
Between the housing and the cylinder is inserted a buffer ring. The ratchet ring is held against turning by heavy dowels fitting recesses in this buffer ring.

The rotation housing and the back head have side lugs. Side rods through these lugs hold together the housing, buffer ring, cylinder and back head. The rods work against helical springs applied against the housing lugs.

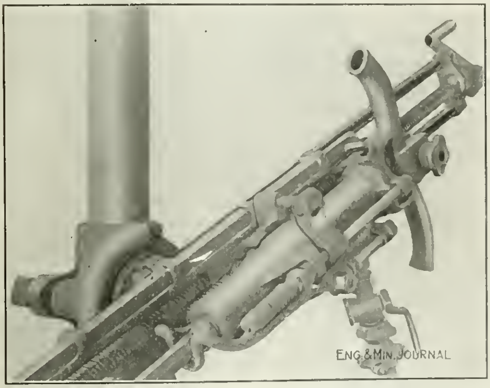
The back head and handle are drop-forged in one piece. The handle is extended into two horn-shaped side grips. The forward portion of the back head contains a lubricating chamber. The automatic lubricating device is contained in a plug screwed into the back head. This plug also carries part of the water attachment. The lubricator is in principle like that described for the Liteweight piston drill. Two spring-controlled ball valves, working in opposite directions, subject the lubricating chamber to variations of air pressure, so that oil is fed slowly to the cylinder and through the exhaust ports reaches the valve, while the drill is running. The plug projects an inch and a half into the back of the cylinder, but the back of the piston is hollow, so that it slips over the plug without contact. The clearance of these parts is such that the whole back of the piston is subjected to the full air pressure at the beginning of the stroke.

The air ports of the cylinder are so placed that there is always a slight cushioning on the return stroke, due to entrapped air, and a corresponding cushioning on the down stroke if the steel is not in the chuck.

One of the most interesting features of the drill is the water-and-air feed. This is arranged about as it is in the Liteweight and Hy-speed water-feed models of piston machines. The water is conducted in through a hose with a cup-shaped strainer at the end of the connection, which filters the water without restricting the port area. It is drawn into the water tube by entrainment with live air through the small nozzle which is shown pointing toward the entrance to the water tube. The water tube itself runs through the piston and into the shank of the steel in the usual manner.



ROTATING AND STRIKING PARTS OF SULLIVAN ROTATOR DISASSEMBLED



SULLIVAN ROTATOR IN ITS CRADLE MOUNTING

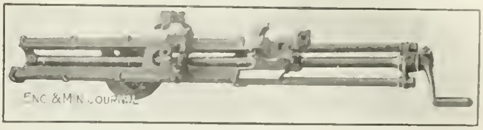
Whether the water model be used or not, hollow steel is commonly employed, and in such case the air for cleaning the bottom of the hole is that which leaks past the rotation mechanism and thus enters the steel. It should also be noted that in both models, the exhaust air from the front of the cylinder passes into the steel around the water tube.

A device is provided for holding the drill steel in the chuck when it is desired to pull it from the hole or churn it up and down. This is a yoke which ends in trunnions mounted in sockets above the side-rod springs in such manner that the device is kept in operation by the normal compression of the springs.

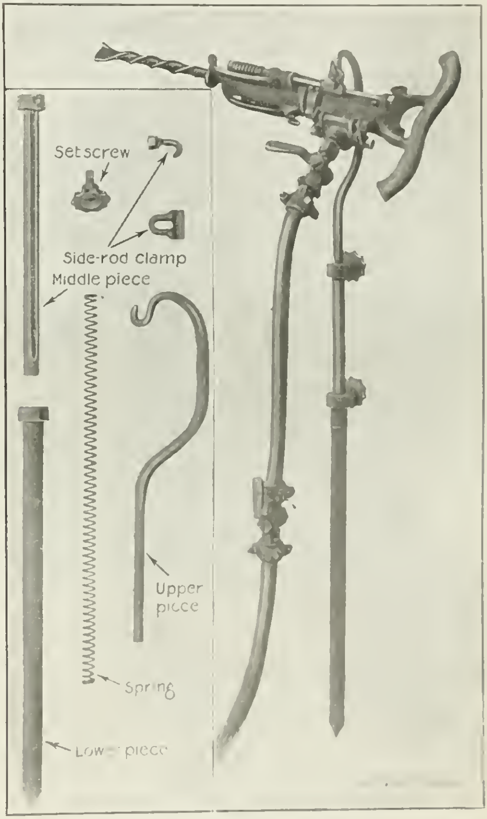
The machine weighs 38 lb., has a $2\frac{1}{4}$ cylinder and about a $2\frac{1}{2}$-in. stroke.

MOUNTINGS FOR SULLIVAN ROTATOR

The machine is designed to be used not only as a plugger or sinker, but also as an all-round drilling tool. To this end two mountings are furnished. One of these is a cradle, running in a shell equipped with a feed screw, by means of which the machine is manipulated exactly as is a piston machine or a Leyner. The cradle or sliding part of the mounting consists of two hinged clamps, the feed nut being attached to the back clamp. One of the clamps swings from the side over the cylinder of the machine; the other swings forward and grips the handle. Both are readily tightened by hand setscrews so as to hold the drill firmly in position. This mounting, drill and cradle weigh together about 90 lb.



SHELL AND CRADLE FOR SULLIVAN ROTATOR



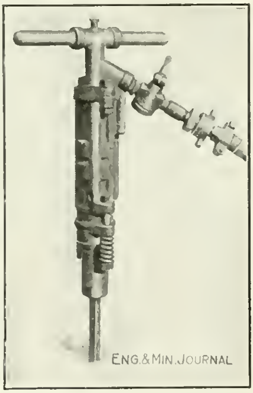
THE "FISHPOLE" OR "SHEPHERD'S CROOK" MOUNTING FOR THE SULLIVAN ROTATOR

An entirely novel mounting is the "fishpole" or "shepherd's crook." The rotating plugger with [illegible] has proved an excellent machine for [illegible] holes in soft formations, such as the [illegible]. It is for facilitating work like this or for boring any short horizontal holes that the "fishpole" mounting is designed.

It consists of a double-telescopic column of small section and light weight. The upper section makes a bow and ends in a hook: by means of a small clamp around one of its side rods, the machine is hung from this hook. The lower portion of the column contains a spring. This upper section is free to slide in the middle section, unless clamped by the screw. The device is designed to operate as follows: The operator adjusts the machine to its proper height by means of the upper screw and telescopic adjustment. Then with both screws clamped he collars the hole. Then he releases the lower screw, and by a slight depression of the machine against the pressure of the spring in the lower section, keeps the steel always in line with the hole axis. The spring is just a little stronger than is necessary to support the weight of the machine and column above it. The operator is thus relieved of the duty of supporting the machine, and can devote his strength to keeping the steel pressed against the ground.

CHICAGO PNEUMATIC SINKER

The Chicago Pneumatic sinker is in general merely the Chicago Pneumatic stoper, with the telescope feed removed and a back head with a rotating handle put in its place. The ball valve, the cylinder and the front head are the same in almost all respects. The longitudinal exhaust ports of the stoper cylinder are stopped off by the solid back head bolted to the cylinder, and inclined ports are drilled to these at the lower end of the cylinder, so as to direct the exhaust downward.



CHICAGO PNEUMATIC NONROTATING SINKER

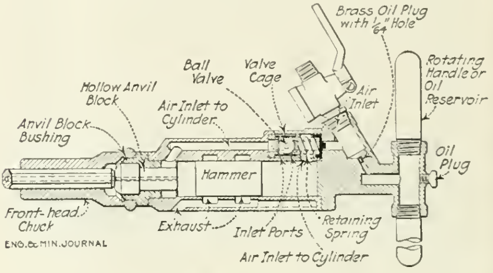
The machine is designed to operate with hollow drill steel, but this is made collarless, commonly called "shankless." To prevent the steel from entering the cylinder, the anvil block of the stoper is retained, but is drilled through the center. This hole registers with the hole in the steel and furnishes a supply of air to the drill bit for cleaning purposes. This will be live air part of the time and exhaust part of the time.

The back head of the drill carries the air inlet connections, the air being controlled by a simple throttle. The rotating handle, which consists of two portions screwed into the head, is hollow and acts as a chamber for lubricant. This is conveyed to the drill through a $^1/_{64}$-in. hole in a brass plug, as in the other ball-valve machines of this company.

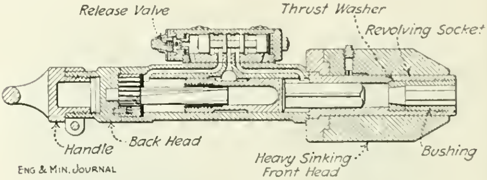
This plugger weighs 43 lb., has a $2\frac{1}{8}$-in. cylinder and a 4-in. stroke.

MCKIERNAN-TERRY ROTATING PLUGGER

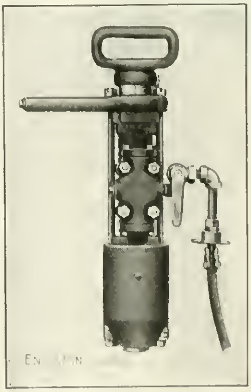
The McKiernan-Terry rotating plugger was the first machine of the kind sold in this country. The McKiernan-Terry Co. was thus a pioneer in introducing both rotating pluggers and rotating stopers. The description of the McKiernan-Terry rotating stoper applies almost intact to the rotating plugger, with the exception that the telescope feed is replaced with a handle. In fact, the telescope feed and the handle are interchangeable, and any one cylinder can be used for either a plugger or a stoper. The handle is screwed on and clamped just as is the inner tube of the stoper. The plugger may differ in two other points, however. For the upper end of the valve chest, a release valve is often applied, by pressing which, the motion of the valve and of the hammer is stopped, and the full pressure of live air directed through the drill steel into the hole for cleaning. Another difference is in the use of an extra-heavy front head to give weight for sinking.



CHICAGO PNEUMATIC TOOL CO. SINKER



MCKIERNAN-TERRY ROTATOR WITH SINKING HEAD



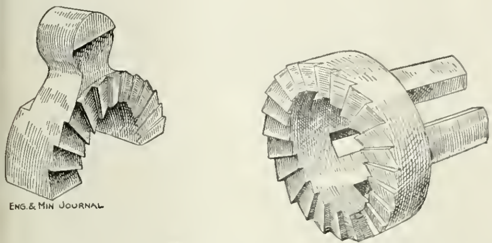
MCKIERNAN-TERRY ROTATING PLUGGER WITH HEAVY SINKING HEAD

There is, of course, no necessity in the plugger for the valve arrangement by which the pressure in the feed cylinder can be varied. In view of the great similarity between these two machines, no further description seems necessary.

The weight of this plugger is 92 lb. Its stroke and cylinder diameter correspond to those of the stoper.

CLEVELAND "MUCKER" ROTATING PLUGGER

The "Mucker" drill, made by the Cleveland Rock Drill Co., and only recently put upon the market, is in some respects the most interesting machine of the automatically rotating plugger class. Instead of the rotation of the steel being affected by the reciprocating piston or hammer, a small but complete engine is mounted on the bottom of the machine and is capable of control separate from the hammer.



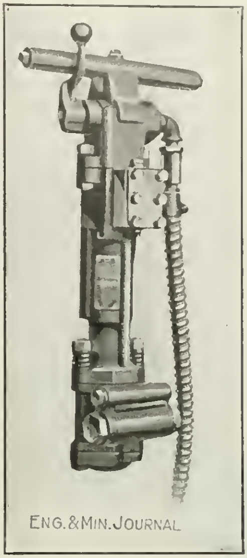
Parts of "Mucker" Rotation Ratchet

The hammer valve is of the three-spool pattern, set in a valve chest on one side of the cylinder, the chest having a bolted cover. The hammer itself is not symmetrical, but has a forward-projecting portion with a diameter to correspond to the small inner end of the anvil block, as has been usual in Cleveland machines.

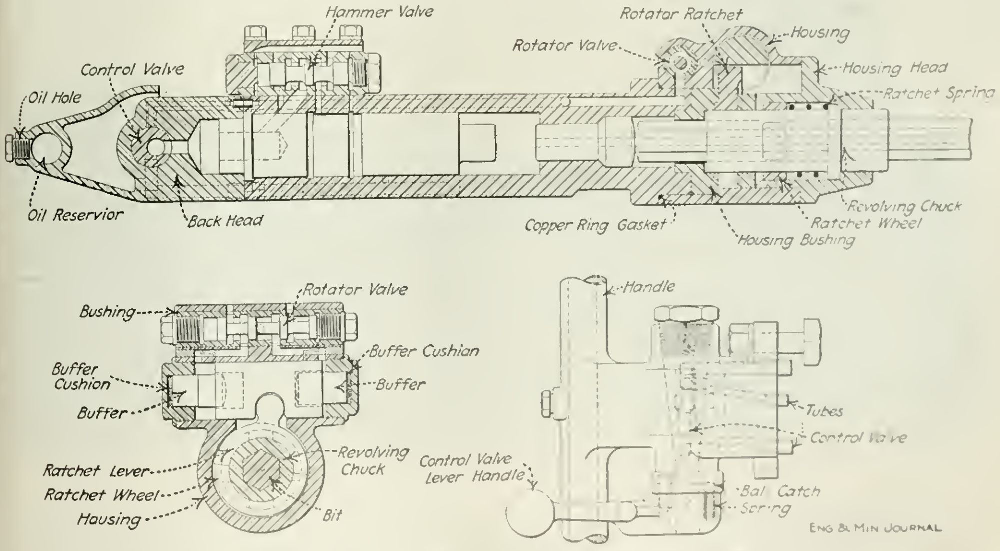
The anvil block lies in the cylinder itself. The lower end of the cylinder is closed by the rotator housing and its bushing, and the end of the housing again is closed by the housing head. These parts are held together by short through-bolts with helical springs on their upper ends. The back head and handle are of one piece, bolted to the upper end of the cylinder. This back head contains the control valve or throttle and the necessary accompanying ports.

This control valve is a tapered plug with such an arrangement of ports as to give three drilling positions. In the first position, the hammer hits lightly and the rotator runs at half speed; this is desirable when starting a hole. In the second, the hammer is stopped while the rotator still runs at full speed, available for cleaning the hole. In the third position, both hammer and rotator are running at full speed, the ordinary drilling position.

The air supplied for the rotator does not pass through the hammer valve or the cylinder, but is conveyed through a separate passage in an enlargement of the cylinder wall. The rotator consists of a four-spool valve and a small piston working transversely on the machine. The lower part of this piston contains a recess which engages an upward-projecting tooth of the rotator ratchet. This is a segmental face ratchet covering about 180° of arc; the unsymmetrical radial teeth engage similar teeth on the full-circle ratchet wheel. This ratchet wheel has four forward-projecting lugs which engage the rotating chuck itself. The general shape of the segmental ratchet and the ratchet wheel is illustrated by sketches, which, however, are not exactly correct and are not to scale. These parts are kept in engagement by a helical spring surrounding the chuck and bearing against the lugs of the ratchet wheel on one end and against the collar of the chuck on the other. The rotating chuck has a hexagonal



Cleveland "Mucker"



Sections of the Cleveland "Mucker" Rotating Plugger section inside to receive hexagonal steel. This steel and the anvil block are hollow, and because of the anvil block, no collar is necessary on the steel.

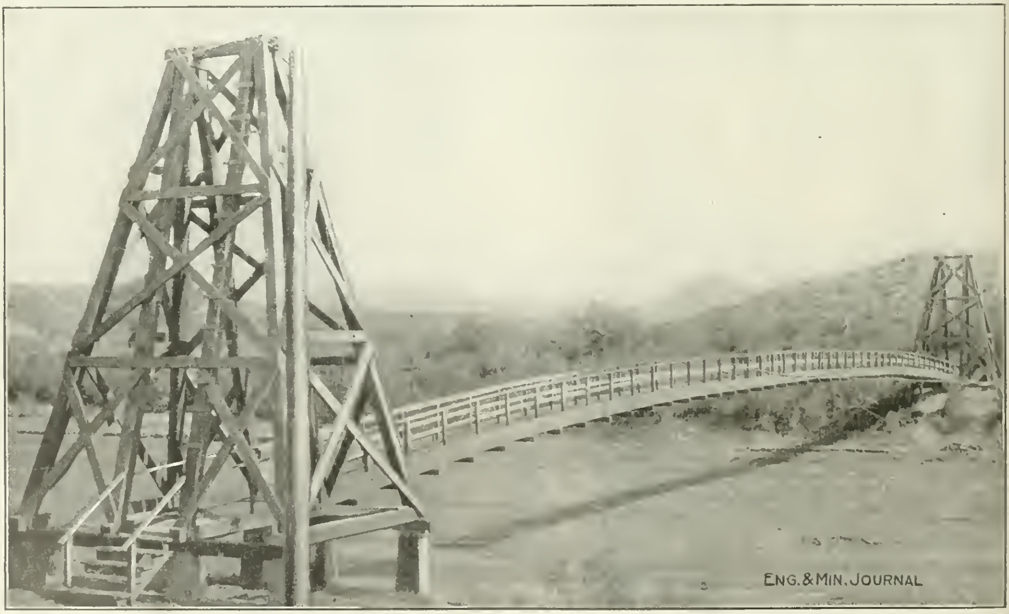
The rotator piston works against buffers and buffer cushions at both ends of its cylinder. The ends of the rotator cylinder and the ends of the rotator-valve chest, as well as the ends of the hammer-valve chest, are closed with screw plugs. The chuck revolves in the housing head and the housing bushing as bearings. The joint between the rotator housing and the cylinder is packed with a copper ring gasket.

The control valve in the back head has a lever handle ending in a ball, and is held in its various positions by a small spring-actuated ball. The several air passages are fitted with tubes between the back head and the cylinder walls in order to prevent leakage. The handle of the machine is an oil reservoir with the oil plug in the center.

The machine weighs $85\frac{1}{2}$ lb. and has a cylinder diameter of 2 in.

A Wooden Suspension Bridge

A suspension footbridge 273 ft. long was recently built across the Gila River, near Kelvin, Ariz., by the Kelvin Sultana Copper Co. to connect its mine and power plant and to accommodate miners living in Kelvin, according to *Engineering News*, Sept. 24, 1914. Although designed only for pedestrians, single pieces of machinery weighing 1800 lb. have been taken across it. The maximum load placed upon it to date was 3000 lb. The bridge carries a 1-in. pipe line which conveys boiler water from the mine to the power plant.



General View of 273-Ft. Suspension Bridge

The general design is shown in the accompanying view. At the center the roadway is 15 ft. above mean high water. The wooden towers are carried on concrete foundations. On the west side of the river (the far side in the view) the former river bottom, now about 8 ft. above mean high water, forms a flat several hundred feet wide which affords poor bearing. The concrete foundations on this side are 14 ft. deep and 6 ft. wide at the base. On the opposite side, the piers are about 3 ft. high. The towers, constructed of 10x10-in. Oregon pine posts with 3x8-in. bracing, are 21 ft. square at the base and 31 ft. 5 in. high.

The two cables are made each of two $\frac{3}{4}$-in. plow-steel ropes which had seen about six months' service in hoisting. The floor, 4 ft. wide in the clear, is attached by $\frac{5}{8}$-in. Ernst patent hangers passing through 4x6-in. cross-bars, on which rest two 4x8-in. and one 3x8-in. stringer. The floor, of 2x12-in. lumber, is nailed directly to the stringers. Directly over each side stringer is a 4x6-in. guard timber bolted through plank and stringer to the cross-bars.

Anchorages are concrete blocks. The cable ends are passed around several 16-ft. lengths of 90-lb. rail embedded in the concrete. On the power-plant side turnbuckles are provided.

From the center of the bridge there are four guys to the bank, making an angle of 30° with the center line of the bridge. There is little sway to the bridge under ordinary loads.

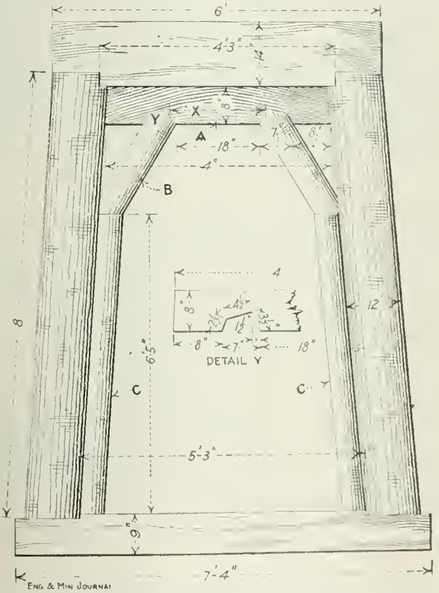
In building the bridge, as soon as the towers were completed the cables were hung and roughly adjusted to nearly the proper deflection. The hangers were then put on, beginning with the longest and working from both ends toward the center simultaneously. When the hangers were all placed, the deflection was adjusted (27.2 ft.), the floor laid and the handrail put on.

Details of Practical Mining

A Method of Reinforcing Set Timbers

By H. H. Hodgkinson*

The following method of bracing set timbers has proved successful and economical. It not only permits the use of much smaller timbers, but gives the additional advantage of making it possible to use the set timbers and braces several times. The most striking feature of the method is the absence of spikes. Only two 6-in. spikes are used, as will be seen from the accompanying sketch. These two timbers *CC* remain fastened to the posts when the set timbers are torn apart. This absence of spikes not only saves considerable time in tearing the set timbers and braces apart, but avoids damaging the timbers themselves. If set timbers are to be removed and used again, only a few spikes should be used in framing and bracing the sets. Six- or 8-in. spikes are hard things to remove from oak timbers, and, in the process of removing them, the joggles are almost sure to be damaged and the timbers split, rendering them unfit for further use.



Reinforcing Set Timbers

Referring again to the sketch, the timber *A* is hewed off on the top so as to conform to the bottom of the cap and permit a good bearing. It is beveled at each end to fit the posts and is held in place temporarily by means of a small wedge driven in between it and the posts while the two braces *B* are being driven in. The braces *B* are cut and beveled so that when driven into place they fit exactly and make tight joints. The timber *A* not only acts as a distance piece, but prevents the braces *B* from forcing themselves up into the cap and splitting it. Besides, this permits the use of much smaller joggles on the cap and posts, as will be seen, since they are only 1½ in. The pieces *CC* are fastened to the posts with 6-in. spikes to keep them in place, while they rest directly upon the sill.

The pieces *B* are rounded instead of coming to a sharp point at *X*, to prevent splitting the piece *A*. The pieces *CC* are 6-in. diameter round oak lagging; *B* and *A* are 8-in. round oak lagging.

Balancing Dummy in Inclined Shaft

By L. Hall Goodwin*

In the inclined shafts of the Lake Superior district it is the custom to hoist in balance, the practice, however, is different from that used generally throughout the West in that the drums are not designed to clutch in and out of balance but both ropes are wound on the same drum so that the position of one skip in the shaft relative to the other is always fixed. Mines in the development stage usually sink and timber the two-hoisting-compartment shaft in final form, except that rail stringers are put in one road only and hoisting is carried on unbalanced until the shaft has attained a considerable profundity, when rails are put in the other road and the second skip put in service. At the Houghton Copper mine, a small development property on the Superior lode just north of the Superior mine, a novel method of securing balanced hoisting from the start was employed. Work is now confined to the 625-ft. level, and hoisting is done electrically.

Track stringers were laid in the south road only, but in the north road rails of usual weight were laid on the 12x12-in. sleepers to carry a dummy. These rails were laid in the center of the roadway with a 2-ft. gage, so that when permanent stringers are put in they will be laid outside of the present rails, and the latter will be simply transferred to them as the work progresses. The dummy was made of riveted sheet iron and filled with iron scrap; it is 2x2 ft. in section and [illegible] ft. long. A point in its construction worthy of attention is a pivoted rear axle which swings freely on a pin projecting from the lower end of the dummy. This allows the four wheels to accommodate themselves to irregularities in the narrow track, which in this improvised arrangement are probably pronounced, and minimizes the possibility of the dummy's jumping the rails.

The main reason for the adoption of this device was the need of cutting down the heavy power demand [illegible] starting an unbalanced skip. The contrast with the [illegible] company imposes a penalty for peak load at all times and an additional penalty for load on the company's lighting peak. The penalty would be nearly four times as great with an unbalanced skip as it is with the present arrangement, and a larger hoist motor would also be required.

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*Mining engineer, Franklin Furnace, N. J.

*[illegible] St., [illegible] Mass.

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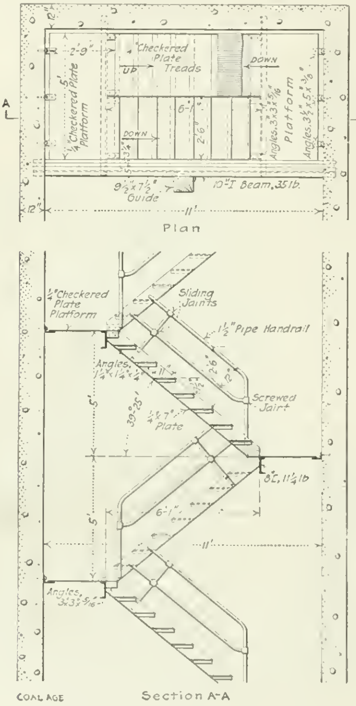
Vertical-Shaft Steel Stairway

The air shaft or auxiliary shaft of the Bunsen Coal Co., Danville, Ill., is divided into three compartments and lined with concrete. One of the compartments, about 5x11 ft., is reserved for a manway and fitted with a steel stairway. The shaft is vertical, rectangular, 11x25 ft. inside lining and about 210 ft. deep (*Coal Age*, Nov. 2, 1914).

The stairways are of zigzag pattern, and, together with the landings, occupy a space longitudinally in the shaft for a width of 5 ft. 6½ in. Each flight rises on a 39° 25′ angle from the horizontal, and is 8 ft. long. The separate flights, including the landings, are supported on 8-in. channels weighing 11¼ lb. per foot, placed crosswise in the shaft, which in turn are supported at one end on the 10-in. I-beam dividers, while the other end is secured in the concrete end-wall and has a bearing of 6 in. The channels are placed 2 ft. 5½ in. from the side walls, and are spaced vertically 5 ft. apart center to center, alternating for each flight.



Plan and Section of Stairway

The stair stringers are ¼ in. thick by 7 in. deep. The treads are ¼x11 in. by 2 ft. 6 in., with checkered surfaces, and are supported on 1½x1½x¼-in. angles, riveted to the stringers. The rise between treads is 7½ in. The landing plates are ¼ in. by 2 ft. 9 in. by 5 ft., and are also checkered on the surface. Three lugs of 3½x5x⅜-in. angle iron are riveted to the landing plate and fastened to the concrete wall by means of ⅝x5-in. expansion bolts well drawn up. The hand railings are made up of two lines of 1½-in. pipe; the uprights are bolted to the stair stringers and connected to each line of railing. The total weight per vertical foot of stairway and landings, not including the channel supports, is 100 lb. The stairway is easy for the men to walk on and is of economical design.

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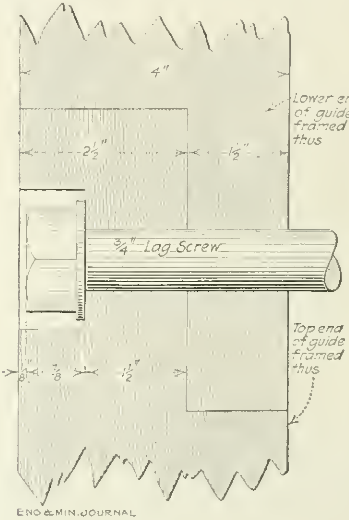
Framing Shaft Guides

By Percy E. Barbour*

The cut shows a method of framing and securing guides in the shaft of the Montgomery mine at Candor, N. C.



Framing for Shaft Guides

The shaft sets were placed 6 ft. 6 in. centers and the guides were fastened to each set by lagscrews as shown. The guides were of oak dressed on three sides.

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Belt-Maintenance Reduction

At a certain Western manufacturing plant until a few years ago it was customary, as in many plants, for each operator to care for the belting at his machine (*Eng. News*, Nov. 12, 1914). No records were kept, but at the end of each year the books indicated that a large part of the expense was for the renewal of leather belts. Improvements were undertaken. One of the first was the installation of a belt-tension machine, all belts being stretched in accordance with belting slide-rules. Errors, such as the use of too light or too heavy belts, were corrected; all pulleys were properly aligned, and the shifting fingers were adjusted to give plenty of clearance.

A man was appointed whose duty it was to record all data pertaining to the belts, such as the date of installation, the maker's name, the length and tension, the condition of the belt and the amount of time spent on repairs. All this information proved of valuable assistance in purchasing new belts and in obtaining a knowledge of the cost of belt maintenance. All belts were inspected regularly, and often a slight repair saved not only the stoppage of machinery but also the cost of a new belt.

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*Mining engineer, 887 Middle St., Bath, Maine.

It was found that to keep the leather soft and pliable it must receive an occasional treatment of neatsfoot oil and beef tallow, mixed in the proportion of 5 gal. of oil to 1 lb. of tallow. This application combined with the proper tension gave the belts a firm hold on the pulleys and produced good results.

Experience at this plant has proved that, with proper care and treatment, the life of a belt may be prolonged and the stoppage of machinery from belt breakage materially reduced. Thousands of dollars have been saved in this plant each year by this method of caring for belts.

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Permanent Stockpile Trestle of Wood

By Oscar Gustafson*

The several methods of stockpiling ore on the Michigan and Minnesota iron ranges were outlined in the Journal of May 23 and 30, 1914. The article describes the meth-

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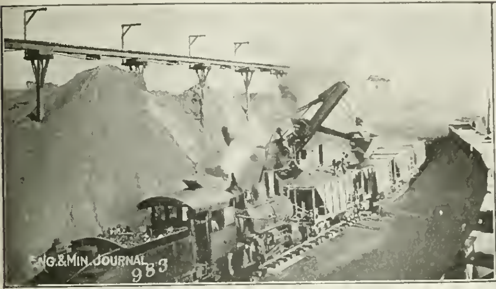
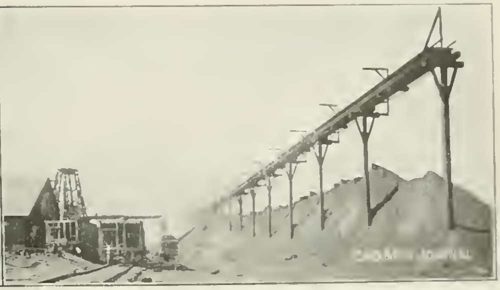
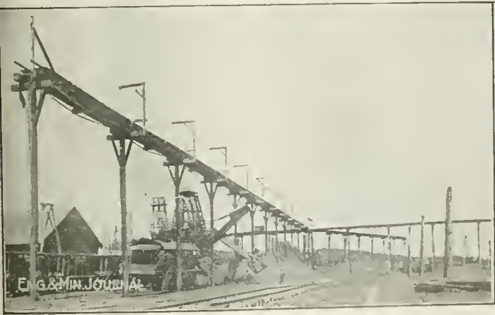
*Surface foreman, Colby Iron Mining Co., Bessemer, Mich.



Shovel at Work on First Cut

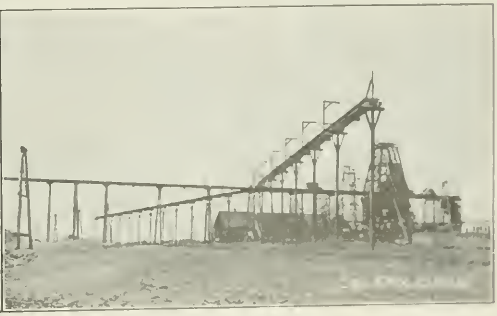


Shovel Finishing First Cut



Shovel on Third or Clean-Up Cut

Note boom and dipper working between the legs.



Stockpile Cleaned Up

Trestle leading to left is of old two-deck type

Motor-Driven Stockpile Car

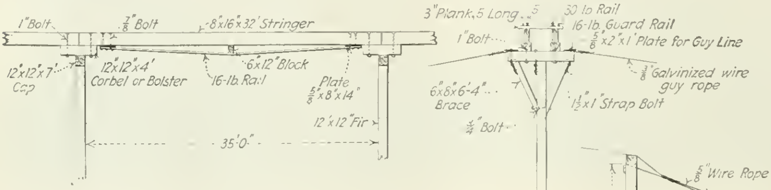
Endless-rope or electric-locomotive haulage is more common in stockpiling. There are a few Michigan mines where this self-propelled type of car is used.

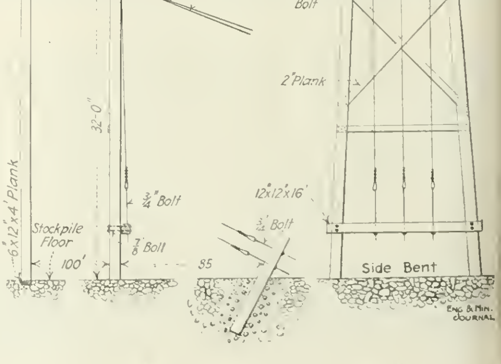
Top of Trestle

First cut on one side almost finished. Trestle slightly displaced by [illegible] removal of ore. Displacement was corrected by [illegible] wires. Note the [illegible] [illegible]ts.

ods in general use. A special method used on the Mesabi was described by Clarence M. Haight, in the JOURNAL of Jan. 31, 1914. At the 1914 meeting of the Lake Superior Institute, Lucien Eaton described in great detail the various methods followed on the Marquette range and S. R. Elliott described the Negaunee trestle of steel and concrete. This last mentioned trestle is commonly spoken of as the only permanent installation in use. However, the Colby Iron Mining Co., operating the Colby and Ironton mines on the Gogebic range, has in use a wooden stockpile trestle, which is designed to be permanent and is giving great satisfaction. Besides not having to be taken down each year, it differs from the trestle in common use chiefly in that the bents have but one leg instead of two.

Loading tracks are laid on each side of the stockpile, and the one line of legs spaced 32 ft. apart offers but little difficulty to steam-shovel loading. It is an advantage to both the railroad and mine to have a loading track on each side of the stockpile, for after finishing the first cut the end of the loading track is thrown over and the shovel runs back on this track and starts a cut on the other side of the pile without waiting for the first track to be placed again and connected. This saves considerable time to the shovel and crew. While the shovel is working on the second cut, the railroad section crew has plenty of time to place the first track and is not compelled to call in an extra gang.





ELEVATIONS OF MAIN BENT, SIDE BENT AND ANCHORAGE

After designing this trestle, I had an experimental piece built at the Colby mine in the fall of 1912. This proved so satisfactory that 632 ft. was built in 1913 and 1500 ft. in 1914. It is found to be cheaper than the old trestle, remains in alignment better while loading is going on, and is more sightly.

The design follows broadly that of the Negaunee trestle. Each bent is a single leg of 12x12-in. fir, 38 ft. long, on which a 12x12-in. fir cap, 7 ft. long, is mounted and braced by two 6x8-in. by 6-ft. fir braces, mortised and bolted to both leg and cap. To each cap are bolted two 12x12-in. by 4-ft. fir corbels or bolsters, to which again are bolted the 8x16-in. by 32-ft. fir stringers, as shown in the illustrations.

The stringers are trussed with 16-lb. rails; to each end of these a $\frac{5}{8}$-in. plate is riveted and then bolted to the stringer. The truss rods are blocked in the center with a 6x12-in. wood piece. To the stringers are spiked 3-in. planks 5 ft. long, and the 30-lb. rails are laid on the planks at 20-in. gage. Outside of the 30-lb. rail, a 16-lb. guard rail is spiked. To each end of the cap is bolted a plate with an eye in the end, for attaching the guys. These guys are $\frac{3}{8}$-in. galvanized-wire strands; they extend out to side bents erected at 100 ft. from the trestle, the guys from three center bents being attached to each side bent.

The guys pass over the cap and down to eye-bolts, passing through a 12x12-in. by 16-ft. timber near the ground. The side bents are 32 ft. high, built of round timbe and well braced. They are themselves guyed by two $\frac{5}{8}$ in. wire-rope guys to a "dead man," concreted in th ground.

Following is a comparison, Table I, of the cost o the old-type two-leg trestle and this one-leg design, an in Table II is shown the estimated yearly saving of th new type over the old.

TABLE I—COMPARATIVE COST PER LINEAR FOOT O TWO- AND ONE-LEG TRESTLES

	Two Legs	One Le
Fir timber at $40 per M.	$1.160	$1.66
Hemlock planking and bracing at $20 per M.	.190	.22
Round timber	1.130	.12
Iron at 3c. per lb.	.080	.08
Cut and cast washers	.003	.00
Spikes and nails	.024	.02
Track rails, 30-lb.	.290	.29
Guard rails, 16-lb.	.160	.16
Trolley wire	.081	.08
Labor, carpenters	.720	.75
Labor, blacksmiths	.114	.13
Labor, electrician	.035	.03
Galvanized rope and clamps	...	.11
Truss rails, 16-lb.	...	.10
Cement	...	.02
Total	$3.987	$3.79

TABLE II—ESTIMATE OF SAVING PER FOOT OF NEW TRESTLE OVER OLD

Taking down old trestle	$0.150
Labor of erecting	.720
Timber destroyed	.850
Bracing plank	.095
Top plank	.032
Iron	.019
Washers	.005
Spikes and nails	.006
Fish-plate bolts	.003
Labor, blacksmith	.059
Labor, electrician	.035
Use of rope and blocks	.019
Total	$1.993

The photographs show various stages in the process of loading from around one of the new trestles and also the self-propelled dump car used for tramming on the trestle from the shaft to the stockpile.

⁂

Tar Painting of Concrete—B. N. Abbott says ("Eng. Record") that asphaltum will not firmly adhere to concrete, but if the concrete surface be first painted with coal tar, the asphaltum will adhere so firmly that it cannot be broken away without bringing pieces of concrete with it. The coal tar should be heated in small quantities, just to the boiling-point, and then applied immediately.

Details of Milling and Smelting

Sampling Lead Bullion

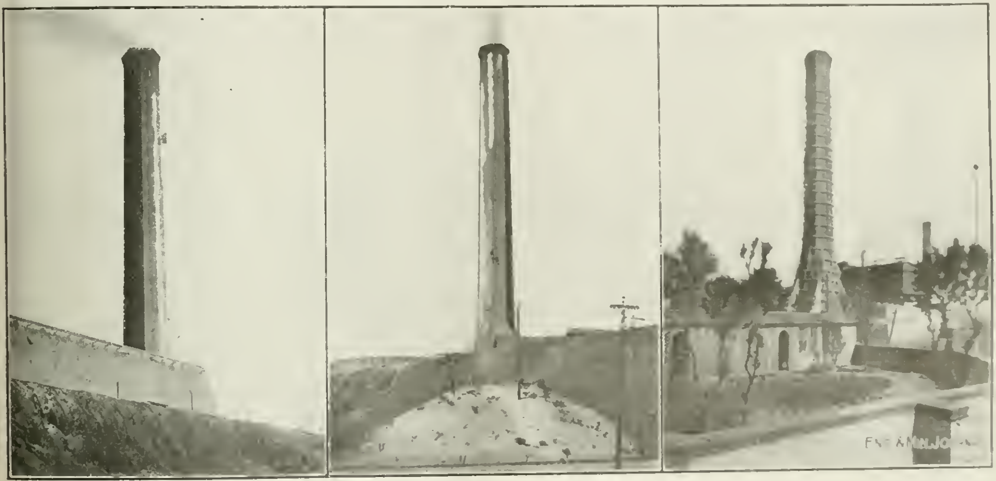
The sampling of lead bullion at the International Lead Refining Co.'s plant at East Chicago, Ind., is described[1] by G. P. Hulst. The lead bullion comes into the plant on a high line in carload lots of 30 to 40 tons; it is taken from the car, weighed over scales and thrown into sampling kettles of 45 tons capacity. These are fired with coal and heated until no frozen bullion remains in the bottom or adheres to the sides of the kettle. The kettle is scraped clean on the sides and bottom, and the wet dross is skimmed off clean into molds. The kettle is thoroughly stirred while 24 to 30 samples of approximately ½ assay ton are taken. These are taken in a long-handled iron mold providing for taking six to eight "gum drops." The mold is inserted and heated to the same temperature as the molten metal and the gum drops are dipped out and cooled in the mold by dipping the bottom of the mold into water. The samples should be free from fins.

In assaying, the gum drops should not be clipped but weighed up and the results computed. The dross bars are weighed and sawed according to old hammer-and-punch sample template. The sawdust represents a sample of the dross. In the case of high gold in the bullion, there is a slight correction in the assay. This method of sampling, Mr. Hulst states, was developed in 1903 or 1904 at the Omaha plant of the American Smelting & Refining Company.

Smelter Stacks and Lightning

The value of lightning rods seems to be differently appraised by the operators and builders of metallurgical works. As a whole, the vogue of the lightning rod has declined, due, perhaps, to over-assiduousness on the part of agents. Nevertheless, the protection of tall smeltery stacks by lightning rods is considered essential by certain operators. A trip through the smelting districts, however, will show that opinion on this point is divided. Some operators feel that a platinum-tipped rod will attract lightning, but the ground connection usually provided is not sufficiently large to carry away the current. Also that after a period of years with no inspection, a lightning rod is likely to be a source of danger by reason of bad connections or corroded rods. On the other hand, the advocates of lightning rods contend that even though the latter may not have a ground connection sufficient to carry the largest bolt of lightning, they serve to conduct the electric charges away before the potential becomes high.

Many works have no lightning protection for their stacks, but it is noteworthy that one of the newest plants constructed in the Southwest, namely, that of the Arizona Copper Co., has been provided with lightning rods. On the other hand, it may be well to recall that one of the Illinois smelting works found on inspection that the ground connection of its lightning rod was completely severed by corrosion a short distance below the top of the stack. Doubtless many will recall other similar instances of "[illegible]."



Two Stacks of the El Paso Smelting Works, El Paso, Tex.

Two views of the main stack which was struck by lightning several years ago; later, on the development of a crack in the brickwork, it was decided to repair the stack. At the left is the reinforced stack now used by the reverberatory and converter departments; the skin friction of the concrete emplacement is estimated to be sufficient to support the entire weight of this stack.

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[1] Bulletin of A. I. M. E., November, 1914.

However, the efficiency of lightning rods when maintained in good order is evidenced by one of the most noteworthy structures in the country, namely, the Washington Monument. This monument bears the scar of an electric discharge which struck it during its erection. It has since been protected by four lightning rods, and every amateur photographer in Washington has a photograph of lightning striking the monument, or more properly, these protecting rods, which have carried the current away harmless. During nearly every electric storm in Washington, the lightning discharges through these rods several times. The efficiency of the lightning rod, as installed, is generally conceded, but its efficiency at the end of five or six years without inspection is another question. When were your lightning rods last inspected?

The new stack at the Garfield Smelting Works, at Garfield, Utah, was struck by lightning on Oct. 6, 1914. Pieces of brick were torn out in spots over a considerable part of the height, but so far as can be seen from the ground, no serious injury was done to the stack. The breakage was apparently shallow, not continuing through the walls at any point. The stack was completed last summer and is 350 ft. high and has a diameter of 22 ft. inside at the top; no lightning rods were provided.

At the El Paso Smelting Works, at El Paso, Tex., the main stack was struck by lightning a number of years ago, and while the damage was not deep, it extended over a considerable portion of the stack. No repair was attempted at the time, but several years later a crack developed. The accompanying engravings show the stack in process of repair and also after the repair was completed, the new mortar indicating plainly the course of the lightning. About this time another stack at this works was discovered to be in a precarious position, though not due to lightning. The stack was one of the oldest at the works and when the new management found out the condition of the stack, it was decided to repair it. On investigation it was discovered that there was almost no foundation under the stack, only such as might be placed under a building wall or column; as the stack had developed a slight crack and showed a tendency to get further out of plumb, it was decided to reinforce the stack with the buttresses and the concrete enlacement, shown in the engraving at the right. An interesting fact in connection with this repair is that it was estimated that the skin friction of the concrete reinforcement is sufficient to support the entire weight of the stack, which has continued to serve its purpose for 10 or more years, without any evidence of further deterioration. From an artistic point of view, the repair was also an amelioration. The attractive photograph was taken by the *padre* from the garden of the adjacent St. Joseph Church, which ministers to the religious needs of the Mexican settlement just outside the north gate of the smelting works. The stack was originally the outlet for the copper blast-furnace gases, but since 1911 it has been used by the reverberatory and converter departments; the gases from the old copper blast furnaces now pass out of the main stack with the lead furnace gases.

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Smelting Titaniferous Ores

According to O. Simmersbach (*Stahl und Eisen*, 1914, p. 672), in smelting titaniferous iron ores the aim should be to obtain all the titanium in the slag, as it does not improve the quality of pig iron. Ores mixed so that the slag does not contain more than 2% Ti. can be smelted in the same way as titanium-free ores; and provided that the slag contains under 6% MgO, its melting point will not be inconveniently high.

⁂

Notes on Leaching Experiments at Douglas, Ariz.

In discussing the various papers on the leaching of copper ores presented at the last meeting of the American Institute of Mining Engineers, Lawrence Addicks contributes the following remarks in the November *Bulletin* on electrolytic deposition of copper from the solutions:

> I have been particularly interested in this subject the last three months in doing some work for Phelps, Dodge & Co., and I have been astonished to find under what adverse conditions it was possible to get good deposits. A coherent deposit premises a sufficient number of copper ions in contact with the cathodes to satisfy the current. This can be obtained by having the solution heavy in copper, or a solution considerably lighter in copper but with rapid circulation. The ordinary electrolytic refiner has a handicap which is entirely absent in leaching liquor, namely, the presence of gold and silver slimes at the anode which cannot be disturbed by any violent circulation, or there will be prohibitive silver and gold losses in the cathode. I also think that it is wrong to look at this problem as a cyclical one rather than as a continuous one, and that it would be better to consider the use of liquor high in copper, say 3%, take it down to 2 or 2½%, run that back into the tanks, make up the ½% that is missing and return the liquor to the electrolytic tank. In this way better depositing conditions are obtained and, when studied over, it is not bad from the leaching point of view. Of course, that means counter-current washing of the ore in order to bring the liquor up to the necessary strength for the depositing tanks, and indicates the use of Dorr thickeners or something of that kind. The question of wash water bringing up the bulk is easily dealt with in the dry climate of the West by using a cooling tower and evaporation to get reduction of bulk.
>
> Now as to a depolarizer; using a carbon anode, iron is the real depolarizer in most cases, even though sulphur dioxide may be introduced. Iron is almost always present and is an efficient depolarizer. I found in the experiments at Douglas that it was quite possible to consider working voltages as low as 0.6 and 0.7 volts. The depolarizer requires circulation in order to bring fresh iron to the surface of the anode. With such voltages I aim to obtain a recovery of 3 lb. every kilowatt-hour.
>
> There are two questions I want to ask. One is regarding the apparently remarkable wood in the West, which seems to withstand the acid liquors. I am used in all my experiences in electrolytic work in the East to see wood, after an exposure to sulphuric acid, reduced to a soft charcoal through which you can poke your finger. If redwood will withstand acid to the extent which my brief observation indicates, I do not see that there is any problem entailing the use of asphalt mixtures and other protective coatings for this work.
>
> The other question I want to put is whether anyone has had experience in the restraining of the solution of impurities by having the leaching liquor high in those impurities. The real problem in Arizona is one of alumina and what to do with it after it gets into the solution. My idea was to use a solution so high in alumina that the additional amount dissolved from the ore would be small. I might also say that I have worked with solutions and electrolytes as high as 7% alumina, and use regularly liquor containing 3% Al_2O_3 and 3% Fe, without any trouble with the deposit.

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The First Large Rectangular Copper-Smelting Furnace in North America was built about 1880 at Capelton, Que., according to Alfred W. G. Wilson, of the Mines Branch, Canada Department of Mines. This furnace was approximately 10 ft. in length and 4 ft. in width at the tuyeres. W. E. C. Eustis, in a personal letter to Mr. Wilson, states that "the furnace was built in about two weeks as an experiment. It was provided with two tap holes, and I believe was operated with two No. 9 Sturtevant fans or their equivalent. I remember distinctly that John L. Thompson, who was in charge of operations, ran down to the office and told me that the double elephant was in operation and to come up quick and see it. To my astonishment I found on arriving two streams of slag and metal rolling from this furnace, each of which looked as big as my leg. It was a most surprising sight at that time"

Combined Cyanide and Other Processes—I*

By Herbert A. Megraw

SYNOPSIS—The cyanide process is seldom used alone, in spite of its applicability to many different kinds of ore. Concentration is the most usually employed auxiliary. It removes base metals, allowing them to be saved separately, and averting excessive cyanide consumption. Comparison of a concentrating and nonconcentrating mill is given.

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Notwithstanding the wide popularity of the cyanide process in the treatment of ores containing gold and silver, it is seldom indeed that it is used alone. Almost invariably other aids to the highest economical extraction are employed, and it is by no means rare that two or even more other processes are used in conjunction with it. Some of the systems used as aids to cyanidation are actual extraction processes, while others are preparatory processes, designed to put the material in the best possible condition for action of the cyanide.

Process Depends upon the Nature of the Ore

The processes used as assistants depend, of course, altogether upon the nature of the ore to be treated. Simple ores require simple processes, while complex ores may require a combination of processes. For example, a clean siliceous gold ore, in which the gold is finely divided, will require only the cyanide process to extract the economical maximum. If the gold occurs partly fine and partly in a comparatively coarse state, it is probable that amalgamation would be required to recover the coarse gold. If the gold is contained in complex sulphides, and only partly free, concentration may be required as one of the assistant processes. The same is true with silver ores, except that native silver is rarer and not usually considered amenable to cyanide treatment, although in some cases it has been made so, as will be mentioned later. Gold or silver ores, or both, containing small amounts of copper may require an entirely different treatment, which may possibly include ammonia dissolution of the copper. And so it may be seen that with various ore compositions various processes may be required to satisfactorily extract the maximum possible value from the ore.

Possibly the simplest combination of processes is that of removing the pyrite from gold ores by concentration, and cyaniding the tailings. This is a system which is employed in a large number of cases, although in many of the California mills amalgamation is added to the combination of systems, and the cyanide omitted. Confining ourselves, however, to concentration and cyanidation, it may be readily seen that this procedure is applicable to those gold ores which contain an appreciable part of the gold combined with the pyrite. The free gold which does exist in the ores may be either coarse or fine. In the first case it will be removed with the pyrite on the concentrators, and in the second it will proceed to the cyanide plant, where there will be no difficulty in dissolving it in a reasonable time.

Concentration is one of the most inexpensive of metallurgical processes, and there is usually no hesitancy in using it in combination with cyanide or other processes whenever it is considered that any benefit may be obtained. The power cost is low, and the maintenance and supervision required are small. The greatest item of cost, and one that must be examined carefully wherever the process is considered, is the marketing of the concentrates after they are made.

Concentrates Not a Final Product

Concentration produces a material which does not command a stable market, such as bullion does, but is subject to treatment charges which vary according to its analysis. Transportation charges on concentrates are higher than those charged against bullion, and they must usually be shipped in a moist state, so that freight has to be paid also on a certain percentage of moisture. Besides, the exact value of concentrates is difficult to arrive at because of the necessity of sampling and assaying by both the buyer and seller, the buyer usually taking good care that there is a safe margin in his favor. Thus, it is rare indeed that the producers of concentrates are enabled to secure the exact value of the precious-metal content of their product. All these considerations must be given due weight in the selection of a combination of processes, since they all have a direct influence upon the ultimate economy. In some cases, which are increasing in number at the present time, the concentrates are treated by a separate process at the mills where they are made. Their higher precious-metal content will justify a much greater per-ton expense on the small quantity produced than would be allowable if the concentrates were treated in the mill run of ore, so that a small concentrates-treatment plant is often justifiable. The cost of marketing concentrates is usually so great that home treatment can be performed in an entirely satisfactory manner at a saving of expense, including as cost the value of the metal left after that special treatment.

Preliminary concentration of silver ores, to remove the pyrite, is largely practiced and is more generally required even than with gold ores. This is because silver seldom occurs native, but is almost always in combination of some kind. The most usual silver mineral is the sulphide, argentite, which is found either partly or wholly in almost all silver ores. There are, of course, a number of other sulphide combinations, some of which are easily treated by cyanide, and others of which are not. Where the latter occur the necessity for concentration is apparent.

Treatment of Mexican Silver Ores

In many silver ores the concentrates are shipped to smelters, who recover the silver by fire methods, but in a number of other cases they are treated on [illegible] with a [illegible]-grade cyanide solution, being reground to extreme fineness before treatment. Some Mexican mines ores are probably of greater interest in general than those of any other single district, consideration of the plans of working there will be considered. In view of the fact that the greatest silver-producing district in the United States, Tonopah, is in many ways similar to the larger Mexican districts, a discussion of this subject from the Mexican standpoint will be of wide interest and may be said to be of almost general application.

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*This is the seventeenth of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvements. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, 1913; Jan 31, Mar. 7, Mar. 21, Apr. 25, May 23, June 20, July 25, Aug. 29, Sept. 12, Oct. 17 and Oct. 31, 1914. The next article will deal with "Combined Cyanide and Other Processes—II," and will appear in the issue of Dec. 26, 1914.

Generalization can only be permitted in cases where the conditions are alike, but this is so rare that each particular instance needs special study. In considering the question academically, however, we may begin by assuming an ore containing silver sulphides, but which contains no base metals or minerals of a kind detrimental to cyanidation, and one from which it is not possible to derive such a quantity of base-metal concentrates as to make it profitable to separate these as a special product. Such are the ores of the principal Mexican camps of Pachuca, Guanajuato, largely those of Zacatecas, and many others.

Comparison of Concentrating and Nonconcentrating Systems

In a combination of processes, the ultimate profit is the thing to be looked after, and that process or combination of processes which gives the greatest ultimate profit is the one which will be used. Therefore, in the case of the class of ore mentioned, the object is to determine whether there is a greater profit in the process of concentrating the ore prior to cyanidation and subsequently selling the concentrates to the smelter, or in the process of direct cyanidation of the ore as a whole, after which consideration may be given to the alternative of treating the concentrates in a separate process at the same mill in which they were produced. This will probably offer some economy over shipments of the concentrates to a smelter, particularly where the latter is at a considerable distance from the point of production. An actual comparison of this sort is mentioned by J. B. Empson in a communication to the Mexican Institute of Mining and Metallurgy, Vol. 3, 1912-13. Mr. Empson presents figures and data from the practice of the Cia. Minera "La Blanca y Anexas," given by the superintendent, G. W. Harris.

In this calculation, the metal quotations are, silver at 40 pesos, and gold at 1333.33 pesos per kilo. The object of the calculation was to show what lesser total extraction would have yielded the same money value had the contents of 351 tons of concentrates carrying 5747.6 kilos of silver and 35.116 kilos of gold been produced as bullion. The data taken in the calculation represent the official returns from the sale of concentrates by La Blanca y Anexas, as well as the actual returns on bullion shipped for the half year ended December, 1911. The facts are substantially that 48,252 metric tons were milled during the half year. The average of mill feed was 4.09 grams gold and 774 grams silver per metric ton. The ratio of ore to concentrates was 136 : 1. The tonnage of concentrates and the contents of gold and silver have already been mentioned. The extraction by concentration was 15.36% of the silver content of the ore and 17.93% of the gold content. The total extraction by concentration and cyanidation was 93.12% of silver and 95.567% of the gold.

In the preparation of figures, all costs are given in Mexican currency and are separated under two heads. Milling costs represent all expense up to the time that the bars are in the express office and concentrates at the railway station. Liquidation costs cover all charges subsequent to those included in milling. The cost of concentration per ton of ore milled is as follows:

COST OF CONCENTRATION

	Centavos
Labor..	3.5
Power.	2.0
Labor and maintenance.	1.4
Sacking, sampling, teaming, etc (5 pesos per ton of concentrates).	3.7
Total..	10.6

In the calculation of the cost of production of bars it is assumed that the treatment cost, including cyanide, lead acetate, etc., would not be increased over that incurred in the ores from which the concentrates have been removed. Precipitation and melting costs, including labor, vary directly with the amount of metal precipitated and melted. Excluding labor, the costs for this period are 55.2 centavos per kilo of fine metal produced (including zinc, coke, crucibles, etc.). Multiplying this amount by the total fine kilos of metal contained in the concentrates, we have 3191.66 pesos. Dividing this by the total number of tons milled gives 6.6 centavos, and subtracting this amount from the above, namely, 10.6 centavos, equals 4 centavos per ton of ore milled, the assumed saving by not concentrating.

Marketing Bars and Concentrates

The accompanying tables show the basis of liquidation of bars and concentrates. It is to be noted that state tax is levied upon gold at 24 pesos per kilo, equivalent to 1.8% on 1333.33 pesos, the value of a kilo of gold. The tax is applied to 80% of the total.

LIQUIDATION BASIS FOR CONCENTRATES AND BARS

Concentrates	Bars
Silver—95% at N. Y. quotation.	Silver—100% at N. Y quotation.
Gold approximately 97% at 1.33⅓ pesos per gram.	Gold—100% at 1.33⅓ pesos per gram.
Treatment.... 21 00 pesos per ton	Treatment 60 centavos per kilo gross, or
Freight.. ... 5 13 pesos per ton wet	70 6 centavos per kilo fine
or .. 5 70 pesos per ton dry	Assay .... 2 50 pesos per bar
Total 26 70 per ton dry	Express....78 centavos per 1000 pesos
Federal tax, 2½% of total value.	Federal tax, 2½% of total value.
State tax, 1.8% on 80% of silver and 24 pesos per kilo of gold, on 80% of total.	State tax, 1.8% of silver, and 24 pesos per kilo of gold
Revenue stamps, after all deductions except state tax, 5 centavos per 10 pesos or fraction.	Revenue stamps, after all deductions but express, 5 centavos per 10 pesos or fraction.
	75% returned by refinery.

The total smelter deduction per ton of ore milled, on the concentrates, amounts to 26.8 centavos. Treatment and freight charges of 26.70 pesos per ton of dry concentrate equals 19.6 centavos per ton of ore milled. The Federal tax, equal to 2½% of the total value, makes a total of 6928.33 pesos, a tax of 14.4 centavos per ton of ore milled. The state tax equals 1.8% of 80% of the total silver, and 80% of the total gold pays 24 pesos per kilo. At this rate, the total is 3990.85 pesos, or 8.3 centavos per ton of ore milled. The revenue stamps amount to less than 0.5%, but in order to cover miscellaneous, stamps, etc., on freight bills, 0.5% is allowed, making a total of 1385.67 pesos, or 2.9 centavos per ton of ore milled. Thus, the total cost in connection with liquidation of concentrates amounts to 72 centavos per ton of ore milled.

In bars the total content of gold and silver is paid for by the refinery. The cost per kilo of fine metal is: Treatment, 70.6 centavos; assaying, 8.9 centavos; and express on a bar of 1300 pesos, 3.6 centavos, a total of 83.1 centavos per kilo. This amount multiplied by the number of kilos in the concentrates, as formerly given, equals 4804.84 pesos, or 10 centavos per ton of ore milled. The federal tax is 14.4 centavos per ton of ore milled, and the state tax in this case, 10.3 centavos per ton of ore milled. The cost of revenue stamps per ton of ore milled is 0.7 centavo; the total liquidation cost in connection with production of bars per ton of ore milled, 35.4 centavos.

The total liquidation cost then, in the case of concentrate, is 72 centavos, and in the case of bars, 35.4 centavos. The difference in favor of bars is then 36.6 centavos, while under the head of milling, the difference is 4 centavos per ton of ore milled, making a total in both liquidation and milling, of 40.6 centavos per ton of ore milled. The difference in favor of bars has now to be calculated in terms of percentage of the original ore value.

The original ore contained 774 grams of silver, valued at 30.96 pesos, and 4.09 grams of gold, valued at 5.35 pesos, a total of 36.41 pesos. Of this total it would appear from the foregoing calculations that 40.6 centavos could have been saved if concentration had been used, and as 40.6 centavos is 1.12% of 36.41 pesos, it follows that 1.12% of the recovered value could have been sacrificed and still leave the result of nonconcentration equal to that obtained by concentration, as far as profit is concerned.

In this calculation, however, it has been considered that all the gold and silver contained in concentrates would have been obtained in the form of bars by straight cyaniding, but inasmuch as it is impossible to obtain 100% from this material in the ordinary way, it is necessary to apply the percentage recovery obtained in cyaniding the general pulp to the sulphides of the concentrates. This result is shown in the accompanying table.

LOSS IN CYANIDING WITHOUT CONCENTRATION

	Grams Silver	Grams Gold
Average value of heads to batteries....	774	4 09
Average value of heads less concentrates.	655	3 36
Average value of tailing....	53 25	0 196
Actual extraction on cyanide heads...	91 87%	94 17+
This percentage applied to battery heads......	33.57 pesos	
Actual extraction recovered in 6 months by concentration and cyaniding.......	34 04 pesos	
Total extraction recovered during 6 months in percentage	93 5%	
Loss in extraction by not concentrating per ton of ore milled........	47 centavos	

Thus we see that the loss in extraction by omitting concentration would amount to 4.7 centavos per ton, and this is equal to 1.29% of loss per ton. Comparing then the 1.12% estimated profit by bars over concentrates with the 1.29% estimated loss by not concentrating, there is a difference of 0.17% in favor of concentrating previous to cyaniding. This difference seems to be too small under ordinary circumstances to justify plant changes, or even to guarantee that there would be any material difference between the two methods. Certainly, on any ordinary plant, it would not be sufficient to justify the additional installation expense required by the concentration.

There is, however, another alternative which has not been considered by Mr. Empson in this article, and that is the possibility of treating the concentrates by themselves in a separate concentrates-treatment plant, and extracting very nearly 100% of the precious-metal content at a cost considerably lower than that of shipping to the smelter. Certainly there is a great difference between the cost of shipping concentrates, and the probable cost of treating them on the spot, so that there is a fair possibility, at least, that advantage might be gained by having recourse to that system. It is by no means impossible to handle concentrates successfully in this way, and often only an improvised installation is required. I know of one small plant which produced about 300 lb. of concentrates per day, which successfully treated the material extracting about 99% of the gold and silver contained by grinding concentrates and cyanide solution in an improvised tube mill made out of an oil drum. Eventually, four of these were installed, lined with silex brick, and kept operating on concentrates exclusively. The consumption of cyanide, while high, was not more than might have been expected on that class of material, and the total cost of recovery did not approach the cost when the concentrates were shipped to the smelter. An added advantage was that the metals in the concentrates were recovered much sooner than would have been the case had they been shipped, since the amounts produced day by day would have had to be stored until sufficient for economical shipment had accumulated. With the present advantageous methods of treating rebellious ores, such as desulphurization and the other processes which have lately come to light, cyaniding the concentrates ought to be a much easier and cheaper process and should give high-percentage extractions.

(To be continued)

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Mining Dividends for November

Nineteen United States mining companies reported dividends aggregating $1,173,125 for November, 1914, as against $2,313,646 paid by 31 companies in 1913. American metallurgical and holding companies paid dividends of $8,692,022, as against $9,977,955 last year, and Canadian and Mexican companies paid $631,891, as against $1,879,896 in 1913.

United States Mining Companies	Situation	Per Share	Total
Alaska Mexican, g ...	Alas.	$0 20	$[illegible]
Alaska Treadwell, g .	Alas.	1 00	2[illegible]
Alaska United, g	Alas.	0 20	[illegible]
Bunker Hill Con, g	Calif.	0 02½	[illegible]
Bunker Hill & Sullivan, l.s	Ida.	0 25	81,[illegible]
Arizona, c pfd. Is.	Ariz.		[illegible]
Caledonia, l.s..	Ida	0 01	[illegible]
Elkton, g	Colo.	0 02	[illegible]
Federal Min. & Sm., pfd	Ida	1 [illegible]	11[illegible]
Fremont, g .	Calif	0 02	[illegible]
Golden Cycle, g.	Colo.	0 [illegible]0	[illegible]
Homestake, g.	S. D.	0 65	16[illegible]
Hecla, l.s	Ida	0 01	10,[illegible]
Jerry Johnson, g	Colo	0 [illegible]½	12,[illegible]
Nevada Wonder, g.s	Nev	0 [illegible]	7[illegible]
Parrot, c	Mont	0 [illegible]5	34,477
South Eureka, g	Calif	0 07	20,[illegible]
United Verde, c	Ariz	0 75	22[illegible],000
Yosemite, g	Calif	0 10	[illegible],000

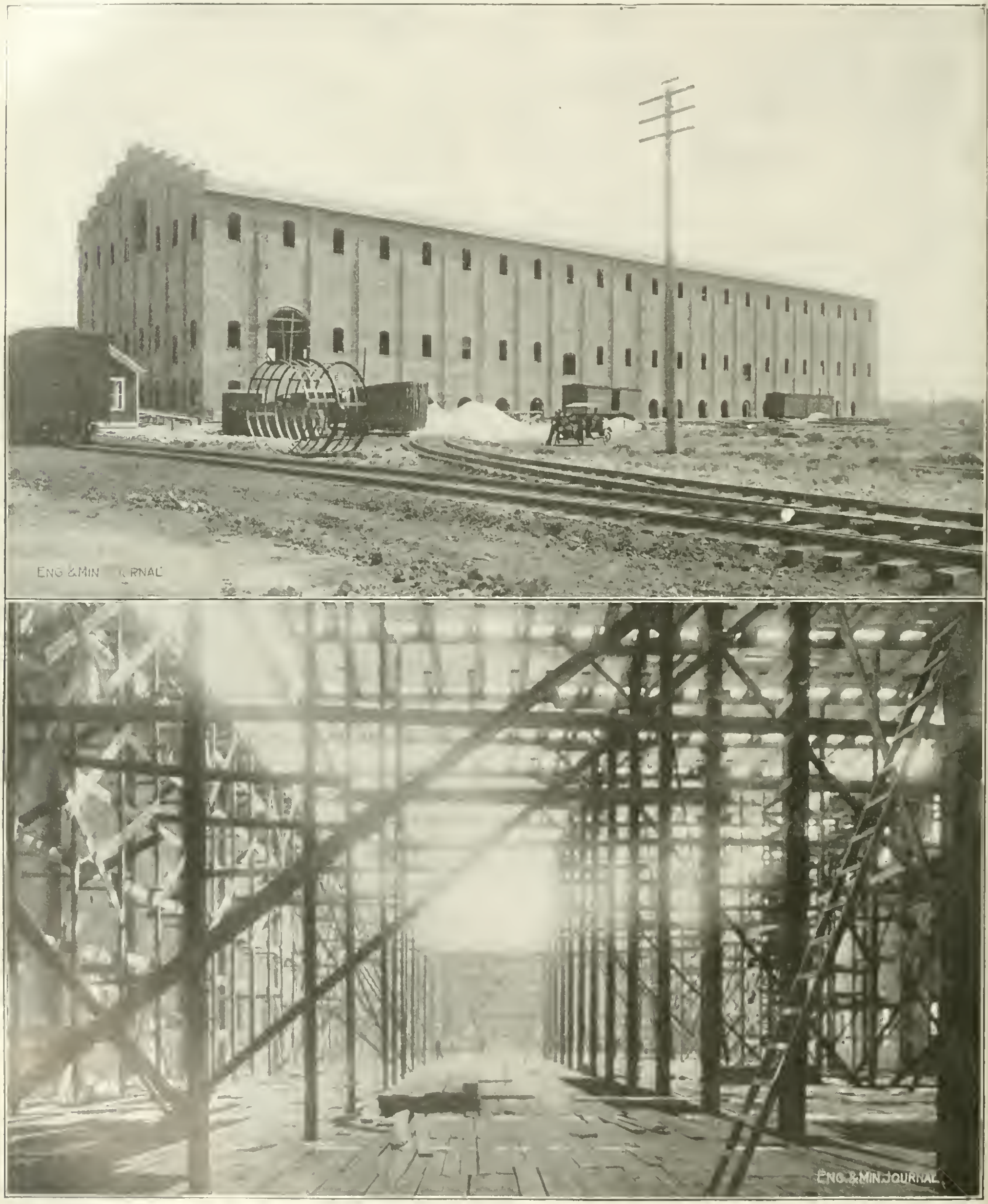
Iron, Industrial and Holding Companies	Situation	Per Share	Total
Amalgamated, c	U. S.	0 50	1,538,879
Cambria Steel	Penn	0 62½	*562,500
International Nickel, pfd	N. J.-Can	1 50	133,689
U. S. Steel, pfd	U. S.	1 75	6,304,919
Warwick, I. & S	U. S.	0 35	52,0[illegible]5
White Knob Copper & Dev	Calif	0 25	10[illegible],000

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Amparo, g.s	Mex	0 03	[illegible],000
Coniagas, s	Ont	0 [illegible]	240,000
Crown Reserve, s	Ont	0 02	3[illegible]
Dominion Steel, pfd	Can	1 50	1[illegible],000
Hollinger, g	Ont	0 15	90,000
Lucky Tiger, g.s	Mex	0 09	64,[illegible]
Right of Way, s	Ont	[illegible] 01	1[illegible]
Temis. & Hud. Bay, s	Ont	3 00	23,[illegible]

*Paid in scrip

Totals for the first eleven months of the year are: United States mining companies, $50,715,223 in 1914 against $61,519,256 in 1913; smelting and holding companies, $78,819,121 in 1914 against $81,974,586 in 1913; and Canadian, Mexican and Central American mining companies, $11,315,259 in 1914 as against $20,[illegible] last year.

Photographs from the Field

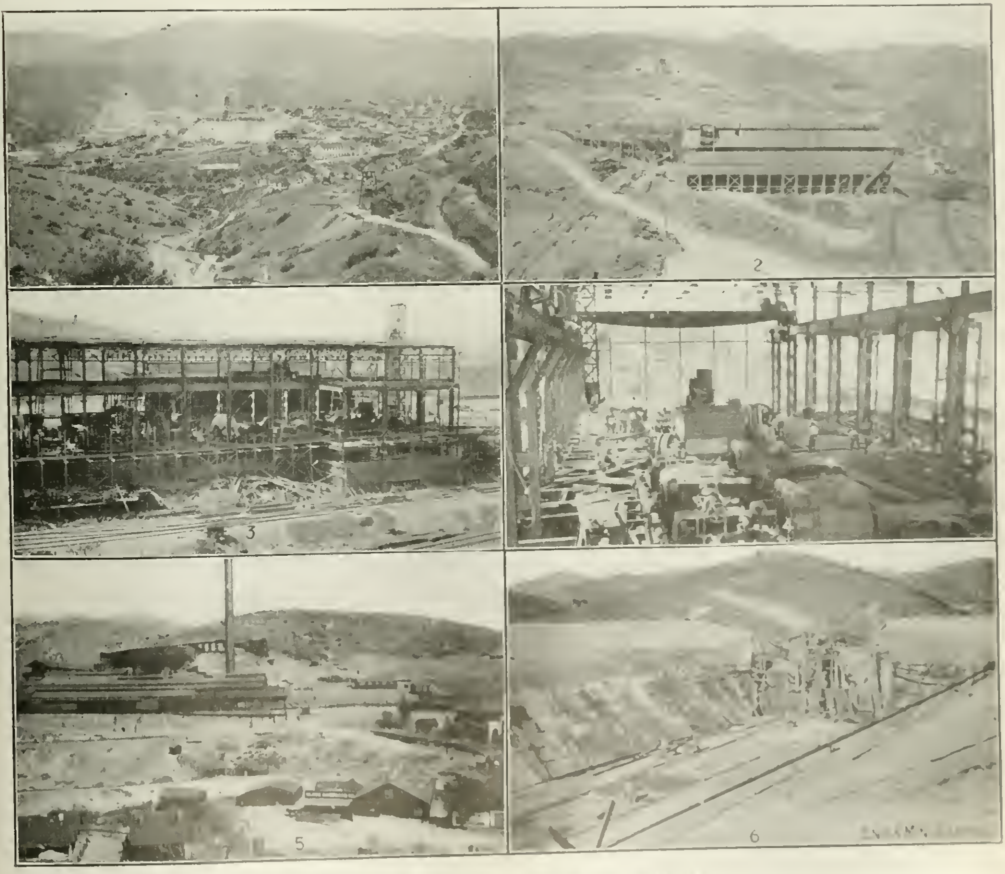


Exterior and Interior Views, During Construction Period, of the 100-Ton Acid Plant of the Anaconda Copper Mining Co., Anaconda, Mont.

THE MASON VALLEY MINES CO., MASON, NEVADA

The Mine Ore Bins and Upper Tram Terminal — The Lower Tram Terminal and Loading Bins

Tramway is 6250 ft. long, with a drop of 600 ft. It has a capacity of 100 tons hourly. It connects the mine with the Copper Belt Ry., which delivers to the company's smeltery, 16 miles distant.



IN THE MIAMI COPPER DISTRICT, ARIZONA

1. The Miami Concentrator and Settlement. 2. International Smeltery and Inspiration Mill. 3. [illegible] Turbines of the International Smeltery. 4. Power Plant of the Inspiration Co. 5. The Old Dominion Smeltery [illegible] 6. The 5,000,000-gal. Reservoir of the Inspiration Co.

Editorials

The Recovery in Copper

The sharp rise in the price for copper in November was based chiefly upon improved demand for domestic consumption, the large sales for the month having been more for domestic delivery than for foreign. During the three months of gloom—August, September and October—manufacturers lived largely on their old contracts for supplies, and placed new orders only for their immediate requirements. The normal business in contracts for delivery during the two or three ensuing months practically ceased to exist. Gradually, however, the orders received by the manufacturers, reflecting ultimate consumption, began to increase, first in the brass business, then in the sheet business, and last of all in the rod and wire business, and along with the clearing up of uncertainties in several directions, and the general increase in optimism, the manufacturers of copper saw that the ground had become safe for the resumption of business with the copper producers in the old way.

Some very substantial buying began in the latter part of October, when already it looked as if daylight were ahead. The interruption to the export business, which happened suddenly at the beginning of November, cast a new shadow over the field, but as things turned out, this proved to be simply an excellent test of the soundness of things. Copper was in fact in the position that producers would rather keep the metal than sacrifice it. When manufacturers became convinced that the producers meant what they said and that there were not going to be any "bargain counters," they began to buy in earnest and congratulated themselves that they were getting copper at less than 12c., which was quite bargain enough. With these circumstances the price for copper rose rapidly, so much so that it was laid to "speculators" by some skeptics who must always have a manipulative reason for everything. In fact, there is never any considerable speculation in the domestic copper business. The producers sell in the main to the manufacturers who are going to use the copper and are quite averse to selling it in any other way. Certain of our British contemporaries are more amusing in their suspicion that the American producers have raised the price for copper in order to make the British government pay more for the copper it has been seizing!

At the end of November, we find the copper market at about the same level where it stood at the end of July, when war was expected, although there were still faint hopes that it might be averted. Even before the war cloud gathered in July, everybody was gloomy because copper was selling down toward 13c. Everybody is now happy because it is around 12½c. We surely do not want anybody to be anything but happy, and we hope that a further advance in price will increase the happiness. We must, however, point out that the present situation does not offer any basis for excessive enthusiasm. The copper producers are much better off than two months ago they had any reason to hope. The price having gone to 11c., has recovered to 12½c., instead of sinking to 10c., which many feared would happen. Furthermore, the porphyry producers have exhibited their ability to operate their mines on half scale without increasing their cost of production per pound of copper. Thus there is in prospect a resumption of dividends, if not at the old full rate, at least at a partial rate.

It must be remembered, however, that the improvement in copper, satisfactory as it has been, reflects the conditions in the industry upon the basis of a 50% curtailment of production. It would be fatal to the welfare of everybody if any important producer should become minded to do anything other than to remain curtailed. The essential thing in the copper business, just now, is to preserve the *status quo*.

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The Copper-Export Controversy

The controversy over the exportation of copper from the United States to other neutral countries has had a curious dénouement, if dénouement it be. For our own part, we are inclined to think the affair is as good as ended, although some agitation will doubtless be continued.

In the present phase of the matter, Great Britain apparently does not deny the right of the United States to sell copper to Italy (or Sweden), but insists upon being assured that the copper is destined for use there. This, in itself, may be high-handed, but evidently the Italian government agrees to the principle and itself has formulated measures to insure it.

Let it be noted that Italy had previously declared an embargo on copper exports. Manifestly Italy herself is not now minded to let any copper come within her borders that might be surreptitiously forwarded to Germany.

The system of regulating the business that has been put in effect is substantially as follows: An Italian consumer wants to buy copper and inquires about its purchase in New York. New York says it will sell him the copper if he can satisfy his government that he is going to use it. The Italian consumer having so satisfied his government, the latter informs the Italian Embassy in Washington, the Embassy then certifies the shipper's papers and the shipment may be made. Mere affidavits by the shippers of copper are not valid in the eyes of the foreign governments, which say, in effect, that they do not take anybody's word. Nor are consular certifications of any good.

This procedure puts serious obstacles in the way of direct business between New York and Italy. In quoting prices the shipper needs to know when and how he is going to ship. He cannot figure on his insurance and some other things until he can give the name of the ship, the underwriters requiring that; but with the formalities that must now be executed, the contemplating shipper is quite in the air. Furthermore, no shipping agent will agree to carry any copper unless all the papers are in the highest form of regularity. No ship owner can afford to risk days or weeks of demurrage on account of seizure for the sake of the freight on a few hundred tons of copper. In fact, the shipping men have been so thoroughly scared that some of them are looking upon the carrying of any metal as a thing to be avoided, whether it be contraband or not.

What, then, is the industrial effect of this, letting it be taken for granted that all ideas about getting copper into Germany have been dismissed; that that no longer is a possibility?

Some expert authorities say that the difficulty of doing business directly with New York will result in its being done primarily with London. They argue that such a capture of trade is just what England wants to accomplish, i.e., that she intends to command the whole Continental market.

It is well known among the copper producers that when England seized the copper at Rotterdam, which she was reputed to have paid for generously, she did in fact obtain a lot of very cheap copper, which may have been resold advantageously, it is hinted. Anyway, the producers here did not appreciate England's "generosity" in this matter.

But supposing that Italy is going to buy her copper through London, instead of directly from New York, she is going to use just as much in one case as in the other, and the producer here is not affected. What really affects him is his inability to sell copper to Germany, but it is Italy that prevents him from doing that; and if to make surer her embargo, Italy interposes difficulties in the way of copper transactions between herself and the United States, that is her own affair. Furthermore, if London scalps a profit on copper transactions done for Italy, it seems to us that it will be the Italian who will pay.

However, we can hardly believe that England is contemplating doing the copper business for the whole of Europe, so long as the center of the refining industry is New York. Certainly she has not undertaken to supervise the transactions of either France or Russia.

The long and short of the copper-export controversy is that England is not now interposing objections to the transaction of business between one neutral country and another, but claims the right to assure herself as to the innocence of the parties doing the business. It is the European neutral countries which are interposing the real difficulty. They say that copper may not be shipped to them on order, and that every transaction in which their citizens participate must be supervised by their authorities. In bringing this about, British diplomacy appears to have outgeneraled everything else. The original American contention against Great Britain was sound in the eyes of eminent international lawyers, but what can America do if Italy does not want to take copper from her except in a certain way?

"Skilled Miners Familiar with the Mines Around"

It is unfortunate, but true, that many plain mining men cherish hostile feelings toward mining engineers, sometimes in general and often in particular. In the latter cases the psychological attitude may be entirely justified by the circumstances. And, too often perhaps, the attitude may be reciprocated. But it is certainly unjust for either class to generalize when indulging in condemnation. In the hope that publication will contribute in some degree toward harmony, we take the liberty of quoting from the files of a private correspondence between a consulting engineer (*sic*) and one of his mine-owner clients. This engineer wrote:

> Your letter of Sept. 26 received, and I note that you have expended $15,000 on this property without satisfactory results. The data furnished by Mr. B. is very incomplete, and my opinion is that you will find it difficult to raise additional capital in the way you suggest, one of the chief obstacles being the lack of maps and other records of work done in the past. But, as I explained to you some time ago, this lack can be remedied to a certain extent by expending a moderate sum for surveys, sampling and assays.
>
> With all respect for the personal convictions of Mr. B., I beg to dispute the point that "a skilled miner familiar with the mines around has more show than a mining engineer." Perhaps he bases his opinion upon his experience with some who call themselves mining engineers, but are rank imitations. I have recently received a so called report from one who is perhaps a home-made, self-titled mining engineer. In the course of his report he pretends to quote from a U. S. Geological Survey bulletin. A comparison with the original text shows that dates have been altered and whole sentences omitted, for obvious reasons.
>
> I recount this merely to emphasize the importance of knowing whether one is considering a "real" mining engineer in comparison with the experienced miner. The latter's experience is often limited to one or two mines of a single district whereas the mining engineer brings to a property a breadth of experience covering many considerations not dreamed of by the average miner. The miner has concentrated his attention almost entirely on the breaking and removing of rock, an essential part of mining, but the successful management of a mining property embraces many other considerations.

A mining engineer worthy of the name always relies to a large degree upon the "skilled miner familiar with the mines around." He would be a fool not to rely on several miners. But his training as an engineer permits him to form his conclusions by studying all material available. This includes not merely what the experienced miner has observed, but a personal study of the ore deposit itself and a study of what the government geologists and other mining engineers have concluded concerning the mines of the district. The mere miner, no matter how expert he may be in his own particular line of coöperating with the engineer who directs, is seldom able to assume in turn all the various functions of a mining engineer with any great degree of success. [illegible] he reaches that point, he is a mining engineer himself and is qualified for membership in the professional societies and is accepted in full fellowship, lack of college diploma being no bar whatever. The college diploma merely indicates that a man has been examined and found qualified in the studies and a recent graduate may or may not be as good as the practical skilled miner. Sometimes he is a skilled miner before he goes to college and sometimes he takes up pick-and-shovel and hammer-and-drill work immediately after graduation.

Deposits differing widely in character occur in the same district. A San Juan miner, skilled in working at the American Nettie mine, where the ore lies almost horizontally between sandstone and shale, may not be competent to take charge of the "Salamander." A miner who has worked in the "Republican" or the "[illegible]" would probably be a good foreman for the "Salamander," but could he sample the ore, assay it, survey the workings, keep books, make contracts, etc.? Again, perhaps the man from the American Nettie would discover ore which had been totally overlooked by every miner who had ever been in the "Salamander."

There are instances of this sort that are not hypothetical. Many will recall the story of the Camp Bird [illegible]

Among other work a 40-ft. drift had been extended eastward in the Gertrude claim without finding ore; to qualify for patent, another 10 ft. was subsequently driven. The Allied Mines Co. relinquished its control of the property because its "skilled miners" did not recognize as ore what had not been previously so regarded. Twenty years later Thomas F. Walsh, who had been mining in other districts of Colorado, was interested in what he saw on the Gertrude dump; he had the east drift sampled and found that rich ore had been left in the breast. He secured the adjoining property and ultimately a magnificent reward for not being bound to the traditions of a single camp. The miners who drove the last 10 ft. of that drift were probably "skilled miners familiar with the mines around," and their familiarity with the first 40 ft. of the drift may have been such as to breed contempt for the last 10 ft. Walsh was a mining engineer without knowing it. His experience in other mining districts made him inquisitive; he added good judgment and executive ability to this inquisitiveness, and got results. These are the broad qualifications toward which the training of the mining engineer is directed. The mining of lower-grade deposits has gradually increased the complexity of the operation and has contributed toward the disappearance of the "skilled miner" from the management, valuable as he may be in the actual mining of the ore.

BY THE WAY

Diamonds exposed to the action of radium become highly radio-active, said Sir William Crookes, in the course of an address before the Royal Society, according to the *Engineer*. This acquired radio-activity continued for years with apparently undiminished force. Sir William produced a diamond which had been exposed to radium for some months about 12 years ago. After the exposure it was found to be highly radio-active, and affected a photographic plate. Though it had never been near radium since, it was now practically as active as ever, in spite of the fact that it had been carried about in his pocket and subjected to the drastic treatment of being boiled in strong acids.

⁂

It seems a far cry from the foot-and-mouth disease to metallurgy, but the following circular from Edward Hill's Sons & Co., of New York, indicates a connection:

> The U. S. Department of Agriculture has made a ruling as follows:
>
> Imported packages of merchandise and goods packed in hay and straw may be shipped out of this state intact as received from foreign countries, provided you furnish this office with your written guarantee to secure affidavits from each of your consignees that such packing is promptly burned as the goods are unpacked at destination.
>
> For any antimony, therefore, shipped to you, we will have to have your guarantee, sworn to before a notary, to comply with the regulation. This is something over which we have no control, and we cannot help doing it, as it is a regulation that is made on account of the foot-and-mouth disease among the cattle. We do not think it will last long. When we are shipping you antimony, we will inclose one of these affidavits and will be obliged if you will comply with the ruling. We have given guarantee that you will.

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A cablegram from Melbourne advises that the Australian military authorities have raided the offices of the Broken Hill Proprietary, Mount Lyell, Mount Morgan, North Brokenhill, and South Brokenhill mining companies, and also the offices of the Australian Metal Co., says *Iron & Coal Trades Review*, Nov. 13, 1914. Books and other documents have been seized, it being understood that the authorities are desirous of obtaining information concerning the disposal of metals, and also information regarding contracts entered into since the outbreak of war. Mr. Hughes, the attorney-general, announces that the raids were made by his authority under the Trading with the Enemy Act, and that circumstances required this unusual action.

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In the growth of population-centers it is not unusual to hear of what was once a homestead or farm being divided into city lots. The opportunity, however, of homesteading city or town lots does not often present itself. Such an occurrence has just been brought to light in the old mining camp of Springdale, near Pioneer, Nye County, Nevada. Years ago a townsite was established and named Springdale. It flourished, and one Albert Lidwell, it is stated, sold many town lots. Springdale, like all other mining camps, died in the course of time. Recently, numerous complaints have been filed, stating that Lidwell has made a homestead and desert entry on the same ground he once sold as town lots. The United States General Land Office has taken a hand in the matter and a hearing was given all opposing interests at Rhyolite, Nov. 20.

⁂

The revival of the kelp industry in consequence of the war should bring advantage to the peasantry on the West Coast from Donegal to Kerry and Cork. The Germans, owing to their great potash mines at Stassfurt, had a practical monopoly of the supply of potash to all countries, the only attempt to compete with them being made by the United States, which, however, was only able to engage in that enterprise on a small scale. The only source for the supply of potash to the British Isles, in addition to the imports of niter from India, is the potash made from Irish and Scottish kelp. The Irish kelp-burning industry, says the *Freeman's Journal*, has almost disappeared in recent years, owing to other sources being tapped for the supply of iodine. The failure of the potash supply should give it fresh stimulus.

⁂

The potash situation in the United States has entered into an interesting stage by reason of a circular letter which has been issued to American manufacturers by the New York agent of the German Potash Syndicate, says the *Chemical Trade Journal*. United States consumers were advised that the Syndicate had on hand a limited supply of potash salts, which, pending the cancellation of contracts with American buyers, it would be pleased to forward to such neutral shipping ports as are available for transshipment. The Syndicate would ship as much as possible of concentrated salts—chiefly muriate of potash—and only fill up shipments with crude salts whenever this was necessary. The philanthropic scheme would, in all probability, have touched the hearts of American buyers had not the announcement been made that all grades were to be advanced $4 per ton, cash to be paid before delivery, and delivery to be accepted of any grade of material that the Syndicate felt inclined to ship.

PERSONALS

F. W. Bradley, of San Francisco, Calif., is visiting in New York.

C. A. Burdick has gone to Michigan on a business trip of a few weeks.

J. H. Curle has joined the Sportsmen's battalion of the Royal Fusiliers in the British army.

Kirby Thomas has been making examinations of iron properties in the Chattanooga district of Tennessee.

Dr. F. S. Pearson, of London, was in Ottawa on Nov. 20 and had an interview with Premier Borden, of Canada.

F. L. Hall, representing an English manufacturing company, is in Canada to arrange for a supply of raw asbestos.

Arthur Feust does not purpose to return to Nicaragua, as it was previously reported in the "Journal" he intended doing.

P. K. Lucke, general superintendent of Cia. Minera de Peñoles, Mapimi, Mexico, is now resident at the Limes, East Molesey, England.

A. J. Loomis, for several years manager of Whiteside mine of Shenango Furnace Co., at Buhl, Minn., has resigned, to take up his residence in California.

James MacNaughton, general manager of the Calumet & Hecla mines and subsidiaries, has returned from a two weeks' business visit to the Eastern offices.

Frank S. Hartman, for 15 years past in charge of the office of the Thomas Iron Co., at Hokendauqua, Penn., recently completed his 50th year of continuous service with the company.

W. Y. Williams, of Spokane, Wash., formerly connected with the Granby company, is now largely interested in the Swede group at Bear Creek, in the Similkameen district of British Columbia.

Charles Enzian, of the Bureau of Mines, with headquarters at Wilkes-Barre, Penn., has left Santa Rita, N. M., where he has been observing the operations of the Chino Copper Co., and has gone to California.

N. Truschkoff, recently at the Eiderlinsk mines in the department of Orenburg, is now manager of the Ekibastous mines and smelting plant of the Khirgis Mining Co., Ltd., in the Semipalatinsk district, Siberia.

D. C. Jackling, managing director of the Chino Copper Co., was in Santa Rita and Hurley, N. M., the middle week of November. He incidentally made a brief hunting trip in the upper Gila country with Chino officials.

H. Sin Hio, an engineer in the employ of the Japanese Government, is making an inspection of the iron-mining operations on the Mesabi range, Minnesota, having special interest in the washing and drying appliances in use.

J. P. Hutchins is now in Petrograd. He expects soon to go to Southern Russia to examine a coal mine, after which he plans to return to London via the Mediterranean, if war conditions permit. He hopes to be in London by Jan. 1.

Z. T. K. Woo, T. C. Hsu, Z. U. Kwank, of Nanyang, China; M. Oshima and T. Fujita, of Tokyo, Japan, all connected with the Hanyeh Ping Iron & Coal Co., a Chinese corporation, have completed a trip of inspection of the Minnesota iron ranges as the guests of the Oliver Iron Mining Co. The purpose of their trip is to secure information relative to pit mining and the operations of the ore-carrying railroads, and iron and steel manufacturing methods in general.

Arthur Crowfoot, who for the past 19 years has been associated with the Boston & Montana reduction department of the Anaconda Copper Mining Co., at Great Falls, Mont., has been appointed concentrator superintendent for the Arizona Copper Co., Ltd., with headquarters at Morenci, Ariz., the appointment to take effect Jan. 1, 1915. Since the closing down of the Great Falls plant, Mr. Crowfoot has been employed at the Washoe reduction works at Anaconda, Mont.

A. G. Andrew, Jr., has taken the position of superintendent of the stamp mill of the Isle Royale Consolidated Copper Co. at Houghton, succeeding James G. Glanville, who was compelled to resign because of continued ill health. Mr. Andrew has been in charge of the Point Mills subsidiary mill of the Calumet & Hecla, where a reputation for efficiency and high recovery of copper made his work conspicuous. Mr Andrew is a graduate of the Michigan College of Mines. Wallace Hayden, of New York, succeeds him at the Point Mills plant. Mr. Hayden is a Colorado School of Mines graduate.

OBITUARY

Joseph Selden, a director of the Hancock Consolidated Mining Co. and various other properties in Michigan, vice-president and general manager of the First National Bank of Calumet, died suddenly of heart failure at his home, Nov. 21. He was prominent in the industrial and commercial life of the copper district of Michigan, being president of the Copper Country Commercial Club.

Charles Davies, a pioneer mining engineer of New Mexico and Arizona, died in Phœnix, Ariz., Nov. 1, aged 78 years. Mr Davies was a native of Wales, coming to America at the age of 21 and locating in New Mexico, where he operated mines at Pinos Altos, Georgetown, Mogollon and Silver City in the early '80s. He was for several years superintendent of the Breman mill. In Arizona he was interested in the Octave mine at Congress and had engaged in mining at Globe and Dos Cabezas.

August Christian, chief engineer of the Anaconda Copper Mining Co., died Nov. 19, after an illness of five months, aged 61 years. Mr. Christian was born in Germany, went to Butte in 1891 and had been identified with the Anaconda company for more than 20 years, his valuable services being greatly appreciated. He was a member of the Montana Society of Engineers and of the American Institute of Mining Engineers. He ranked high in his chosen profession, being considered among the best engineers in the state He is survived by his wife, a daughter and two sons.

SOCIETIES

American Institute of Mining Engineers—The New York Section held a meeting, preceded by a dinner at the Machinery Club, New York, Dec. 2. Following the dinner, at 8 o'clock, Robert Sticht, manager of the Mt. Lyell Mining & Ry. Co. in Tasmania, prophet and oracle of pyrite smelting, talked informally. Disciple David H Browne acted as toastmaster

Mining & Metallurgical Society of America—The San Francisco section gave a dinner on Nov. 16, at the Palace Hotel, in honor of the homecoming of F. W Bradley. Twenty-one guests and members were present.

The New York section held a meeting on Thursday, Nov 19, at Browne's Chop House, New York. 46 members and guests being present. Prof. J. F. Kemp made an address on "The Newer Theories of Ore Deposition," and Robert Sticht gave a talk on his work in Australia.

Utah Society of Engineers—An address on the "Adjudication of Water Rights" was made before the society by W[illegible] Beers, state engineer, on the evening of Nov. [illegible] Mr Beers called attention to the necessity of taking measures for the settlement of water-right disputes and suggested that a board be formed to study the question of water rights and their adjudication in Utah and other states He recommended also that the legislature refrain from attempting to solve the problem of water rights by radical legislation, and proposed that the state stream measurement fund be increased from $5000 to $10,000 yearly

University of Washington—The eighteenth annual short miners' session of the College of Mines at Seattle will begin on Jan 1, 1915, and end April 1. It will give to all mining men and others interested in the work of [illegible] an opportunity to take up in a systematic, [illegible] way, work in ore or quartz mining and milling, geology and mineralogy, chemistry, [illegible] claim surveying, coal mining, mining law, and other [illegible] subjects The course is [illegible] to meet the needs of men who wish to learn something about the [illegible] side of prospecting, mining, testing and assaying of ores, valuation of placer properties and [illegible]. In this work all of the laboratories and [illegible] of the various departments of the university are [illegible] to the student. Twelve instructors [illegible] different [illegible]. As [illegible] [illegible] and the [illegible] to [illegible], as well as the [illegible] graduate entering the course, [illegible] opportunity to take up the [illegible] work suited to [illegible] needs.

Editorial Correspondence

DENVER—Nov. 23

A Gold Brick, believed to be the largest ever derived from placer operations in Summit County, was recently poured by the Tonopah Placers Co. It weighed 160 lb. avoirdupois, was worth $37,660, and was recovered by boat No. 2 in 16 days.

A Fire was started at the Arkansas Valley smelting plant in Leadville, during the night of Nov. 17, by a piece of hot ore which fell from a Dwight-Lloyd sinterer upon a patch of oil spilled on the floor. The roaster building was totally destroyed and the two roasting units practically ruined. The destruction was really the result of carelessly casting a bucket of water on the burning oil, thus scattering the flames in all directions. Excellent work by the employees acting as volunteer firemen prevented the spread of fire to adjacent buildings. Manager William B. McDonald states that the damage is being rapidly repaired and he hopes to keep the rest of the plant running uninterruptedly, with a resumption of roasting operations in the course of two or three weeks.

BUTTE—Nov. 26

Muckie McDonald and Joe Bradley, former president and vice-president, respectively, of the Butte Mine Workers' Union, were convicted, Nov. 22, of the charge of kidnapping and deporting three miners and were sentenced by Judge Clark, of Boulder, McDonald to three years and Bradley to five years in the penitentiary. During the trial they attempted to shift the whole blame upon James Chapman, whose whereabouts are unknown. The latter, it will be remembered, was arrested by the military authorities, but was released at the request of his wife and left with her soon afterwards for California. Efforts are being made to arrest him and bring him back to Butte for trial. "Red" Foley, who was tried in Bozeman on the charge of grand larceny for assisting in the dynamiting and looting of the safe of the Butte Miners' Union No. 1 during the rioting of June 13, was convicted Nov. 23 and sentenced to 20 months in the pentitentiary. The whereabouts of his partner in the crime, "Kid" Davis, who is supposed to have got away with $5000 from the safe, are unknown. At a meeting of the union Nov. 23 it was decided to raise a fund of $10,000 to appeal the cases of McDonald, Bradley and Foley and for the defense of the men still in jail awaiting trial on other charges.

SEATTLE—Nov. 25

The Hot Springs district of Alaska, situated on the strip of land between the Yukon and the lower Tanana, has had the best season of its history, with a production of nearly $750,000, a big gain over 1913. Most of the increase resulted from the extensive drilling done by Bock on the deep ground of lower Sullivan Creek during the last two years. After discovering pay, Bock let lays on most of the ground; his profit for the season is placed at $225,000.

JOPLIN—Nov. 24

The Tuberculosis investigation by representatives of the Bureau of Mines and of the U. S. Public Health Service is really an investigation of safety and sanitation in the Joplin mines. The mine operators are taking a far more active interest in the proceedings than had been expected when it was at first undertaken. For two weeks Edwin Higgins, of the Bureau of Mines, and Dr. J. A. Lanza, of the Health Service, have been visiting the mines, taking samples of air and examining the men engaged in the industry now as well as those who have become diseased and are now known to be victims of miners' phthisis. Many of the operators are lending great assistance to the investigators, and the state mine inspection department is actively helping the work. To date approximately 20 mines have been inspected and samples of air taken for analysis. The work will be continued for at least two weeks more

Doctor Lanza is conducting that part of the work relating to the sanitary conditions of the mines and of the men at work and in their homes. This includes examinations of the changehouses, locally known as "doghouses." Free clinics at the local hospitals are being conducted and the experiences of the district physicians obtained in their treatment of miners afflicted with disease. Into this end of the investigation the visiting nurses under the employ of the Antituberculosis Society have been able to go a good ways, because of the previous surveys undertaken to ascertain the extent of tuberculosis and to help the victims. These nurses now have charge of 150 such patients scattered over the district living under all sorts of conditions, and are for that reason especially able to assist the government health officer. The lack of knowledge on the part of the miners of the simple facts of personal hygiene is appalling.

A Meeting of Operators with the government investigators and the state mine inspectors was held Nov. 21. The investigators discussed some of their findings and asked the operators to give them all the assistance they could in the way of counsel from their experience. It was determined to organize the mine operators into a committee of safety and sanitation. A committee will be elected to undertake this organization and the formulation of rules which may be introduced over the entire field, looking to the reduction of rock dust in the mines, the amelioration of conditions now pronouncedly unsanitary, and other rules for the better safeguarding against ordinary accidents. This committee was to report Nov. 25, and a meeting of all operators was called for Nov. 28 to complete the organization and start active work.

The Results of the work now being done by Mr. Higgins and by Doctor Lanza will be published, along with their recommendations, in a future bulletin of the Bureau of Mines. Their work will include investigations in the southeast Missouri mines and in the mines of southwest Missouri, southeast Kansas and northeast Oklahoma.

DULUTH—Nov. 28

Assessments for 1914 on iron-ore tonnages and mineral lands in the Minnesota iron-producing districts, as finally decided upon by the state tax commission, have been made public. Dr. Rukard Hurd, secretary to the commission, and an authority on the matter of mineral taxation, has issued a statement on behalf of the commission. As regards the Cuyuna range, that portion of the statement relating to the manganiferous deposits is of much interest, since the commission, it is understood, has gone to considerable lengths to ascertain the metallurgical value of this material. An abstract of his report follows:

For the Mesabi and Vermilion ranges, the customary annual adjustments were made, including deductions for shipments and stockpiles (the latter taxed as personalty), additions of newly developed tonnages and revision of previous estimates as now verified, measured and calculated by the Minnesota School of Mines. Upon conclusion of the work of adjustment, a general raise of 5% was ordered upon all mined and unmined iron ore and upon unplatted mineral land in St. Louis County, and of 10% upon all unplatted lands in Itasca County.

The total tonnage of merchantable ore on the Mesabi and Vermilion amounts to 1,407,218,914 tons, which includes 9,308,432 tons in stockpile May 1, 1914. The total assessed valuation of the total tonnage and the mineral lands is $270,603,874. The commission is of the opinion that the iron ores of the Mesabi and Vermilion are now upon a basis of 50% of true and full value, in strict compliance with Minnesota laws.

The iron-ore tonnages of the Cuyuna range having been during the year measured and calculated by the mining engineer of the tax commission, and their grade and class determined, the commission made for the first time an ad valorem assessment thereon of 50% of present indicated full value. The assessment is placed upon 13 active mines, or those about to become mines, containing 30,356,975 tons; on 19 properties of reserve ore of the first class, containing 27,066,558 tons; on 15 properties of reserve ore of the second class (lower grade), containing 13,434,382 tons; on 35 properties, containing 13,907,949 tons of low-grade, nonmerchantable or nonmineable ore; and also on manganiferous "ore material" arbitrary values are placed amounting to a total of $65,250; these values are considered to be upon mineral lands. The total assessed valuation on the total merchantable iron ore of 71,085,440 tons, including 227,575 tons in stockpile, and on mineral lands of the Cuyuna range, amounts to $6,033,085. Long exhaustion periods are taken to discount the future value of reserve ore. No commercial manganese ore has been developed on the Cuyuna range. There is a considerable quantity of manganese, but so mixed with iron formation as to make it a manganiferous iron "ore material" of no present metallurgical value.

The following figures are published by the commission:

MESABI AND VERMILION RANGES, IN ST. LOUIS, ITASCA AND LAKE COUNTIES

	Total Value of Tonnage and Mineral Lands	Shipments Tons
1906	$64,486,409	25,611,384
1907	191,706,682	29,180,975
1908	180,210,693	18,098,894
1909	204,526,526	29,284,495
1910	224,669,845	30,413,963
1911	235,771,506	23,368,719
1912	259,418,277	33,892,390
1913	260,622,823	35,605,243
1914	270,603,874	24,000,000
		249,456,064

CUYUNA RANGE, CROW WING COUNTY

1914	$6,005,776	1,000,000
Prior		1,186,401
Total		252,642,465

STOCKPILES, MAY 1, 1914

County	Tons	Summary and Total of Assessed Value
St. Louis	8,698,233	
Itasca	518,657	
Lake	71,541	
Crow Wing	227,575	
Total stockpile and value	9,516,007	*$2,379,000

TONNAGES AND VALUES AT PRESENT

	Tons	Value
Mesabi and Vermilion range ores	1,397,910,482	$264,553,874
Mesabi mineral lands		*6,050,000
Cuyuna mineral lands		65,250
Cuyuna range ores	70,857,865	5,940,426
Total	1,478,284,354	$278,988,650
Total full value on 50% basis		$557,977,300

*Estimated.

The full value shown above is more than 60% of the entire taxable value of the State of Minnesota in 1906, before the creation, in 1907, of the tax commission; it is of far greater value than all of the real and personal property in Minnesota of all the railroads operating therein, which pay a tax of 5% on gross earnings in lieu of all other taxes on real and personal property used for railroad purposes.

The State of Minnesota, for state purposes alone, and exclusive of county and local taxes, has received in taxes from the iron ore and mineral lands above noted the following sums:

1906	$179,272	1912	$933,193
1907	671,489	1913	1,317,220
1908	604,264	1914	1,325,196
1909	576,174		
1910	609,984	Total	$7,136,435
1911	919,643		

This includes taxes on stockpiles of approximately 5,000,000 tons per annum and assessed at approximately $1,250,000 per annum, 1907-1913 inclusive, and as stated for 1914, with a 4.75 mills state tax for 1914. In addition, from the total shipments, the state has received over $7,500,000 as gross-earnings tax from the ore-carrying railroads.

Since 1907 the tax commission has handled, measured, grouped, classified and assessed over 1,700,000,000 tons of merchantable iron ore. It has the records of many millions of tons of nonmerchantable ore, and the records of hundreds of drill reports showing no ore. No property in the state, except banks subject to frequent examination, with publicity of their financial condition, is under better control and subject to more complete knowledge than the iron ore and lands.

The Chemung Iron Co. is concerned in a deal involving upwards of $18,000,000, recently consummated in Duluth, whereby C. A. Congdon, G. G. Hartley and others, of Duluth, have disposed of their holdings in the Chemung to the Steel Corporation. The Chemung held numerous royalty interests, leases and some fees on the Mesabi range, all of which were under lease to the Corporation. It is stated that the transaction was made on the basis of the present worth of the various interests rated on the tonnage developed, and is in line with the Steel Corporation's policy of purchasing royalty interests outright to avoid the necessity for actual mining on properties whose lease period may be far advanced. Besides the benefits accruing to the purchaser through not having to mine this ore when and as provided in such leases, there is the added benefit to the iron-ore trade of avoiding the possible danger of over-production. Other transfers of a similar character have been carried through by the Corporation in late years, notably those involving the Higgins Estate lands.

HOUGHTON—Nov. 28

A Conviction was obtained at Marquette in the case of John Huhta, who was found guilty of the murder of Thomas Dally and the Jane brothers. He was sentenced to prison for life, and is now serving. The murder of these three Englishmen took place about a year ago during the strike. They were shot in their beds at night. The crime was so shocking that the Citizen's Alliance came into being the next day in a public protest against the Western Federation of Miners. Two months later Huhta, secretary for the Federation organization at South Range, confessed the murder, implicating Nick Verbanac, a prominent Croatian politician and organizer, and two others. The confession later was repudiated, then reaffirmed. Under Michigan laws Huhta had to be tried. A change of venue was asked and the trial was moved to Marquette. It took place before Judge Cooper, from an adjoining district, with a jury influenced by local sentiment. Five high-priced lawyers paid by the American Federation of Labor, including Congressman W. J. MacDonald and a lawyer selected and paid by the county of Houghton to defend Huhta, brought into use every possible technicality to keep him out of jail. The jury was out just 38 min. Congressman MacDonald, in his closing plea for the murderer insisted that a verdict of guilty would mean the condemnation of the whole Western Federation of Miners as murderers. The jury rendered just that verdict. The verdict is furthermore a justification of the work of the Citizen's Alliance and relieves the Waddell corporation of blame, for it was upon the Waddell men that the Federation tried to fix the responsibility.

MARQUETTE—Nov. 28

The Tax Conference announced in the "Journal" of Nov. 28 will be attended by delegates from most of the cities in the iron and copper districts of Michigan. The majority of the delegates will not be representatives of mining companies. Persons in all lines of business in Upper Michigan realize the injustice of the tonnage tax and they are going to be prepared to make a determined stand at Lansing. The bill which has been drawn by attorneys for the State Grange would place a tax of ¼c. per lb. on copper and about 10c per ton on iron, in addition to all other taxes. The mines of Michigan have a difficult time at present competing with the iron mines of Minnesota and the low-cost copper producers of the West without being burdened with additional expense. It was only a few weeks ago that a Jones & Laughlin representative stated that three Michigan iron mines would be closed down because iron ore could be purchased cheaper in Minnesota than the company could produce it on the old ranges. It is not known how Governor Ferris stands on the tonnage tax as he has never expressed his views on the subject.

TORONTO—Nov. 28

The Standard Stock & Mining Exchange, which, after the outbreak of the war, held only one session daily, resumed double sessions Nov. 16. The minimum price restriction was removed, the only remaining limitation being that all sales must be cash transactions. The abolition of the price restriction had no serious effect on the general market, the most notable result being the drop in Crown Reserve, due to the reduction of the dividend rate.

The Nickel Exportation question continues to be agitated. It is urged that the export of nickel outside the Empire should be prohibited unless the United States will guarantee that it is kept out of Germany and Austria. The agitation is being seriously taken up by many leading newspapers, which point out that the recent order-in-council forbidding the export of nickel to European ports entirely, fails to meet the case as regards the shipment of matte from Sudbury for treatment in New Jersey, irrespective of the final disposal of the refined metal. Force is [illegible] by the statement, which appears to find general acceptance, that the Krupps are interested in the New Jersey refinery. The question bids fair to become a serious political issue. The government has been investigating the destination of the nickel matte shipped to the International Nickel Co. with a view to preventing exportation of the refined metal to Germany, and is in communication with the British Government on the subject. At the invitation of the International Nickel Co. an expert accountant was sent by the Canadian government to New York, who reported to the British government [illegible] safeguards [illegible] by the company to prevent [illegible] exported nickel from reaching Germany. It is [illegible] that [illegible] is regarded as satisfactory [illegible]

The Mining News

ALABAMA

TENN. COAL & IRON (Ensley)—Work started on plant to manufacture fertilizer out of slag from steel works. Building measures 80x200 ft., and will be completed during early part of 1915.

ALASKA

GOLDEN EAGLE (Port Wells)—Property just opened up and after four days' run plates yielded $6000. If showing continues is intention of owners to add at once another 10 stamps.

BOSTON GROUP (Juneau)—New shaft- and compressor-house being constructed by George Noble company about done. Hoist and compressor installed, will be ready for use in about 10 days. Shaft down 150 ft.

CORDOVA MINING & DEVELOPMENT CO. (Cordova)—Bonds secured on No. 9 and Home Rule claims adjoining Golden Eagle mine in Port Wells district. Contracts let for 200 ft. of tunnel work. Small stamp mill to be installed.

CLARENCE J. BERRY DREDGING CO. (Circle City)—Articles of incorporation filed with Chas. E. Davidson, Secretary of Territory. Capital stock placed at $1,200,000. Company headquarters in San Francisco, owns large acreage in Circle district.

NO. 1 BELOW, FAIRBANKS CREEK (Fairbanks)—Charles Grill manager states that while ground was lower grade this year than last, cost of operating has also been reduced by improved methods. Last year costs ran $1 per ft. in open-cut; this year's are only $0.50. Use of boists and large scrapers made great difference, allowed stripping, so no longer necessary to put everything through sluice boxes. This winter considerable work will be done in preparation for next summer and some winter dumps will be taken out.

MASCOT ASSOCIATION (Fairbanks)—Recent strike on this property on Kenyon Creek, in Healy River country, of Upper Tanana, made by E. Hammer, owner, turning out better than first reported. Shaft 120 ft. to bedrock, two tunnels 30 ft. each run toward right and left limits, latter showing increased values as tunnel progressed. Gravel now runs $1.25 per sq.ft. That toward right limit pans poorly; decided to concentrate mining on creek on left limit. All ground on creek located and several lays let. Lawrence & Albrecht have large plant on ground for mining on large scale; many smaller outfits already at work. This is first pay struck in this section of country.

KEYES & RETTIG (Fairbanks)—These Chatanika operators made fair profit on ground running only 60c. per sq.ft. During summer also opened large block of ground on No. 7 Below, Cleary Creek, and now have it in shape to start work as soon as water runs next season. New record for district made when Ralph Keyes, son of one of operators, hoisted 551 buckets from depth of 60 ft. in 10 hr.; 60 buckets hoisted in last 30 min. Record remarkable; must consider that bucket, while in shaft, is hoisted with single block, and that, after engaging carrier at shaft collar, it travels up trolley cable 50 ft. or more by straight line before dumping over sluice-boxes. Furthermore, since bucket must engage and leave carrier gently, practically comes to stop at top of shaft both hoisting and lowering. Time also lost handling men and equipment during working hours, so record stands at bucket a minute for day. This record later broken by Charles Watson, another Chatanika operator, credited with 583 buckets in one shift, as reported recently in "Journal."

CALIFORNIA

Amador County

MOUNTAIN KING (Pine Grove)—Sale contemplated. Development progressed to point requiring power hoist, which with other machinery will be installed if sale is made. W. B. Pitts owner.

Butte County

RAMSAY BAR, on Big Nimshaw Creek, near Stirling, operated in early days by hydraulicking and ground-sluicing. Large boulders moved by early miners supposed to cover unworked placers. George L. Febre and others, of Stirling, have installed donkey engine and will clean out tailings in search for placer gold.

INDIAN SPRINGS CHANNEL GOLD CO. (Chico)—Reported property will be reopened and 100-ton mill installed. Mine an old one, former producer, near De Sabla. D. C. & G. C. Kirby, Los Angeles, owners.

SOUTH BANNER (Oroville)—Richard Phillips has reopened mine, is also developing Old Glory mine. Preparations made for extensive work on these and other properties under Table Mountain, but war necessitated confining development to smaller scale than initially contemplated.

Eldorado County

RED WING (Eldorado)—William H. Deaner has recorded location of five acres of ground adjoining mine, to be used as millsite. Mr. Deaner recently took over property on purchase bond, and has started development.

CONFIDENCE (Josephine)—This property in Volcanoville district sold for delinquent taxes to John A. Shields, of Placer County, will be reopened. Formerly equipped with five-stamp mill which was destroyed by fire. Reported to have been producer, though not fully developed.

Inyo County

SANTA ROSA—Reported at Bishop that mine will be reopened and pipe line installed for carrying water for milling.

PITTSBURG-LIBERTY (Masonic)—Reported receiver Sanford has negotiated sale of property for $35,000 and matter has gone to referee in bankruptcy proceeding for confirmation.

WILSHIRE BISHOP CREEK (Bishop)—Building for cyanide plant completed; machinery being installed. New mine hoist ordered in Denver, to be installed immediately. Expected mine will resume by first of 1915. Expected 10-stamp mill will be increased by another five-stamp battery after operation becomes regular.

Kern County

AMALIE DISTRICT excitement has subsided; owners of claims and prospectors now working instead of boosting. No doubt some good ore was found; there is possibility of making a mine or two, but a good deal of talk was newspaper talk. District 15 miles east of Caliente; formation is limestone and schist.

Nevada County

BLACK BEAR (Rough and Ready)—This mine and Forlorn Hope to be reopened. Shaft being unwatered preparatory to extensive development.

BLUE TENT (Nevada City)—Old gravel mine being reopened by D. A. Campbell and others. Tunnel cleaned and drifting in gravel toward pay channel progressing. Mine formerly large producer.

MEADOW LAKE DISTRICT quartz mines near Cisco to be reopened; new claims located. Schist formation, cut by granodiorite and capped by andesite. Ores refractory, and in former working, gold was not saved by crushing and amalgamating. Reported tube mills and cyanide plants will be installed when season opens next spring. George Cooper, of Ophir, Placer County, states all available ground is located. H. J. Gray purchased holdings of Lee Butts, of Penryn.

Sierra County

HYDRAULIC MINING in Slate Creek region to be resumed upon completion of large restraining dam being constructed on creek near American House. Cement for dam construction being hauled from Honcut, on S. P. R.R., in southern part of Butte County, by motor trucks, via Clipper Mills and La Porte. Dam will provide capacity for storing tailing for length of 17 miles and permit resumption of hydraulic mining at La Porte, Howland Flat, Port Wine and St. Louis, which includes one of richest hydraulic regions in northern part of state, one extensively operated in early days.

Siskiyou County

ETNA DISTRICT hydraulic mines rigged up and ready for rains. John Peterson, Woodfried & Barry and Henry Peters, operating in Eddy's Gulch, are prepared for good run should season provide ample water.

SAWYERS BAR DISTRICT hydraulic miners prepared for opening of season, and expect large output of placer gold. Wilke & Matthews have recently purchased large placer holdings on the Salmon and are rigged up ready for rains. Bigelow Bros. have about completed rigging up on high bench claim near Sawyers Bar.

PINERY (Quartz Valley)—Rigging up completed on this hydraulic mine, one of richest in district. Weed & Co. owners.

OOM PAUL (Oro Fino)—Old Johnson mill being fitted up for run of high-grade ore. A. C. Renfrew developing property under purchase bond.

Trinity County

LORENZ HYDRAULIC (Weaverville)—Method of elevating gravel with giants proved successful last season and will be operated on large scale as soon as rains insure sufficient water. Six giants used; two for piping in, one for elevating tailing, others for moving gravel forward into position for piping in. Portable flume is used. Lorenz Bros. owners.

UNION HILL HYDRAULIC (Weaverville)—Mine equipment in good shape for long season, provided rains insure sufficient water. Gravel piped in with four giants. Flume 1300 ft. long laid in tunnel through hill to Trinity River. Nearly 1,000,000 cu.yd. of gravel handled last year. Trinity Consolidated Hydraulic Mining Co., owner; D. W. Shanks, manager.

ASBESTOS MINES in northeastern part of county now employing 46 men, including miners and constructors. Reduction mill completed and sawmill cutting lumber for completion of camp buildings. Wagon road to Castella, 20 miles, under construction at estimated cost of $45,000. Extraction of asbestos in progress, but shipments to S. P. R.R. at Castella will not begin until spring, when it is expected to have wagon road completed. H. T. Mecum general manager.

Tuolumne County

PEORIA FLAT (Tuolumne)—Steam shovel digging tailing race. Quenner gravel mill, capacity 1000 tons per day, on ground ready for setting up.

ATLAS (Tuttletown)—Property taken under purchase option by California and Oregon men represented by Edward J. Carter, of Los Angeles, and William W. Elmer, of Portland. Extensive development in progress. Mine recently put in producing class, but not fully developed.

COLORADO

DAMAGES of $24,000 awarded Samuel Watson, of New York in Federal Court in Denver. Watson sued Jacob B. Ross, of Silverton, Colo., charging misrepresentation concerning Esmeralda mining property. Testified he took option in 1909 for purchase price of $100,000, after assurance by defendant that property was worth $250,000. Under subsequent investigation, value dwindled to $50,000; 20,000 tons $23 ore reduced to 4500 tons $19 ore.

Boulder County

BLACK CLOUD (Salina)—Concentrating mill has met with such success that owners, Messrs. Cotton and Seaman, propose erection of similar custom plant at Ward.

Clear Creek County

LINCOLN (Idaho Springs)—Lincoln Gold Mining Co. recently incorporated for $20,000, with R. R. Moodie, H. A. Wimbush and H. G. Wimbush as directors. Principal office, Denver; mining operations to be carried on in Clear Creek County. Company will develop and operate Lincoln vein, which lies between Bellman and Dove's Nest properties, to be worked through Big Five tunnel.

Lake County

WARREN F. PAGE, prominent operator in Leadville district, has undertaken new project, viz., driving exploratory and drainage crosscut adit into Canterbury Hill and toward Prospect Mountain. Portal near Great Eastern claim. Three shifts at work and Page has made arrangements to push adit at least 2000 ft.

BIG FOUR (Leadville)—Tramway from shaft to railroad at foot of hill complete. One carload of first-class ore shipped daily. New electric pump installed for sinking, which will now proceed under contract.

DAVIS (Leadville)—New shaft on Fryer Hill going down. Wash found unusually deep but has finally been passed. Sinking will continue into solid formation far enough to permit opening sufficient stoping ground.

San Miguel County

LITTLE DORRIT (Telluride)—Equipment for crosscut tunnel shipped to mine in Bridal Veil Basin and development work will be continued throughout winter.

MOUNTAIN FLOWER (Telluride)—Development work to be carried on during winter in Delta crosscut on Deep Creek. Machine drills installed.

Teller County

NEW MILL for Cripple Creek assured by awarding of contract to Colorado Iron Works by Cripple Creek Cyanide Milling & Mining Co. Will be 150-ton plant on south side of Beacon Hill. Said will cost $70,500 exclusive of grading. Plant to be turned over completed to operating company and run satisfactorily for 30 days. Gold Dollar Consolidated said to have signed contract agreeing to deliver 75 tons of ore daily for 21 years. Similar smaller contracts signed or arranged for.

IDAHO

PULASKI (Hailey)—Mill running smoothly, although requiring still some adjustment. Ore gold-bearing.

MICHIGAN

Copper

OLD COLONY AND MAYFLOWER companies continue exploration with four diamond drills.

SUPERIOR (Houghton)—Just eight days after fire, hoisting was resumed, a record-breaking recovery. Only limited tonnage as yet, since hoisting capacity is limited and compressor in use is only a "dinky." Rebuilding of boiler house and repairing of boilers and compressors will not take longer than month at most; by Jan. 1, at latest, Superior will be furnishing rock at usual rate.

REPUBLIC (Republic)—Cleveland Cliffs overhauling water-power plant. Guard lock being provided with better device for letting water in and concrete replacing wooden construction wherever possible. Improvements will allow water to get away from turbines faster and will increase efficiency. Cleveland-Cliffs has completed new dam at Lake Michigamme. Past summer was extremely dry and main storage basin on the Carp River does not hold water it did this time last year. Company now operating steam turbines at Maas mine and conserving water.

QUINCY (Hancock)—Operations conducted on economical basis as possible, alternative actual suspension. Mine enormous low-grade producer. Success depends practically upon large tonnage, for grade is not showing any inclination toward improvement with depth. In newer part of mine, Mesnard and Pontiac shafts, good deal of speculation as to just what copper content will be shown. Costs in 1913 higher than usual owing to partial suspension of operations. Management determined to keep mine in operation while possible to finance situation satisfactorily.

WINONA (Winona)—Captain Broan and trusty miners continue successful operations. Certain stockholders have asked pertinent question as to how it happens these men on tribute, can secure 22 lb. of refined copper per ton, while mine working full blast under own management, was able to secure little better than half of that amount. Assume Captain Broan is "picking the eyes out of her." This assumption is unfair all around. Lease covers section of No. 3 shaft from third to seventh levels inclusive. Section known to everybody at the Winona as rich in copper. Men are not having run of mine. Neither are they doing shoddy work. Underground conditions will be just as good when they get through as before they started. There will be no danger of falling walls, caused by insufficient timber.

CENTENNIAL (Calumet)—Despite rumors to contrary, management has no intention of suspending work. Confronted with actual loss in maintaining operations management went right to employees. Result of conference means that, commencing Dec. 1, Centennial will operate full time instead of three-quarters time as at present. Men accepted voluntary reduction in wages, with arrangement whereby all underground work now will be done on contract. Under new arrangement wages will amount to same as at Wolverine and Mohawk. Tonnage of rock will be increased at least 20% and possibly 30%. With this larger tonnage and practical assurance that there will be no diminution of copper content in rock, management can be fairly safe in figuring on breaking even with copper at 12c. a lb. or above.

OSCEOLA (Osceola)—Every time copper price declines seriously it requires greatest economy to operate old Osceola without loss. When war broke out management had well under way plans for rebuilding shaft and rock house and preparations for increasing tonnage greatly, figuring that large tonnage, even of extremely low grade, would make mine profitable. War spoiled plans and recently mine has actually been losing. In fact in one month alone, loss was $30,000. It was planned to close down this branch of Osceola company, but management was reluctant on account of the men; management recently called meeting of miners who gladly acquiesed in proposal to go on contract and to work full time instead of three-quarters as at present, accepting per diem reduction in wages with guarantee of better monthly total than they now receive. As in case of Centennial, men feared suspension. Old Osceola rock tonnage now will run over 35,000 a month with approximately 12 lb. of copper per ton; this can be handled without loss, as there will be no increase in overhead charges.

Iron

ATHENS (Negaunee)—Big shaft has reached depth of 340 ft. Going down at the rate of 40 ft. per week now. Place being prepared near shaft for storage of gravel.

BUCHOLTZ (Iron River)—On this small property adjoining village of Iron River on north, party of Green Bay and Marinette, Wis., capitalists has spent considerable money in equipment and unwatering under name of Eenterprise Mining Co. No ore yet mined or shipped. Work all consisted of drifting and crosscutting from bottom of shaft.

OGLEBAY-NORTON (Crystal Falls)—Company reported to have made large find of ore between Crystal Falls and Fortune Lake, where diamond drilling has been in progress several months. Known about month ago that formation had been cut. Large acreage being explored, churn drills used at start to test out formation and separate worthless land from that thought to contain ore. Diamond drills then set to work to prove up territory. Will be several months yet before work is completed.

MINNESOTA

Cuyuna Range

THOMPSON (Crosby)—Mine ceased shipments for season, having been range's largest and most regular shipper of year. First season as openpit, formerly underground mine. Ore will be removed next season by milling process.

LOCKER-DONAHUE PROPERTIES (Ironton)—After shipping complete stockpiles, Cuyuna-Mille Lacs and Cuyuna-Duluth shafts suddenly closed down completely. Mines shipped approximately 57,000 tons of high-manganese material. No reason for shut-down given out by management.

ROWE (Riverton)—Attorneys for Pittsburgh Steel Ore Co. have taken up with state and Federal officials question of feasibility of constructing dam across Rabbit Lake for power purposes in conjunction with concentrating plant which it proposes to construct on shores of lake opposite mine and town of Riverton. Lake is bayou of Mississippi River, hence necessity of securing Federal approval.

CUYUNA RANGE TONNAGE—Approximating small tonnage that may be shipped all-rail before Dec. 31, shipments from Cuyuna range total 882,430 tons for 1914, as against 733,021 for 1913. Individual shipments as follows: Armour No. 2, 288,029 tons; Barrows, 47,350, Cuyuna-Duluth, 50,000 (possibly additional small shipments), Cuyuna-Mille Lacs 51,500 (possibly additional small shipments), Iron Mountain 300 (estimated); Kennedy, 188,209; Rowe, 78,685; Thompson 178,357; total, 882.430 tons.

Mesabi Range

SCRANTON (Hibbing)—Contrary to published reports, property will not be stripped. Deposit is within village limits of Hibbing, estimated at about 25,000,000 tons, owned by state and operated by Pickands-Mather as underground mine, although parts would be amenable to openpit extraction.

Vermilion Range

NORTH AMERICAN (Tower Junction)—Mine now permitted to fill with water. Officials on the ground state grade of product unsatisfactory.

SIBLEY (Ely)—Newspapers report all men recovered from recent cave. Five were dead, one alive. Latter Joseph Skusik, imprisoned 112 hr. Accident occurred, Nov. 9, shaft caving for distance of about [illegible] ft. from collar. It had been in use for more than six years. Timber crew were at work replacing rotted section at about [illegible]-ft. point, when shaft came together immediately below them, permitting cave from surface. Shaft was in solid ground and cause of accident not determined. Full-sized working shaft put down by rescue crew; stated this is already shifting and pinching badly. Only warning of cave was that cage was binding in certain places in shaft [illegible] some little time prior to accident. Operations not likely to be resumed until about Jan. 1.

MISSOURI—KANSAS—OKLAHOMA

SCOTT & CO. on Templar land has about [illegible]000 tons of rich dirt to crush [illegible], holding for better price. Mine shut down for want of room to handle dirt. Expect to [illegible] steam hoist in near future.

MONTANA

Silver Bow County

TUOLUMNE (Butte)—Mine closed down Nov. 2[illegible]. [illegible] to continue operations [illegible]

NEVADA

Clark County

ORO AMIGO (Goodsprings)—Platinum now discovered in ores from this property, situated about ¾ mile north of Boss. Oro Amigo Platino Mining Co. incorporated by local owners to develop property; force of men now at work to be increased.

BOSS (Goodsprings)—Property under bond and lease to Peter Buol, of Las Vegas, and associates, at price said to be $150,000, first payment due Dec. 1. Further sampling indicates all ore contains platinum in considerable quantity; property attracting considerable attention. Same syndicate bonded adjoining property of Buys & Kunz, and intends to consolidate two properties under one management if deal is consummated. Report of sale to Seeley Mudd incorrect.

YELLOW PINE (Goodsprings)—Recent wreck of ore train between mine and Goodsprings resulted in damaging Shay locomotive to such extent that operations at mill have been suspended, pending completion of repairs. Some mill products which were on hand and some crude ore being shipped, but full operation will not be resumed until after Jan. 1. New two-compartment shaft has reached depth of 800 ft., and sinking continues. Foot-wall crosscut on seventh level has intersected vein, showing width of 12 ft., assaying over 40% zinc.

Elko County

EASTERN STAR (Gold Circle)—Milling plant will be built, to be in operation by next spring.

Esmeralda County

YELLOW TIGER (Goldfield)—Buildings and equipment, destroyed by fire Nov. 4, will be replaced at once.

ATLANTA MINES CO. (Goldfield)—Water on 1750-ft. level being drawn off through bulkhead to Merger shaft. With level unwatered work will be resumed.

GOLDFIELD CONSOLIDATED (Goldfield)—Drifting under way from Grizzly Bear workings across northern end of St. Ives claim toward Sunflower claim of Merger company. Shale contact to be explored, expected to open on its dip oreshoot developed in Jumbo Extension.

GOLDFIELD MERGER (Goldfield)—Trustees held meeting at Goldfield Nov. 14 to elect officers for coming year. Large pump recently installed giving good satisfaction. Atlanta ground being drained and results of development work there will determine future policy of company. Crosscut being driven on 1330-ft. level from shaft to Grizzly Bear workings of Goldfield Consolidated.

Humboldt County

IMPERIAL—Entire camp equipment and all supplies at this property on Winnemucca Mountain destroyed by fire. Fire believed of incendiary origin.

Mineral County

AURORA CONSOLIDATED (Aurora)—After 12-day shutdown for changes in milling process, mill again in operation at full capacity. Ore hauled from mine by electric locomotives, crushed and elevated to mill by belt conveyor. Forty 1600-lb. stamps crush 500 tons daily. Regrinding done in six 6x16-ft. tube mills. Dorr thickeners have been divided horizontally in middle, making two decks to each tank; this relieves weight of heavy slimes collected. Other equipment includes Dorr agitators, Knight-Trent filters and Merrill clarifying and zinc-dust precipitation systems. Mine 60 miles from railroad, at elevation over 7000 ft.; winter supplies all in, so no occasion for shutdown from snow blockade.

Nye County

MONTANA-TONOPAH (Tonopah) Mill shut down temporarily on account of low price of silver. Reports from company's Commonwealth mine in Arizona stated to be encouraging.

Ormsby County

PITTSBURG-LIBERTY MINING CO. (Carson City)—Meeting of creditors of this bankrupt company held. Referee in bankruptcy approved offer of Stall Bros. to take property on lease and bond for $40,000; $10,000 to be paid in 10 months, remainder in 18 months. Work to start at once and at least 150 shifts' work per month to be done. Mill to be repaired; lessees may mill any ore. Property said to have produced $600,000 above 100-ft. level. Many Nevada men interested. Property situated at Masonic, Mono County, Calif.

Washoe County

LARGE PLACER FIELD DISCOVERED on eastern slope of Sierras, west of Reno, on rim of Gennessee Valley. Believed gravel is in bed of ancient river. Coarsest nuggets found in prospecting. Area of 1800 acres staked by Reno men; winter camp to be established and hydraulic or drift mining started next spring.

SIERRA STANDARD MINING CO. (Reno)—Articles of incorporation filed. Reno principal place of business. Captialization, $250,000, shares $1 each.

NEW MEXICO

Dona Ana County

GOLD STRIKE in Caballo mountains near Rincon proved to be bunco game, operators claiming mine was salted. Reports created wild rush to field and district was thoroughly advertised. Prominent operator declares false all reports of rich strikes.

Grant County

BONNIE (Lordsburg)—Putting in mining machinery. Six drill compressor on ground and hoist shipped.

MUELLER & BOCK (White Signal)—Cleaning out shaft preparatory to shipping from winze on pay streak.

WARNOCK & WALTER (White Signal)—Hoisting outfit purchased for sinking on vein 250 ft.; now down 85 ft.

STAUBER & WRIGHT (Pinos Altos)—High-grade gold ore again found in Savanna workings. Ore banked in Silver City.

Socorro County

MOGOLLON MAIL CONTRACT from November, 1914, to June, 1819, let to Bennett Auto Co., of Silver City, N. M., at $10,000 per year. C. W. Marriott, for 16 years Mogollon mail and express hauler, will continue in express freighting. Mogollon telephone rate disputes will be settled, Jan. 1, when camp will have individual exchange.

UTAH

Juab County

UTAH MINERALS CONCENTRATING (Eureka)—A little ore sent through crushing machinery; other equipment being warmed up for complete trial run.

CHIEF CONSOLIDATED (Eureka)—Repairs to shaft completed and development work being carried on extensively. Planned to have as much ore as possible blocked out against time when shipping starts at normal rate, but output will be held down under present market conditions.

WASHINGTON

UNITED COPPER (Chewelah)—President Conrad Wolfe states company has decided to improve milling plant and increase size. New tube mill to be put in; investigation being made of Coeur d'Alene flotation process.

WESTERN UNION MINES CO. (Republic)—Company which was recently organized and acquired holdings of Republic Mioes Corporation, San Poil Consolidated Mining & Milling Co. and Last Chance Mining Co. has authorized advertisement for bids for constructing central power-plant at Republic, capable of generating not less than 1000 hp. Equipment to consist of two 500-hp. Diesel engines, with direct-connected generators, and full complement of electrical appliances. Company plans to make proposed power station nucleus of large plant, capable of generating sufficient current to provide light for mines and camp, power for mines and for 1000-ton reduction works contemplated. Number of improvements made in San Poil reduction works since acquisition, and during period of rehabilitation plant was operated, about $24,000 in gold and silver bullion being produced. Mill now operating satisfactorily, and with output of company's mines increased to point anticipated, bullion production will approximate $30,000 a month. North Washington mill being repaired and enlarged, expected it will be increased to 225 tons capacity by Feb. 1, 1915, when it is believed new power plant will be operating.

CANADA

Ontario

EIGHT CLAIMS situated on east side of Wolf Lake, in Sesekinika area, bought by Dr. J. M. Bell, of Huronian Belt Mining Co. Price given at $150,000. Negotiations were under way for purchase of number of locations in this neighborhood, but were broken off on account of war, and this is first large transaction since then.

YORK ONTARIO (Cobalt)—Assets of company, which operated King Edward mine on lease seized for wages.

NORTH DOME (South Porcupine)—Assets will be sold by tender after Dec. 18. Company went into voluntary liquidation.

Yukon

CLAIM JUMPING not to be permitted when owners have enlisted. Government announces requirements regarding rental and labor will be waived.

⁂

ASSESSMENTS

Company	Delinq.	Sale	Amt
Argenta, Ida	Nov 21	Dec 19	$0 0005
Atlantic, Ida.	Nov 28	Dec. 28	0 0005
Beaver Copper, Utah.	Dec 3	Dec 22	0 005
Bellion, Ida. (post.)	Nov 4	Dec. 7	0.005
Bullwhacker, Mont.	Dec. 14		
Clear Grit, Ida.	Jan 12, '15	Jan. 29, '15	0 0015
Con. Imperial, Nev	Dec 23	Jan. 15, '15	0 01
Consolidated Ores, Utah	Dec. 4	Dec. 20	0 25
Con Virginia, Nev.	Nov. 27	Dec. 18	0.10
Copper Chief, Ida. (post.).	Nov 1	Dec. 7	0.005
Crown Point, Nev.	Dec. 8	Dec. 29	0 05
Eagle Bird, Calif		. . .	20 00
East Hercules, Ida. (post.)	Dec 1	Jan. 2, '15	0 001
Echo, Ida.	Nov 20	Dec. 15	0 0015
Emerald, Utah (three installments)		June 9, '15	0 01
Exchequer, Nev.	Dec 21	Jan. 11, '15	0 03
Gold Bond, Utah.	Nov 24	Dec. 21	0 001
Hale and Morcorss, Nev	Dec 14	Jan. 1 '15	0 03
Hider Nevada, Nev	Nov. 21	Dec. 10	0 015
Hilarity, Ida. (post.)	Oct 12	Dec. 23	0 003
Hope, Calif	Dec 15	Jan. 11, '15	0 05
Hypotheek, Ida	Dec 17	Jan. 11, '15	0 006
Indian Pete, Utah.	Nov 30	Dec. 15	0 01
Lehi Tintic, Utah	Dec 17	Jan. 16, '15	0 0025
Little North Fork, Ida (post)		Dec. 12	0 001
Lynn Big Six, Utah	Nov 21	Dec 26	0.005
Majestic Idol, Nev	Dec 15	July 20,'15	0 005
Mammoth Gold, Nev.	Nov 23	Jan. 1, '15	0 02
Maxfield, Utah	Dec 9	Dec. 30	0 0016
Nevada Silver Reed, Nev	Nov 21	Dec 14	0.0015
O. K Silver, Utah	Dec 14	Dec 31	0 00167
Ophir, Nev	Nov 19	Dec 11	0 10
Overman, Nev	Dec 22	Jan 11, '15	0 05
Phoenix, Ida. (post)	Nov 26	Dec. 26	0 005
Rainbow, Ida	Nov 30	Dec 31	0 002
Reindeer-Queen, Ida. (post)	Sept 21	Dec. 26	0 002
Revelator, Utah	Nov 9	Dec. 8	0 005
Rexall, Utah	Dec 1	Dec 21	0 002
Seg Belcher, Nev	Dec 16	Jan. 11, '15	0 02
St. Francis, Calif	Dec. 8	Dec. 28	0 0025
Sonora, Ida.	Nov. 30	Dec. 30	0 002
Sunset Banner, Ida.	Nov 26	Dec. 17	0 0005
Sunshine, Ida.	Nov. 23	Dec. 22	0 001
Syndicate, Ida	Nov. 26	Dec. 28	0 001
Tarbox, Ida. (post)	Nov. 25	Dec. 28	0 0025
Tuscumbia, Ida. (post.)	Nov. 20	Dec. 21	0 002
Wilbert, Utah	Dec. 3	Dec. 16	0.01
Wisconsin, Ida.	Nov. 16	Dec. 21	0.003
Yankee Con, Utah	Dec. 17	Jan. 1,'15	0 01

The Market Report

METAL MARKETS

NEW YORK—Dec. 2

Copper has again been active and stronger. Spelter has been a little stronger by virtue of further progress in the export business. Lead has been weaker and mysterious. Tin has been about stationary.

Copper, Tin, Lead and Zinc

Copper—In the early days of our week of record there was rather a lull, although the buying continued to be substantial, including some round lots. On Monday some vigorous buying began again, which had the effect of causing a further advance in price. The aggregate of the business was perhaps not quite so large as in the previous week, but nevertheless was important. It would not be unreasonable to estimate a total of 20,000,000 pounds.

Throughout the week prices exhibited wide variations according to time of the delivery desired. Certain sellers have asked and received ⅛c. more for January than for December and ⅛c. further advance for February. For a little business beyond February fancy prices are reported, but such transactions are, of course, quite speculative and outside of the ordinary customs of the trade.

Buying during the last week was chiefly for domestic account, manufacturers in Connecticut, New York and in the Detroit district having all been in the market. At the same time there was a considerable demand from England and France.

Representatives of the copper producers visited Washington this week to confer again with the Department of State over the matter of copper seizures by the British.

Copper sheets were again advanced on Dec. 1 and the base price is now 18c. for hot rolled and 19c. for cold rolled. The usual extras are charged and higher prices for small quantities.

Brass Prices, base are announced by the American Brass Co. as follows, to date from Dec. 1: Sheets, high brass, 14½c. net per lb.; low brass, 16⅛c. Wire, high brass, 14½c.; low brass, 16⅛c. Rods, high brass, 14¼c.; low brass, 16⅞c. Tubes, brazed and open seam, 18¼c. Angles and channels, 18¼c. Scrap allowances are 9c. net per lb. for high brass; 10⅛c. for low brass.

Tin—The market has been firm. Spot is still scarce and commanding a premium. There are fair inquiries by consumers for futures.

Lead—In our last report we indicated the expectation in the trade that there would be no further advance in price right away. The reduction in price by the A. S. & R. Co. on Nov. 27, however, was more of a surprise than its previous advances had been. The reason given by the A. S. & R. Co. is that the metal had been found to move too slowly at the higher price and consequently a reduction was made in order to make things go more briskly. This explanation is accepted with some reserve among the independent producers. The consensus of opinion among them seems to be to characterize this recent action as mysterious and to await developments. None of them seems to have been desirous to sell and transactions outside of the leading interest have been but trifling in volume.

Spelter—Some further progress in the demand from abroad has stiffened this market a little more, but there have been no especially interesting features. Domestic demand has been small.

An increase in the freight rate on spelter from St. Louis to New York was supposed to go into effect on Dec. 1, but producers seem to be rather uncertain as to just what the new rate is to be. The common expectation is that it will be about 16½ cents.

Hegeler Brothers, a partnership, operating the zinc smelting works at Danville, Ill., has been incorporated as the Hegeler Zinc Co., which will continue the business under the same management and with the same policies as heretofore. Julius W. Hegeler is president of the new company.

Other Metals

Aluminum—The market has been quiet and business rather slow. Prices are a shade easier, 18½@19c. per lb. being quoted for No. 1 ingots, New York.

Antimony—The market has been dull, with small transactions. Ordinary brands are rather nominal at 13@14c. per lb. Cookson's is held at 17@18c. and is rather scarce.

Quicksilver—The market is rather quiet, but steady. Sales have been made at $52.50 per flask of 75 lb. London prices are unchanged.

Nickel—Ordinary forms—shot, blocks or plaquettes—are 40@45c. per lb., according to size and terms of order. Electrolytic metal is 5c. per lb. higher.

Bismuth—Current sales have been at $2.75 per lb., New York.

DAILY PRICES OF METALS

NEW YORK

Nov. Dec.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
26								
27	4.8888	49¼	12⅛ @12¼	33¾	3.90	3.77½ @3.82½	5.27½ @5.3[illegible]	5.12½ @5.15
28	4.8888	49⅛	12¼ @12⅜	33½	3.80	3.70 @3.72½	5.27½ @5.32½	5.12½ @5.17½
30	4.8875	49⅜	12¼ @12⅜	33	3.80	3.70 @3.72½	5.30 @5.35	5.15 @5.20
1	4.8900	49¾	12½ @12⅝	33	3.80	3.70 @3.72½	5.30 @5.35	5.1[illegible] @5.2[illegible]
2	4.8875	49⅝	12.60 @12.85	33¼	3.80	3.70 @3.72½	5.32½ @5.35	5.17½ @5.20

The quotations herein are our appraisal of the markets for copper, lead, spelter and tin based on wholesale contracts, and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally [illegible]. The quotations for electrolytic copper are for cakes, [illegible]. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. [illegible] charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Nov.-Dec.	Silver	Copper					Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'td		Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
		£ per Ton	Cts. per Lb.									
26	22	[illegible]	11.62	[illegible]	*		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	22[illegible]	[illegible]	11.7[illegible]	[illegible]	*		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
28	22[illegible]											
30	22	[illegible]	11.87	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	12.[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

*[illegible]

[illegible] London Metal Exchange. All prices are [illegible] 2240 lb. [illegible] per troy ounce [illegible] copper [illegible] [illegible] 2.17 [illegible] 2[illegible].

Selenium—Quotations are $2@3 per lb. for larger quantities; $4.50@5 per lb. for smaller lots.

Gold, Silver and Platinum

Gold imports into Great Britain, 10 months ended Oct. 31, were £49,362,977; exports, £29,712,990; excess of imports, £19,649,987, against £9,607,677 last year.

Platinum—Sales are reported at $43.50@44. Hard metal is held at $52.50 per oz. for 15% iridium.

Our Russian correspondent writes from Petrograd that conditions in the platinum market have improved a little. The Imperial Bank of Russia now makes advances on platinum at the rate of 18,000 rubles per pood of crude metal. Work at all of the platinum mines and placers in the Urals is now stopped. The production for 1914 will show a considerable decrease as compared with the previous year.

Silver—The market has shown more animation the past week and closes firm at $23\frac{1}{16}$d., in London. This price has not been reached since Oct. 17 last.

Exports of silver from London to the East, Jan. 1 to Nov. 19, as reported by Messrs. Pixley & Abell, in value:

	1913	1914	Changes
India	£9,001,500	£4,679,500	D. £4,322,000
China	752,000	42,000	D. 710,000
Total	£9,753,500	£4,721,500	D. £5,032,000

Imports of silver into Great Britain, 10 months ended Oct. 31, were £9,932,919; exports, £9,520,038; excess of imports, £412,881, which compares with the excess of exports of £1,309,582 last year.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Nov. 28

The base price paid this week for 60% zinc ore was $44@45 per ton. The base price paid for 80% lead ore was the same as last week, $45@46 per ton.

SHIPMENTS, WEEK ENDED NOV. 28

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	3,235,280	393,940	517,900
Year	152,186,990	4,838,890	30,664,650

Shipped during week to separating plants, 3,939,360 lb. zinc ore.

JOPLIN, MO.—Nov. 28

Blende high price is $48.50; assay base, 60% zinc, $43@46; metal base, 60% zinc, $42@44. Calamine, base 40% zinc, $22@24; average, all grades zinc, $42.55 per ton. Lead, high price, $48.60; base $47 per ton of 80% metal content; average, all grades of lead, $47 per ton.

Information received here is to the effect that the number of retorts now in operation is equal or greater than a year ago. With an evident shortage in ore production of 30,000 to 40,000 tons per month, over a like period a year ago, indications point to one of two things—zinc ore will soon command an exceptional premium or some retorts must soon be cooled. From any angle it looks good for the producer of zinc ore, and it is hoped the smelters will not get squeezed. With the midsummer surplus spelter all sold the smelter men should prosper, but spelter must advance or they cannot.

SHIPMENTS WEEK ENDED NOV. 28

	Blende	Calamine	Lead	Values
Total this week...	8,603,040	443,810	1,502,500	$227,730
Total 11 months...	471,249,590	35,460,580	81,466,100	$11,726,940

Blende value, the week, $186,770; 11 months, $9,411,590.

Calamine value, the week, $5670; 11 months, $416,370.

Lead value, the week, $35,300; 11 months, $1,898,990.

IRON TRADE REVIEW

NEW YORK—Dec. 2

The better feeling persists in the iron trade, though not much additional business is reported except in pig iron. There are more inquiries for finished steel, but few contracts closed.

The pig-iron buying movement is growing more general. Recent sales in Buffalo territory aggregating close to 250,000 tons have been followed by sales in the Pittsburgh district of fully 100,000 tons, while the East and the South are showing a somewhat better movement. Only slight concessions from previously quoted prices were necessary to start the movement.

The pig-iron buying has started a covering movement in Connellsville furnace coke, about 40,000 tons a month having been placed under contract, while there are active negotiations for fully 60,000 tons a month more.

Buyers are beginning to evince much more interest in finished-steel products, there being fairly large inquiry for first quarter contracts, particularly in sheets and merchant bars.

The steel mills of the country are operating at an average rate of not over 35% of capacity, but are probably down to the minimum rate, except as closures around the holidays may temporarily decrease production.

PITTSBURGH—Dec. 1

In bars, plates and shapes the mills are more actively soliciting business, and the very low price of 1.05c. is now relatively common for desirable orders, specifications with order for immediate rolling. For first-quarter contracts the quotation is 1.10c. and buyers are trying to secure contracts for first quarter at the prompt price.

The season price for tinplate is likely to be announced this week, forecasts being that it will be $3.25. There have lately been some sales, for first quarter only, at $3.10 and $3.15, but for the longer delivery the mills would require higher prices, on account of possible advances in the raw materials, steel and pig tin.

Pig Iron—Sales of pig iron in this district in the past 10 days aggregate fully 100,000 tons, the largest volume of pig-iron business in such a limited period for more than a year. More than half the tonnage was sold by a single interest, which made a special drive for business. The American Steel Foundries has taken 15,000 tons of basic (of which 7500 tons was reported last week) at $12.75, delivered Alliance and Sharon; two steel works in the immediate Pittsburgh district have taken 6000 and 5000 tons, respectively, of basic, the cast-iron pipe interest at Scottdale has taken 20,000 tons of foundry, and various other sales of basic, malleable, foundry and forge have been made. Bessemer has sold only in very small lots. Much of the iron sold was at full prices lately quoted, some being at slight concessions. The market is not quotably lower, and on the whole may be regarded as considerably firmer, as follows: Bessemer, $13.75; basic, $12.50; No. 2 foundry, $12.75@13; malleable, $12.75; forge, $12.50, at Valley furnaces, 95c. higher delivered Pittsburgh.

W. P. Snyder & Co. announce their computations of average prices in November, based on actual tonnage sales, at $13.6375 for bessemer and $12.477 for basic, representing declines from October of 30c. in bessemer and 37.3c. in basic.

Ferromanganese—The contract market is still $68, Baltimore, and it is believed that deliveries to actual consumers can be arranged, despite the English embargo, which seems to be subject to this condition. Prompt lots are available at between $68 and $75. There is very little demand, consumers being well stocked.

Steel—There is somewhat more interest in billets and sheet bars, and some fair-sized contracts may be closed within the next fortnight, particularly if regular contracting for tinplate for the new season opens up. We quote billets at $19 and sheet bars at $19.50, maker's mill, Pittsburgh or Youngstown.

IRON ORE

Lake shipments are practically at an end, the close having been hastened by a heavy storm on the upper lakes.

British Imports of Iron Ore 10 months ended Oct. 31, were 6,371,989 long tons in 1913, and 4,986,581 in 1914; decrease, 1,385,408 tons, or 21.7%. Imports of manganese ore were 484,253 tons in 1913, and 444,975 tons in 1914; decrease, 39,278 tons.
HOBART

COKE

Connellsville Coke—Contracting for 1915 furnace coke has suddenly opened up, and four contracts have been closed in the past few days, aggregating about 40,000 tons a month, one lot of about 5000 tons being for the first three months, another lot of 13,000 tons a month being for the first six months, while two other contracts are for longer periods. The contracting has been chiefly on the sliding-scale basis, referable to prevailing pig-iron prices, but with flat prices fixed for the first three months, the flat price being in the neighborhood of $1.70. For six months $1.75 is asked by the lower sellers. A lot of 12,000 tons for December has been sold at the prompt market, $1.60 at ovens.

Inquiries are out, and under active negotiation, from half a dozen consumers for a total of about 60,000 tons a month, and some of this is likely to be closed before the week is out.

The consumers interested in coke are almost wholly the merchant furnaces, the steel interests that usually buy some outside coke not having entered the market to any extent. The movement is probably due chiefly to the heavy sales of pig iron lately made.

CHEMICALS

NEW YORK—Dec. 2

The chemical markets are mainly without feature, as there is practically no business being done.

Arsenic—It is hard to grade prices, as there is so little business. Nominally they range from $3.87½ to $4 per cwt.

Copper Sulphate—Business continues fair, at unchanged prices; $4.35 per cwt. is asked for carload lots, $4.60 for small lots.

Nitrate of Soda—Business is extremely dull. Prices now stand at 1.85c. per lb., both spot and future.

PETROLEUM

Exports of mineral oils from the United States in October were 194,173,497 gal., being 23,930,678 gal. less than in October, 1913. For the 10 months ended Oct. 31, the total exports were 1,723,272,739 gal. in 1913, and 1,890,056,766 gal. in 1914; an increase of 166,784,027 gal., or 9.7%, this year.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28 983	26.553
February	59 043	61.642	57.506	27.190	28 357	26 573
March	58.375	57.870	58 067	26.875	26.669	26 788
April	59 207	59.490	58.519	28.284	27 416	26.958
May	60 880	60.361	58 175	28.038	27 825	26.704
June	61.290	58.990	56.471	28 215	27.199	25 948
July	60 654	58.721	54.678	27.919	27 074	25.219
August	61.606	59.293	54 344	28 375	27 335	25.979
September	63.078	60.640	53.290	29 088	27.986	24.260
October	63 471	60.793	50 654	29.299	28.083	23.199
November	62.792	58.995	49.082	29 012	27 263	22.703
December	63.365	57.760	. . .	29.320	26 720	......
Year	60.835	59.791	.....	28.042	27.576	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50.298	37.779	238.273	171.905
February	48.766	39 830	220.140	181.556
March	46.832	38.038	213 615	173.619
April	49.115	36.154	224 159	163.963
May	49.038	33.360	221 143	150 702
June	44.820	30 577	207 208	138.321
July	40.260	31.707	183 511	142.517
August	41.582	*	188 731	‡
September	42.410	32.675	193 074	‡
October	40.462	30.284	184 837	‡
November	39.810	33.304	180.869	139 391
December	37.635	.....	171.786	..
Av. year	44.252	......	206 279	...

New York in cents per pound; London in pounds sterling per long ton. ‡Not reported.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6 854	5 112	26 114	21 533
February	6.239	5 377	6.089	5 228	25 338	21 [illegible]3
March	6.078	5 250	5 926	5 100	24.605	21 460
April	5.641	5 113	5 491	4.963	25.313	21 569
May	5.406	5 074	5 256	4 924	24 583	21 393
June	5.124	5.000	4 974	4 850	22.143	21 345
July	5.278	4 920	5 128	4 770	20 592	21 568
August	5.058	5 568	5 508	5 418	20 706	‡
September	5.694	5.380	5.544	5 230	21.148	‡
October	5 340	4 909	5.188	4 750	20 614	‡
November	5.229	5.112	5 083	4 962	20 581	25 016
December	5 156		5 004		21 214	
Year	5 648	...	5.504		22 740	

New York and St. Louis, cents per pound London, pounds sterling per long ton

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	71 741	64.304	77.750	69 488
February	14.971	14 491	65.519	65.259	71.575	70.188
March	14.713	14.131	65 329	64 276	70 658	69.170
April	15.291	14.211	68 111	64.747	74 273	69.313
May	15.436	13.996	68 807	63 182	74.774	67.786
June	14.672	13.603	67 140	61.336	70 821	66 274
July	14 190	13.223	64.166	60.540	69 446	64 955
August	15.400	*	69.200	‡	74.313	‡
September	16.328	*	73.125	‡	78.614	‡
October	16.337	*	73.383	‡	79.250	‡
November	15.182	11.739	68.275	53.227	73 825	‡
December	14.224	......	65.223	.	69 583	.....
Year	15 269	.....	68 335	...	73 740	.....

New York, cents per pound, London, pounds sterling per long ton. ‡Not reported.

* No quotations made. ‡ London Exchange closed.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4 321	4.111	4.171	4 011	17 114	19 665
February	4.325	4 048	4.175	3.937	16.550	19 606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3 688	17 597	18.225
May	4.342	3 900	4.226	3 808	18 923	18.503
June	4.325	3.900	4.190	3 810	20 226	19.411
July	4 353	3 891	4.223	3 738	20 038	19 051
August	4.624	3 875	4.550	3 715	20 406	‡
September	4 698	3.828	4.579	3 658	20 648	‡
October	4 402	3.528	4.253	3 384	20 302	‡
November	4.293	3.683	4 140	3.585	19.334	18.500
December	4.047	.	3.929	. .	17.798	..
Year	4 370		4 238	...	18 743	.

New York and St. Louis cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14 94	$17.35	$13 23	$18 59	$13 99
February	18.15	15.06	17 22	14 12	18 13	14 08
March	18 15	15 07	16 96	13 94	17 53	14 10
April	17 90	14 90	16 71	13 90	16 40	14 13
May	17 68	14 90	15 80	13 90	15 40	14 27
June	17 14	14 90	15 40	13 90	15.10	13 96
July	16 31	14 90	15 13	13 90	14 74	13 90
August	16 63	14 90	15 00	13 90	14 88	14 90
September	16 65	14 90	15 04	13 90	14 93	14 03
October	16 60	14 84	14 61	13 75	14 8[illegible]	13 97
November	16 03	14 59	13.91	13 43	14 40	13 84
December	15 71		13 71		14 28	.
Year	$17 09		$15 57		$15 77	

STOCK QUOTATIONS

With the exception of Chollar, Iron Cap and Stratton's Independence, all the quotations given below have been established since Nov. 10. The New York Stock Exchange opened on Nov. 28 for trading in bonds, and it seems likely that complete resumption of trading is near at hand:

COLO. SPRINGS Nov. 30

Name of Comp.	Bid
Acacia	.02½
Cripple Cr'k Con.	.007
C. K. & N.	.03
Doctor Jack Pot.	.07½
Elkton Con.	.39
El Paso	.99
Findlay	01
Gold Dollar	.02½
Gold Sovereign	.0085
Isabella	.10¼
Jack Pot.	.06
Jennie Sample	.02
Jerry Johnson	.02¾
Lexington	.003
Old Gold	‡.01
Mary McKinney	.37
Pharmacist	‡.009
Portland	1.06
Raven B. 11	.03
Vindicator	1.16

SALT LAKE Nov. 25

Name of Comp.	Bid.
Beck Tunnel	.04¼
Black Jack	.03½
Colorado Mining.	.10
Crown Point.	00¾
Daly-Judge.	4 50
Gold Chain.	.07
Grand Central.	.61
Iron Blossom.	1.10
Little Bell.	.10
Lower Mammoth	.01½
Mason Valley.	50
May Day	10½
Opohongo	01
Prince Con	.16
Silver King Coal'n.	2 30
Silver King Cons.	1 52½
Sioux Con.	.01½
Uncle Sam	.02½
Utah Con.	01
Yankee.	.02

SAN FRANCISCO Nov 30

Name of Comp.	Bid.	Name of Comp	Bid.
Comstock Stocks.		Misc. Nev & Cal	
Alta.	.05	Belmont	4 20
Belcher	74	Jim Butler	82
Best & Belcher.	05	Lone Star	14
Caledonia	35	MacNamara.	04
Challenge Con	05	Midway.	.11
Chollar	‡ 02	Mont.-Tonopah.	35
Confidence	.15	North Star	24
Con. Virginia	.16	Rescue Eula	09
Crown Point (Nev.)	.36	West End Con	67
Gould & Curry.	01	Atlanta	45
Hale & Norcross	‡ 01	Booth	11
Mexican	34	C.O.D. Con	11
Occidental	85	Comb. Frac	18
Ophir	12	Jumbo Extension	3 50
Overman.	11	Pitts.-Silver Peak	35
Potosi	01	Round Mountain	36
Savage.	.04	Sandstorm Kendall	14
Sierra Nevada	09	Silver Pick	21
Union Con	14	Central Eureka	‡ 20
Yellow Jacket	39	So. Eureka	*1 80

TORONTO Nov 30

Name of Comp.	Bid	Name of Comp	Bid
Bailey	01	Foley O'Brien	15
City of Cobalt	30	Hollinger	[illegible] 50
Coniagas	5 50	Imperial	01
Peterson Lake	25	Ju[illegible]	13
Right of Way.	02	McIntyre	[illegible]
T. & Hudson Bay	30 00	Pearl Lake	[illegible]
Timiskaming	10¼	Porc[illegible] Gold	‡ 06
Wettlaufer-Lor.	[illegible]	Prest[illegible]	01½
Big Dome.	6 37½	Rea	20
Dome Exten	08½	Seneca Superior	1 50

N. Y. CURB Nov 30

Name of Comp	Clg
Beaver Con	30
Big Four	05
Blue Bell	08¼
Braden Copper	6[illegible]
B. C. Copper	50
Buffalo Mines	[illegible]
Can. Cop. Corpn	1[illegible]
Can. G. & S.	04
Caribou	67
Chambers Ferland	14
Con. Ariz. Sm.	[illegible]
Coppermines Cons	1[illegible]
Davis-Daly	[illegible]
Diam'f'ld-Daisy	[illegible]
Dia. Black B.	07
Ely Con	‡ 01
Florence	[illegible]
Goldfield Con	[illegible]
Goldfield Merger	[illegible]
Greene Cananea	[illegible]
Kerr Lake	[illegible]
La Rose	[illegible]
McKinley-Dar-Sa	70
Mines of Am.	[illegible]
Mutual Min. pf	[illegible]
Nevada Hills	[illegible]
New Utah Bingham	[illegible]
Nipissing Mines	[illegible]
North Star	23
Ohio Copper	13
Oro	19
P[illegible] Smelt	[illegible]
Standard Oil of N.J.	[illegible]
Stewart	[illegible]
Tonopah	[illegible]
Tonopah Ex.	[illegible]
Tonopah Merger	46
Tularosa	12
West End Ex.	[illegible]
Yukon Gold	2[illegible]

BOSTON CURB Nov 30

Name of Comp	Bid
Alvarado	70
Bingham Mines	‡ [illegible]
Boston Ely	15
Butte & Lon'n Dev.	23
Calaveras	93
Calumet-Corbin	10
Chief Cons.	[illegible]
Corbin	‡ [illegible]
Cortez	10
Crown Reserve	[illegible]
Eagle & Blue Bell	9[illegible]
First Nat. Cop.	1[illegible]
Houghton Copper	[illegible]
Iron Cap Cop., pf	‡4 75
Majestic	18
Mexican Metals.	[illegible]
Nevada-Douglas	[illegible]
New Baltic	90
Oneco	1 0[illegible]
Raven Copper	[illegible]
Smokey Dev.	‡ [illegible]
So. Lake	04
Tonopah Victor	‡ 7
Trethewey	15
United Verde Ext	[illegible]

LONDON Nov 19

Name of Comp	Clg
Camp Bird	£ [illegible]
El Oro	[illegible]
Esperanza	[illegible]
Mex[illegible]	[illegible]
Oro[illegible]	[illegible]
Santa [illegible]	1 [illegible]
[illegible]	0 6
[illegible]	[illegible]

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The Engineering and Mining Journal

VOLUME 98 DECEMBER 12, 1914 NUMBER 24

A Trip to the Siberian-Mongolian Frontier

By Newton B. Knox*

SYNOPSIS—Examination trip to some new placers around the headwaters of the Yenisei River in south-central Siberia. By rail from Petrograd to Krasnoiarsk. Advisable to avoid leading hotels. By steamer up the Yenisei to Minusinsk. Across country by wagon road and mountain trail. These Siberians poor packers. Convict labor building a wagon road. Elk-farming rough on the elk. Camels used for packing. Paddle-wheel, horse-actuated ferry. Placers only recently worked, since for long time it was unknown whether the region was in Mongolia or Siberia. Owner permits inefficient hand-sluicing methods under leasing system. Gravels suitable for hydraulicking. Estimates of costs. The native Soyotes an interesting race. Return down river made on two-deck raft. Projected government improvements. Curious rumors of the war. Behind the scenes in Russia's mobilization.

⁂

In the latter part of May, 1914, I left London to examine some recently discovered alluvials lying in southern Siberia close to the Mongolian frontier and near the headwaters of the Yenisei River. So far as I have been able to ascertain, I was the first foreign engineer to visit this little known district and I offer the following notes of my journey in the hope that they will prove of interest. I was accompanied by a young English engineer who served as my assistant. He was thoroughly and unmistakably British and his nationality served in the later stages of the journey, after war had been declared, to facilitate our passage homeward. He possessed a smattering of Russian, of which he was extremely proud. My own knowledge of the Russian language consisted of two words, *kharohshy*, meaning "good," and *nichi-wo*, meaning "never mind," and it is surprising how far these two words, when judiciously used, can carry one. With this limited knowledge of the language, we succeeded in traveling alone and without interpreters from Petrograd to the mines and only once along the journey did we observe the least inclination on the part of the Siberians to take advantage of us as strangers. However, ordering a meal in some of the wayside towns always contained elements of expectation and uncertainty, for we never knew exactly what our order would bring forth. On one occasion we ordered suckling pig and much to our surprise were served with chicken stew.

The Village of Grigorieffka

The Village of Oisa

The Railway Journey

In addition to our ordinary baggage, we had an Empire drill weighing about 1½ tons, which we brought with us from London. We left Petrograd Sunday, May 31, on the Russian Express, arriving at Krasnoiarsk on the following Saturday evening. Before leaving Petrograd we had ex pressed our drill to Krasnoiarsk, a distance of 2700 miles. The drill weighed 2800 lb. and our express bill amounted to 348 rubles. On the train we found that we could secure four second-class berths for the price of two first-class berths; i.e., 190 rubles, and by so doing we secured the whole compartment to ourselves. The only difference between a Russian first-class compartment and a second-class is that in the former there is a mirror, while in the latter there is none. Only Russian grand dukes and American and English "trippers" travel in the mirrored compartments.

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The Russian Express leaves Petrograd once a week and there is no dining car attached. Breakfast of tea (always excellent in this country) and fresh bread and butter are served by the train porter. The train stops at intervals at stations long enough for one to procure satisfactory meals at a moderate price. The food is arranged on a long buffet so that one can choose one's meal by simply pointing to it, a happy arrangement for those possessing only two Russian words. The principal and most popular dish along these wayside stations consists of a thick Russian soup made of beet roots. This is the famous *borsch* and is a meal in itself.

Hotels in Krasnoiarsk

We arrived at Krasnoiarsk at 1 a.m. and drove to the principal hotel expecting to find it closed for the night, instead of which it was a blaze of light. In one corner of the dining room where we went for supper they had erected a stage, and here a Russian girl, dressed in blue tights with large white polka-dots, was giving her conception of an American coon song. The place was crowded. Russian military officers were seated about drinking sweet champagne and tea. All the men wore some sort of a uniform and all seemed to be prosperous and enjoying life.

We were given rooms in the hotel directly over the stage and the band ceased playing only at 6 o'clock next morning. Each Siberian town possesses a hotel of this class, which is the club and meeting place of the community. Smaller and quieter hotels exist in back streets and the traveler will do well to avoid the lights and glitter of these local Savoy-Ritz establishments and go to one of the quiet inns. Russian hotels in general are not uncomfortable, but the traveler should provide his own bedding which he spreads on an iron camp bed in his room. Russian rooms are always overfurnished with chairs; I have counted 12 ranged along the walls of a room which had no other furniture except a bare bedstead, giving the place the air of a deserted lodge room.

By Steamer to Minusinsk

From Krasnoiarsk we journeyed by steamer up the Yenisei to Minusinsk, a two days' journey. These steamers of about 600 tons are clean and comfortable. The cabins are large and fitted with two wide berths, but here again the sleeping bag comes into requisition. The fare, including two first-class cabins, is 21 rubles. The meals are well served and inexpensive. Between these two cities the Yenisei River is about one mile wide and flows through a huge plain of wonderful fertility. The whole district here has an air of prosperity. Each landing stage was piled high with new gaudy-colored farming machinery, some American made, but mostly of Russian manufacture.

Six hours after we left Krasnoiarsk the steamer drew toward a place where stood only a small Russian chapel. As we came in, four long-haired Russian priests lined up on the bank and burst into a Russian chant, apparently one of welcome. Except Black and me, everyone in the steamer, passengers, crew, captain and cook left the boat and crowded into the chapel, where service was held. After service the steamer pulled out to the fervid chanting of the four faithful priests and a boy. At no other place in the world have I witnessed such a display of religious enthusiasm.

Minusinsk is at present the end of steamer navigation. It is a town of about 140,000 inhabitants lying 530 versts above Krasnoiarsk. A railroad is at present being built from it to Archinsk, a station on the Trans-Siberian Ry. Minusinsk is the jumping off place from civilization and at present is an enterprising and prosperous city—it is, in fact, booming. It is the largest trading center of the whole upper Yenisei Valley and its weekly market presents a more animated appearance than that of the larger city of Krasnoiarsk. Next year this town will cease to be the head of navigation, since shallow-draft steamers now being built will run up the river as far as Buluk.

Hand Work in the Gravel

Across Country

From Minusinsk we had to strike across country, meeting the river again after a 12 days' journey. The following is a table of our route, showing the towns and villages passed through:

FIRST SECTION, BY WAGON OR "TALIEGA" ROAD	Versts	Miles
Minusinsk to Daniloffsky Zavod	26	16.6
Daniloffsky Zavod to Kazantzevo	15	10
Kazantzevo to Kozleffka	3	2
Kozleffka to Zheblakhti	12	8
Zheblakhti to Yermatoffskoye	18	12
Yermatoffskoye to Salba	15	10
Salba to Verkhne-Kebezskoye	17	11.4
Verkhne-Kebezskoye to Grigorieffka	3	2
Total distance Minusinsk to Grigorieffka	108	72
SECOND SECTION BY TRAIL		
Grigorieffka to Verkhne-Ussinsk	180	120
THIRD SECTION BY ROAD		
Verkhne-Ussinsk to Turansky-Hamlet	78	52
Turansky-Hamlet to Uyuk	12	8
Uyuk to Buluk (Yenisei River)	70	46.6
Buluk to Nikolneffsky	75	50
Total distance Verkhne-Ussinsk to Nikolneffsky	235	156

FOURTH SECTION BY TRAIL		
Nikolneffsky to mines	20	14
TOTAL		

Total distance from Minusinsk to the mines, 543 versts, or about 362 miles.

The first stage of the journey from Minusinsk to Grigorieffka, a distance of 72 miles, is over the rolling plains of the Yenisei Valley. The soil is sandy in places but on the whole is rich. It is all under cultivation; wheat and rye flourish. The women work shoulder to shoulder with the men in the field. The abject poverty of the peasant class in many parts of central and northern Europe and the crudeness of cultivation in these places are here remarkable for their absence; the Siberian peasant is content with only the most modern farming implements. One of the striking peculiarities of Siberian farm life, due perhaps to the severity of the winter, is the fact that the farmers and their families do not live on their farms. They congregate in villages or small hamlets, consisting of four or five houses, and early morning sees each farmer and his whole family on the road going to their day's work in the fields.

Over Mountain Trails

Grigorieffka is the last village on the plains; here the road ends and a trail begins, which crosses the Sayan Mountain Range and is about 120 miles long. We had arranged from Minusinsk by telegraph for sufficient horses to pack our freight over the trail and for this we were prepared to pay the current packing rates. The drill arrived at Grigorieffka some hours before we did and we found it surrounded by all the packers in the neighborhood, who were gazing open-mouthed at the 5-ft. long casings as if they had been 12-in. guns. These casings they flatly refused to pack, claiming that it was impossible to carry them over the trail. After a long conference among themselves, they agreed to pack our 60 poods of freight over the 180 versts of trail for 600 rubles, which was exorbitant. We finally found an outsider or "scab" with whom we made a contract to pack our material over the trail and deliver it 156 miles beyond by wagon to the river for the sum of 350 rubles. This was the only attempt at extortion which we experienced during our trip.

When all the packers in Peru are dead, the Siberian packer in this district will be the worst packer in the world. His horses are of a fair size, yet they pack only 125 lb. to the horse. They also employ two men to every four animals.

In spite of the tales we had heard of the roughness of the trail, we found it to be but an ordinary mountain trail with a few stretches of marshy ground. We were two days covering it.

Convict Labor on New Road

The government is now building a magnificent post road over these mountains. This is 24 ft. wide, heavily macadamized, with easy grades and with post houses at every 20 versts. The road is about one-third built and it is expected it will be completed in two years. About 3000 convicts of both sexes are working upon it and the absence of all guards is a surprising feature. Yet an escaping convict cannot proceed far in this district, for without a passport he or she would soon be gathered back into the fold again.

I noticed one convict working on the road quite alone. He wore a cap of a striking light-blue and shaped after the fashion of the French cap of liberty—it was the mark of the murderer. It was the only sign or mark I saw, all the other convicts being dressed in ordinary peasant costume.

The building of this road is an example of the awakening of the Russian government to the importance of the district. A Belgian company has already been organized to transport freight over this highway by motor truck.

The district through which this trail leads is one of surpassing beauty and its forests of fir and larch without undergrowth or brush of any kind reminded one of the well-cared-for parks of English homes. We passed acre after acre of wild flowers of all colors, some of the yellow poppies rivaling those of California in color and size.

Typical gravel deposit

Bottom lands near the border

Character of the Gravel

The village of Ousa lies at the end of the trail and is a characteristic Russian village; it is built of logs and has a population of about 10,000. There we took wagons or *taliegas* and drove through a more or less arid region for about 156 miles, when we arrived at the Yenisei again.

Elk Farming

This region stands out in my memory as the home of the queerest sort of farming that I have ever seen, a craze, as it were, which rivals our own Belgian-hare industry of happy memory. It is elk raising.

The Chinese, who cling to their medieval system of medicine, still employ in their "prescriptions" ingredients which smack of witchcraft and superstition. The horn of the elk, while in velvet, is the most popular medicine of these people who have for years been sending agents all through southern Siberia to buy up elk horn in this condition. The price has risen so high and the demand is so on the increase that the peasant has found it to his profit to raise elk for their horns. He farms elk as his principal industry; wheat and rye are only secondary. Even villages have their community elk farms—the country has gone elk-farming mad!

Each farm consists of an inclosure of from one to 10 acres surrounded by a fence 10 ft. high, wherein the elk are pastured. The elk are bred and are supplemented from time to time by wild elk which are run down in the snow in winter by peasants on snowshoes.

The horns when sold *must* be in the velvet and have the blood in them. The Chinese pay for horns in this condition at the rate of 9 rubles a pound; 12 rubles per pound is paid if the elk has been shot and has also its skull bones. A pair of antlers weighs up to 60 or 70 pounds.

Hard on the Elk

Arriving at a village one evening at dusk, I heard proceeding from a corral some most heart-rending cries. On reaching the corral I found a couple of peasants with a poor elk on its back. They were slowly and callously hacking at its horns with a dull saw; at every stroke of which the poor brute shrieked in agony. The operation took fully half an hour and after it was over the horns were shown me and the fresh-cut surfaces oozed blood. The Russians claim that this operation does not hurt the elk, which only screams in fright; and that it is, in reality, good for him! These horns are boiled in a solution of weak tea and delivered to the Manchurian agent for shipment to Pekin. Many thousands of elks undergo this torture each year and the demand for horn is still increasing.

Camels Like Tea

Arriving at the Yenisei River one evening at nightfall, we saw our first herd of camels—40 fat animals standing knee deep in the river and looking all the world as if they had just escaped from a circus. Camels are used in this district for packing during the winter. They carry a load of 600 lb. at the rate of five versts per hour. They sell for about 100 rubles each. With a load of 600 lb. they can make a four days' journey without food, being given from time to time a little weak tea.

No One-Horse Ferry

Crossing the Yenisei is not without its perils and excitements. Arriving next morning at the crossing place, we hailed the ferry, which happened to be on the other side. In answer to our hail, there shot out from the opposite bank a scow on which two miniature paddle wheels were revolving furiously and kicking up much water and foam. No smoke or steam could be seen issuing and its motive power was a puzzle to us until it came nearer, when it was seen that three horses on a raised platform were pulling a sweep attached to a gear which in turn revolved the paddles so joyously.

We and 12 other outfits crowded aboard this 3-hp. ferry, loading the scow to its gunwales. In midstream some of our own horses became tangled up with the motor horses and stopped the paddles. When we got under way again we had drifted two miles down stream, but landed, fortunately, without being upset. These horse-propelled ferries are common on the upper Yenisei.

Through Arid Country

From Buluk on the river, to the village of Nikolneffsy, a distance of 50 miles, the road leads through an arid region broken half-way by the only water hole along the route. There we had our first glimpse of the Soyotes, a people who will be described later. We were struck by the excellence of the Soyot cattle and herds. Leaving the water hole, we crossed a wide flat plateau dotted by half a dozen alkali lakes and looking exactly like the region about Mono Lake in California. These lakes furnish the district with salt.

We were overtaken near one of them by a hail storm of such violence that we were obliged to cover our horses with canvas to prevent their bolting. We ourselves took refuge beneath the wagons. Hailstones as big as eggs driven along by the unbroken fury of the wind are not without danger. These large hailstones, I noticed, were made up of an aggregation of small particles frozen into one mass. Next day in the forest, evidence of the storm was seen in the carpeting of small branches and twigs cut off from the trees. We reached camp at nine that night in a rainstorm and next morning after driving a few versts, we reached the village of the mine and were henceforth among friends and no longer guideless.

Unworked Placers in Disputed Territory

The mine which we had come to inspect belonged, we afterwards found, to that now rare if not almost extinct group, the virgin alluvial. Its unworked state is due partly to the fact that it lies in a sort of no-man's land, a strip near the boundary of Mongolia and Siberia. The people of each country thought the land belonged to the other.

Until recently, all maps of this region gave the border line between the two countries as extending along the principal mountain ridge of the property in question; in some cases it was put at 100 miles north of this ridge. At present the border is accepted as a line from 100 to 150 versts south of the ridge, thereby placing all the territory covered by the claims within Siberia proper. The history of this misplaced boundary and of the treaties about it goes back to 1616 and is too long to be given here. The Soyotes have always inhabited the strip and, being of a non-Russian race and type, have caused geographers to mark the area in question with the color designating Chinese territory. Russia, however, has always claimed it and since 1911 has formally possessed and occupied it.

Leasing Methods Followed

It is not the purpose of this paper to describe the mines in detail. I hope in a later paper to do that. Suffice to say that the gravels, especially those of the higher creeks, are rich. Lessees are permitted to work by Russian hand methods on some of the creeks and the gravel of one creek from operations extending from Apr. 1 to July 21 averaged $2.93 per cu.yd. of product washed. Another gave $3.03 per cu.yd. of product washed. Of course, only the best gravel has been put through the sluices. All the creeks, of which there are about 25, belong to one man.

Hydraulicking Possible

Physical factors, together with the high freight rate, £15 per ton from London, render the dredging of these deposits quite out of the question. They can, however, be cheaply and effectively hydraulicked, as there is at present sufficient water for this purpose obtainable under heads up to 800 ft. Fortunately also, the gravels rest on steeply inclined bedrocks. The gold is coarse and numerous nuggets occur. On July 2 of this year a nugget weighing 1 pfunt 12 zolotniks and having a value of $260 was found in one of the creek beds. Nuggets as big as hazel nuts are common. The complete absence of all fine gold in the clean-ups is due to the crudeness of the gold-saving devices and is no proof of its absence in the gravels. The fineness of the gold is 871.

System and Costs

Drilling on the Upper Creeks

The tributers are allowed by the owner to hand-sluice under the following agreement: The owner allots each "company," consisting of five to 10 men, a definite stretch of ground upon which to work. All the gold obtained is *supposed* to be turned over to the agent of the owner, who pays the tributers for it at the rate of 3.22 rubles per zolotnik. The difference in the actual value of the gold, 4.50 to 4.80 rubles per zolotnik, and this price constitutes the owner's profit. After all expenses of road-making, administration, marketing of gold, etc., have been deducted, there remains to the owner only a profit of 30 kopecks per zolotnik, or a little over 5% of the gross output. Much gold is lost by theft, only one-third to one-half of the gold that is found being actually turned in. There is a further loss of from 30 to 35% gold in the *batura*, which is an exceedingly inefficient gold saver. The cost of *batura* working is high. The current wage in this district is 1.50 rubles per day, but if we assume that each workman costs 100 rubles per month, or 3.84 rubles per day for 26 working days per month, we assume a figure covering all administration expenses, horses and feed, taxes and also the wages of the following men needed in all large camps: One cook for each 10 men, 25 rubles per month; one watchman, 30 to 45 rubles; one hostler, 40 to 45 rubles; one storekeeper, 50 rubles; one foreman, 50 rubles; one superintendent, 175 rubles. This figure of 100 rubles per month per man is applied only where over 500 workmen are employed.

Each workman can mine, i.e. dig, 20 cubic arsheen, 9.4 cu.yd. per day. To mine, wash and remove tailings would require the following crew:

For gravel—	Rubles
Three men mining at 3.84 rubles per day	11.52
Two men wheeling	7.68
One man washing	3.84
Total for 28 cu.yd. (3x9.4)	23.04
This is 82 kopecks per cu.yd., or 41c. per cu.yd.	
For turf—	Rubles
Three men mining	11.52
Two men wheeling	7.68
Total 28 cu.yd.	19.20
Or 70 kopecks or 35c. per cu.yd.	

If the ground is half turf and half gravel this averages 76 kopecks, about 40c. per cu.yd.

When employing horses and carts, the gravel costs 42c. per cu.yd., and this method must be employed when the haul is over 350 ft.

The Soyotes

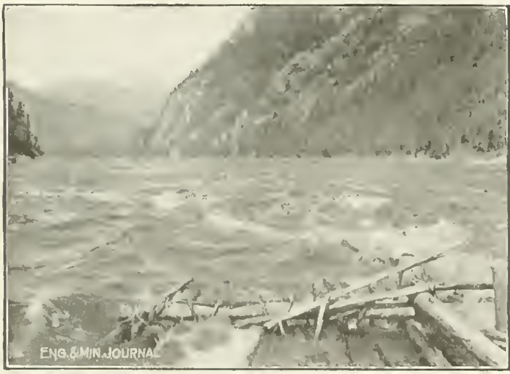
The native inhabitants of this border region are most interesting and warrant a brief description. They have three different names: the Russians call them Soyotes, the Mongolians and Chinese, Uriankhi, while they call themselves Tubaulus or Tuva-ulus.

They are a nomadic people living during the winter in the sheltered mountain defiles and inclosed forest glades and in the summer on the open mountain terraces. Spring and autumn find them on the steppes and bottom lands of the valleys adjoining the Yenisei. These migrations are prompted by the need of new pasturage for their cattle and flocks. They most probably belong to the Finnic tribe with an admixture of Mongolian elements. They have many words and customs in common with the Russian Katchinsk Tartars and Kirghizes. Their religion is Buddhist Lamaism, and at the same time they are zealous Shamanists (Siberian sorcerers). Their Lamaism, however, belongs to that variety of Tibetan Buddhism which believes in, fears and worships evil spirits. The cattle breeders live in tents made of inch-thick felt mounted on a lattice framework. These tents are well made, warm in winter and cool in summer. They are about 10 to 15 ft. in diameter. The reindeer breeders have a conical hut similar to an American wigwam and made of birch bark and skins. Men and women dress in the same way—in a cloak and breeches. They wear furs and sheepskins in winter and in summer cotton and even rich Chinese silk. They are fond of bright colors and usually dress in red. They are picturesque in their high, pointed fur hats and their long, flowing red cloaks. They are usually well mounted, and train and take excellent care of their horses. Their worst failing is horse stealing, which is not a crime with them, but something to be commended. On the strength of the adage "set a thief to catch a thief" all the Russians living in the district employ Soyotes to take care of their horses and cattle. The Soyotes name their children after the first object met with by the parents after the birth of the child and consequently some queer and some poetical names are recorded. [illegible] people, submissive to their authorities, kind to their wives and children, but thieves and liars all. They are inclined to be lively by nature, but they are shy in the presence of their authorities and of strangers. Ideas of morality are not strongly developed among them.

Until stopped recently by the Russians, torturing as a form of punishment was maintained among them. This included burying alive in the ground, beating in the face until unconscious and freezing off the hands and feet.

They are an independent tribe but for centuries have paid annual tribute to Mongolia. This tribute consists of furs of eight kinds: Squirrel, sable, lynx, otter, panther, wolf, marten and fox. The amount of tribute is fixed by the native rulers and is levied on each tent; it varies from 10 squirrel skins to 10 sables.

This border region is a most beautiful, well watered country, reminding one of northern California before the Gringo came. Here the country is new and all kinds of wild game plentiful. Indeed, it is a hunter's paradise, for in the mountains there are elk, caribou, roebuck or *maral,* weighing up to 320 lb., wild goats, mountain sheep, antelope, reindeer, musk deer and boars. Of pelt animals there are found the bear, lynx, wolf, fox, sable, winter weasel, polecat, Siberian polecat, squirrel, marmot and otter. As there exist no game laws of any kind, in a few years, under the relentless killing now going on, these animals will all be exterminated.



THE RAPIDS OF THE UPPER YENISEI RIVER

A STOPPING PLACE ON THE RIVER

RETURN BY RAFT

We finished our examination on Aug. 10 and started homeward. I had sent a man a few days before to buy a raft at Buluk and so when we arrived at the village on the river we found our raft and crew awaiting us.

The raft was about 60 ft. long and about 20 ft. wide. It was made of logs about 18 in. in diameter held together by twisted branches and by pegs. In the center was a platform extending the full width of the raft, about 10 ft. deep and raised about 6 ft. above the "lower" deck. The raft was furnished with a long sweep fore and aft and also possessed side sweeps. Its crew consisted of 12 men and a captain; the captain of an ocean liner could not take his calling more seriously or give orders with more dignity than did ours.

The captain agreed to take us and our freight to Minusinsk and to give us choice of the platform for our tent for 200 rubles. We left Buluk on Aug. 11 and traveled about 100 versts the first day, when we tied up for the night. Here we were passed by a native in a canoe who told us that the "whole world was at war," a statement which we immediately put down as a vodka dream.

We had a common fire on board at which passengers and crew all took turns in cooking their meals. Each night we tied up and some days also, owing to upriver winds, we had to tie up or be blown upstream. We gathered passengers as we went down and had at last about 30 people on the platform, three horses, two cows and several wagons on the lower deck. One of the cows fell overboard and was rescued amid great excitement by the combined efforts of passengers and crew. We passed many families of young wild geese, some of which we shot; they proved most delicious eating. We were passing through a country of deep gorges on these upper reaches, gorges whose sides reached, in some cases, to 3000 ft. above the river. The rocks were mostly red sandstone, schist and a fine-grained greenstone. Sometimes we passed cliffs of blue limestone.

About 300 versts below Buluk we shot the much-dreaded rapids. They are about 200 yd. in length, while the river is only 100 ft. wide. The lower deck was quite under water during the passage, all the crew having scrambled on the captain's bridge. We got through safely, but one of our lady passengers fainted. The government is building a rail portage around these rapids and from here up, small steamers will run next year. The government has also appropriated half a million rubles for improving this river and the work is being well done. Beside this portage, sunken rocks and boulders are being cleared from the channel further downstream. On Aug. 17 we passed through the last gorge and came suddenly into the great valley of the Yenisei. We were then about 120 versts above Minusinsk and the last rock we saw was the familiar uptilted red sandstone. After leaving the gorges all rocks are covered by the deep rich soil of the Yenisei plains.

RUMORS OF WARS

Rumors of wars reached us from various up-river passengers. Each native told us different stories but the most popular tale was that Russia was at war with Italy! We also heard that Russia was fighting China.

It was not until we reached Minusinsk that the whole truth came to us and we were days trying to get accustomed to its full significance.

The steamer from Minusinsk to Krasnoiarsk was filled with a cheerful crowd going to the front. We pulled up once at a bank crowded with people and took on some more soldiers. When we drew off, the crowd left the bank except one poor woman dressed in black who, kneeling at the water's edge, held out her hands as if in supplication to the parting steamer. We saw on our rear deck a six-foot "boy" blubbering openly and shamelessly. It was her only son going to the front and we watched the figure on the beach until it became a black dot.

Krasnoiarsk was full of soldiers. Soldiers, everywhere, and each day the trains brought in more soldiers from the steppes, from the north, from the Baikal region, all big, happy, healthy men eager to fight. We were behind the scenes in the Russian mobilization and were impressed by the wonderful fighting machine that Russia has at her disposal and by the smoothness with which she assembled it. Within two weeks of the outbreak of war she had mobilized over 3,000,000 men on her first line of defense without disarranging any of her railroads. She has another 3,000,000 ready on the second line of reserves, and her total fighting force, including all who have had military training, is 16,000,000.

Roundabout Way Home

Arriving at Petrograd without incident, we found that our only way home to England was via Norway and Sweden. This trip occupied eight days. We were stopped in the North Sea by a British cruiser which looked us over and allowed us to proceed. We arrived in London Sept. 6.

American Institute of Chemical Engineers

Special Correspondence

The seventh annual meeting of the American Institute of Chemical Engineers was held in Philadelphia, Dec. 2 to 5, 1914. At the business meeting, Dr. George D. Rosengarten of Philadelphia was elected president for the ensuing year. The session was opened by an address by Mayor Blankenburg. The papers on the first day were: "The Manufacture and Application of the Artificial Zeolites (Permutite) in Water Softening," by D. D. Jackson; "Feldspar as a Possible Source of American Potash," by Drs. A. S. Cushman and George W. Coggeshall; and in the evening, addresses by Dr. George Otis Smith on "Distribution of Industrial Opportunities" and Jokichi Takamine on "The Chemical Industries of Japan."

Mr. Jackson's paper contained an account of what has been done toward a practical realization of the theoretical possibilities discussed in previous publications on permutite, and showed that this water-softening process has reached the commercial stage in the United States.

The Wednesday excursions were to the Atlantic Refining Co. and the United Gas Improvement Co. The Thursday excursions were to the Welsbach Works at Gloucester, with luncheon as the guests of the company, and in the afternoon to the New York Shipbuilding Co. and Farr & Bailey's linoleum works. A subscription dinner was held at the Hotel Adelphia in the evening with addresses by the retiring president (M. C. Whittaker), the president elect, and others.

Friday promised to be a day of great interest to the metallurgists, but the Sadtler paper on ore flotation was withdrawn on advice of counsel, owing to the approaching Minerals Separation litigation, and Dr. Edward Gudeman's paper on "Aspects of Some Chemical Industries in the United States" was read by title only, leaving the field to J. V. N. Dorr's "Hydrometallurgical Apparatus and Its Use in Chemical Engineering."

Doctor Whittaker in introducing Mr. Dorr said that the economy of the cyanide process was well known to chemists, so he had brought the chief offender there to tell how it was done.

Mr. Dorr said he felt apologetic over coming to talk about his apparatus, but the president had urged him into it, and since he was going to talk he had to talk about that with which he was familiar. The greatest differences between the metallurgy of today and of 30 or 40 years ago was the increase in the scale of operations, due to general advance in engineering knowledge, an increased demand for metals; and the exhaustion of the small, high-grade deposits.

Concomitant with this have been those things which made it possible: Mechanical operations substituted for hand; and continuous processes supplanting intermittent.

The cyanide process borrowed extensively from the chemical industries. The tube mill came from cement grinding; the dust collectors of the early cyanide and chlorination plants came from the flour mills; the Pachuca tank came from the powder industry; and so on. On the other hand, the Kelly filter press has been adapted by the sugar refiner, and the Merrill sluicing press by aluminum manufacturers.

Mr. Dorr then discussed the Dorr classifier (incidentally bringing in an interesting account of tailings disposal at the old Lundberg, Dorr & Wilson mill) with a discussion of the theory of washing and of leaching by this apparatus; the Dorr thickener; and the Dorr agitator. Among the notable points was his mention of a thickener built by the Arizona Copper Co., 130 ft. in diameter by 6 ft. deep.

Papers on the "Hardwood Distillation Industry," by E. H. French and James R. Withrow, and the "Need of Uptodate Manufacturing Statistics," by Bernard Hesse, were also read in the morning. In the afternoon, excursions were made to the Commercial Museum, probably the finest institution of this sort in the world, with addresses by Dr. W. P. Wilson and others of the staff on its activities, and to the chemical and engineering laboratories of the University of Pennsylvania.

With the apparent breakdown of the evening's program, G. W. Thompson, of the National Lead Co., and Dr. H. A. Huston, of the Potash Syndicate, came to the rescue; the first with a careful study on the influence of the way paint is applied to paint defects, his idea being that most of the trouble with paint arose not in the materials, but with the labor; the second with some wonderfully fine motion pictures of the mining and preparation of the Stassfurt products.

On Saturday the Institute visited the Barrett Manufacturing Co.'s plant. The meeting place for next year was not fully decided upon, but it appears that there will be two meetings, one in San Francisco in early September, and one, probably in New York, in December.

Accident Prevention by the New Jersey Zinc Co.[*]

SYNOPSIS—A discussion of the causes of accidents in metal mining, and of the bonus system by which the New Jersey Zinc Co. has greatly decreased them in its operations at Franklin Furnace, N. J.

Although the following methods for the recording of accidents and the stimulation of safety measures are probably well known, yet it seems that the already voluminous amount of literature on safety work contains comparatively few references to the results which may be obtained in metal mining, and, therefore, this discussion is tendered with the hope that it will encourage the interchange of ideas as to what may be accomplished in mining through interest in "Safety First" measures and will add in a small degree to the bibliography of the mining branch of safety work.

Inherent Risks in Metal Mining

Unlike factories and other industrial establishments which have their greatest risks from moving machinery, the metal mines suffer greatly from risks such as "falls of ground," "handling explosives," "the loading of cars from chutes and subsequent tramming," etc., in which the supervision and the education of the workman are absolutely necessary for his safety since no mechanical contrivances can protect him. With the realization that any marked reduction in the number of mining accidents, and the consequent loss of time to the workmen and loss of more or less experienced labor to the company, would probably be attained by the education of the workmen in taking an intelligent interest in their own safety and that of co-workers, the New Jersey Zinc Co., in its mines at Franklin Furnace, N. J., departed this year from its former system of looking entirely to the foremen and bosses for safety and first-aid work and instituted a plan which seems to stimulate the interest of both boss and men. It will perhaps be better to consider the details of this plan after describing the methods which had been previously employed and noting the conditions to which it applied.

The mine at Franklin Furnace, N. J., employs 350 to 450 men (excluding the mill, machine shops and power plant) and produces annually about 500,000 tons of zinc ore and about 250,000 tons of rock fill or waste. The ore is composed chiefly of the combined oxides of iron, manganese and zinc and the silicate of zinc. The waste rock is principally a highly crystalline limestone, so that the safety of the workmen is in no way endangered by the silicosis problem which must occupy the attention of many of the Western metal mines.

Mining Methods at Franklin Furnace

Shrinkage methods of stoping are in general employed to mine the ore, and the property is cross-sectioned by the stope slices (whose widths are 17 ft. and lengths equal to the horizontal distance across the orebody), with ore pillars of an average of 35 ft. left standing between each stope slice. As a rule, the mining of ore in stopes is carried upward a height of 50 ft., with sufficient of the broken ore left in the stope for an upper surface to be about 6 ft. from the solid back on which the miners are working; then the broken ore is drawn out, timbers recovered, and waste rock packed into the empty chamber up to the elevation of the level above. Set timbers are then placed on the rock filling and the mining of the ore continues on top of these timbers for the progress of the stope another lift; and so the stope slices progress upward from the bottom of the orebody. In the future the remaining intermediate pillars of ore will be recovered by some caving systems of mining, starting at the upper portion of the orebody and working downward.

The New Jersey Zinc Co. has for six years had its own hospital with the staff of a surgeon, a head nurse, four nurses, an orderly and two domestics. The hospital is modernly equipped for minor and major operations and X-ray work, has four private rooms and a wardroom accommodating five patients, and is equipped with an automobile ambulance.

The company provides a Neighborhood House with its director, visiting nurses and teachers to look after the sociological needs of the community and provide clean recreation. For over six years the mine has been equipped with three Fleuss oxygen-breathing apparatus for mine-rescue work, and the shift bosses and foremen have been instructed in the use of this apparatus, but fortunately there has been no need of earnest work with it; and the Draeger pulmotor has been a part of the equipment for over three years and has, so far, been unnecessary.

Until the beginning of this year the active first-aid and safety work devolved entirely upon the foremen and bosses, who were trained in bandaging and the general principles of first-aid work and administered as was necessary until delivery of the injured man at the hospital. It was naturally a boss' duty to supervise the proper and safe performance of the work done by each man in his gang, and we felt that our shift bosses were more than ordinarily interested in the protection of their men. Yet we appreciated that failing in human nature which prompted a supervisor to feel that the results of an accident due to disobedience of explicit directions or due to crass stupidity were amply deserved and did not excite sympathetic interest if no serious disability or fatality occurred. For instance, I recollect that at one time there seemed to be an epidemic of men pulling tram cars directly upon their own feet, which were run over by the car wheels, and it was naturally difficult for the shift bosses to get the same attitude toward their men as a governess has toward her ward, for those who work in a mine are supposed to exhibit the discretion and common sense of maturity. However, that such is not the case is shown by the following examples:

The Problem of Boneheadedness

At a certain point on one of our main underground electric haulage tracks, where the overhead weight made timber sets necessary with the posts close to the clearance of the cars, several accidents occurred from men trying to stand between the posts and the cars instead of passing behind the posts where there was plenty of room. To overcome a repetition of these accidents, we delegated a workman to be stationed at this point to keep men from such an accident, and lo, he was the next one so injured!

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[*] An address delivered by B. F. Tillson before the New York Section of the Mining and Metallurgical Society of America, Sept. 19, 1914.

Just recently an experienced miner performed an act so lacking in common sense that it seems unaccountable. Contrary to orders he mounted his rock drill to deepen a drill hole of the round he had fired the previous day, which had not broken its burden, and as a result some of the dynamite which remained in the hole was ignited by the percussion of the drill steel or sparks which it made against the rock, and the explosive burned with fumes which drove the miner from the working place, but did not injure him. Upon his return to this working place he again placed the drill steel in the same hole and some of the explosive which remained from the burning this time exploded and peppered the miner's face with rock and will probably cause the loss of an eye.

So in order to stimulate the shift bosses with such zeal and close attention in their safety supervision as would be expected in the attitude of a kindergarten teacher toward her pupil, we offered in April, 1913, a prize of $200 at the end of the year to the mine shift boss or timber boss having the best record for freedom from serious accidents, whose value was rated by the company's doctor in accordance with his prognosis rated against the total shifts of labor supervised by that boss. A table of prognosis values was formulated with due regard to the relative values of fatalities, total disabilities and major injuries as shown in the New Jersey's employers' liability and compensation laws, and the probable length of time of disability was considered in setting values for minor injuries. The following table is a list of injuries and the values applying to them, among which is a demerit of 50 points for the failure of a boss to report an accident.

VALUATION OF INJURIES FOR SAFETY WORK

Diagnosis	Length of Disability	Numerical Basis
Loss of life		200
Total disability		200
(a) Loss of both eyes		
(b) Loss of both arms		
(c) Loss of both legs		
(d) Broken back		
Loss of arm or leg		150
Loss of eye		125
Fracture of femur	3 months	100
Compound fracture of arm or leg	3 months	100
Loss of thumb or big toe		75
Simple fracture of arm or leg	2 months	60
Loss of fingers or toes		50
Injuries of joints	1-4 weeks	7-30
Lacerated wounds	1-3 weeks	7-30
Contusions	1-2 weeks	7-15
Abrasions	1-10 days	1-10
Scalp wounds	1-10 days	1-10
Dislocations	2 weeks	15
Failure to report accident		50

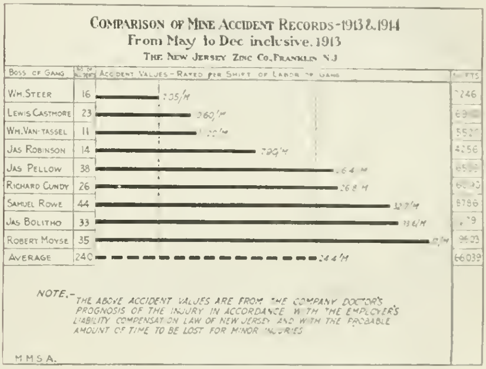
Although we realized that chance played an important part in the winning of this prize, inasmuch as many accidents have the same potentialities but result in sometimes trivial and sometimes serious injuries, nevertheless, in view of the fact that the failure of a boss to win reward did not deprive him of anything which he had previously enjoyed, it seemed such a prize would prove a stimulus to devote attention to safety work so as to improve their chances of winning. It was gratifying to note that this prize went to a man whose work lay in a comparatively hazardous territory, so far as treacherous ground was concerned, and also fell to a man who was conspicuous in his interest and precautions for safety.

The accompanying illustrations show the comparative standing of mine bosses contesting for the above prize, and sheets 1 and 2 show graphically that during the last eight months of 1913, when this prize system was operative, accident prevention compared most favorably with that of the first four months of the year, when no such plan was in operation, for:

(1) The number of accidents per 1000 shifts of labor worked had fallen from 6 to 4.9, or a reduction of 18.30% under the prize scheme.

(2) The number of disabilities (accidents requiring any loss of time subsequent to the date of injury) per 1000 shifts of labor had fallen from an average, for the first four months of the year 1913, of 2.24 to an average of 1.84 for the last eight months, or a reduction of 17.8%.

(3) The shifts of labor lost owing to the disabilities of accidents rated per 1000 shifts of labor worked in mines were 18.35 as an average of the four months previous to the above plan and averaged 17.30 afterwards for the next eight months, and showed a decrease of 5.7 per cent.



(4) There were, during the first four months, only three gangs, totaling 2469.4 shifts of labor, who had perfect freedom from disabilities, while during the last eight months there were twelve gangs, totaling 9126 shifts, who had perfect scores; therefore, the scores in the latter period of time were about four times as good as in the former.

However, it seemed that we could improve on the lump sum reward by making the prize a monthly rather than an annual one, and thus reduce the element of chance in affecting throughout the entire year the reward of a man who has been zealous in his safety work and has shown excellent records for most of the months only to have the misfortune of the spoiling of his chances by some serious but unpreventable accidents in one or two months. Furthermore, we abandoned the elaborate evaluation of accidents by prognosis of injuries for several reasons:

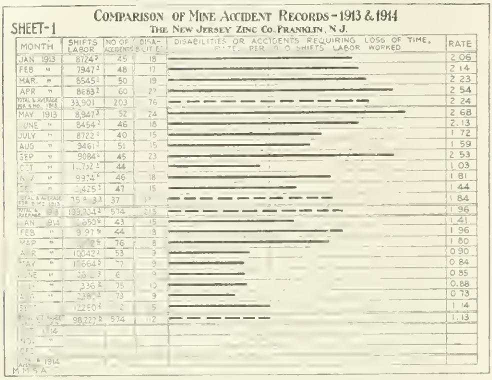
(a) The same latent potentialities exist in the causes of many accidents whose resulting injuries are widely diverse in seriousness, so that the factor of fortune or misfortune affected the score too vitally.

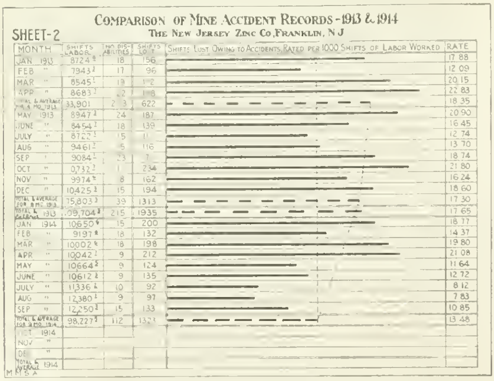
(b) The personal element of a doctor's prognosis is often embarrassing to him as he feels he must be on guard not to show any favoritism.

(c) The clerical labor involved must to a great degree be borne by the doctor, who could spend [illegible] advantage.

The Monthly Bonus Plan

To improve upon the $200 annual lump prize plan we arranged for a monthly distribution of a $10 bonus to each underground timber boss or shift boss who, during 1914, had less than 1.20 disabilities per 1000 shifts of labor worked in his gang each month; and this rate was made arbitrarily as one which was capable of attainment, but indicative of considerable improvement in safety work. Such a scheme has an impulse for safety which is ever present, since it means that a boss can usually increase his salary 10% by devoting his spare time and interest in the continual education and training of his men in safety measures, and encourages him to persist in his instruction of the stupid and ignorant, as well as disciplining of the careless and disobedient. That such has been the case is shown by consideration of the number of bonuses which would have been paid in the two periods of 1913 and until Oct. 1, 1914, if such a monthly bonus rating had been operative for that entire period of time. During the first four months of 1913 eight bonuses would have been paid out of a possible 32, or the standing was 25% "hits"; and in the latter eight months of the year 26 bonuses would have been paid from a possible 64, or the standing was 40.7% "hits." During the first nine months of 1914 we have paid 46 bonuses out of a possible 80 and the record of achievement shows that our bosses are now succeeding 57.5% of the time, also that 29 times out of the 46 there were no disabilities or 36.3% of possible shots were "bull's eyes."





But a teacher rarely accomplishes much without the coöperation of his pupil, and neither will a boss be able to train his labor in safety methods without their interest; so the scheme was inaugurated in January, 1914, of making a monthly rating of the number of shifts of labor lost through accidents (rated per 1000 shifts of labor worked) in each gang of the underground and surface mining operations; and of that gang, respectively, having the best record each month each member was rewarded with a cigar, specially marked so as to denote that it had been given by the New Jersey Zinc Co., for excellence in safe work. Although our mine labor was about 90% of such nationalities as Russians, Poles, Slavs, Lithuanians and Hungarians, it was encouraging to note the pleasure and interest evinced by the men who received these cigars and their pride and understanding in regard to the matter. That this distinctive token means something to the men is shown by the fact that during the first nine months of 1914 there have been 29 gangs of the 80 underground gang-months who have won the cigars by a clean record with no loss of time through accident, although 26,289 shifts of labor were worked; and in addition there were 11 opencut gangs who won cigars, of which nine gangs had a clean record with 5839 shifts of labor. So there were 38 gangs of men in the mine during January to October, 1914, who worked 32,128 shifts in 232 working days, or the equivalent of about 138 men worked for nine months, grouped in gangs, without loss of time from accident. In 1913 there were about one-half as many gangs with perfect "no lost-time" records in 12 months, and less than half as many shifts of labor were included in these gangs; so there has been an improvement in 1914 of about 250% over 1913.

As a result of this personal stimulus there has been a conservation of the laborer's earning powers with profit to his home, and, on the other hand, the employer has greatly benefited because there have been fewer changes in the personnel of his plant with the consequent loss of time, production and efficiency.

In conjunction with the bonus schemes just described other means were taken to educate the men in safety and first-aid work, and to impress the men with the knowledge that the company was doing its utmost to protect them, and that in order to succeed they must use such safeguards as were furnished by rules, instructions and mechanisms. In the mining department a first-aid corps of eight members was formed by the appointment by the mine foreman of two new members bi-weekly to succeed two retiring members. This corps meets once a week to receive instruction from the company doctor and its members are paid their regular hourly rate for such time. At the end of the eighth week of service membership expires, and if the doctor considers a retiring member proficient the latter receives a first-aid badge as a mark of his eligibility to serve in the Workmen's Safety Committee. The above apprentice course does not pretend to fit a man for the handling of accidents in the mine and he is not given access to the emergency kits in the different shift-bosses' territories, but it does intend interesting him in the proper care of himself and others and not only furnishes an index of the men who will prove most helpful as an influence for good on the Workmen's Safety Committee, but also forms a basis for the organization of first-aid and rescue teams in the different territories so as to assist the shift bosses in the care of accidents. During the first nine months of 1914 there have been 41 qualified graduates of the first-aid committee and the formation of rescue teams is in hand, with the idea of training them so thoroughly as to warrant their access to emergency kits and care for the injured who come to their notice. These men will receive training in fire fighting, oxygen-helmet rescue work and competitive drills, and it is hoped that frequent prize competitions among themselves and with foreign plants will keep their interest alive.

Make-Up of the Workmen's Committee

The members of the Workmen's Safety Committee are appointed, two bi-weekly, by the head of the mining department and serve four weeks, holding weekly meetings with the department head, or his representative, to discuss the nature of the accidents which have occurred the previous week and to take a tour of inspection through some portion of the mine, thus devoting an entire shift. Suggestions are encouraged from the men, but probably the most important results are due to their education and prompting of interest in the protection of themselves and others, as well as to the subtle spur to the supervision of the bosses, caused by the inspection and possible criticism of their territories by a workmen's committee. Each member is active for four weeks and then exchanges his active badge (showing a red enamel border) for an exempt one (with a blue enamel border), but receives his usual pay for time devoted to active service; and is privileged as an active member to attend the scene of an accident, in the interests of safety work, when his absence from regular work does not cause injury to the company property or working operations. When any serious accident takes place, the Safety Committee visits the scene to discuss causes and remedies and the committeemen are asked to spread the news to the other workmen of how the accident took place so that they may profit by the example and, if the accident was preventable, avoid the same pitfalls. The exempt members of the Workmen's Safety Committee are requested to take an active interest in safety work and to contribute suggestions to the safety suggestion box, also to caution any workman endangering his own safety or that of anyone else.

MINE ACCIDENT RECORD FOR 1914

		R. J. Moyse	Wm Steer	Total Under-ground	Surface and Misc'l's	Total Open Cuts	Grand Total Mining
January	No. of accidents	10	3	11	0	1	15
	No. requiring loss of time	6	1	18	0	0	18
	Time lost by accidents	40 + (0)	19 + (0)	85 + (71)	0	0	85 + (71)
	Shifts labor worked	910 1	912 1	6817.1	665 2	1242 2	8724 5
	Lost time, accidents rated per 1000 shifts labor worked	6 60	B. 1 10	3B 2 64	0	0	2 06
	Time lost by accidents per 1000 shifts	43 90	10 97	12 46	0	0	9 75 *17 88
February	No. of accidents	5	4	13	1	4	18
	No. requiring loss of time	2	2	14 + 2F	0	1	15 + 2F
	Time lost by accidents	13 + (0)	2 + (0)	63 + 3F + (32)	0	1	64 + 3F + (32)
	Shifts labor worked	965 4	795 3	6295.6	620 2	1031 3	7947 3
	Lost time, accidents rated per 1000 shifts labor worked	2 07	2 52	1B 2 54	0	0 97	2 14
	Time lost by accidents per 1000 shifts	13 48	2 52	10 00	0	0 97	8 06 *12 [illegible]

* Time lost by accidents per 1000 shifts labor, including lost time caused by accident of previous months

The heads of departments are expected to make quarterly tours of inspection throughout the entire plant, accompanied if possible by a safety inspector from some other plant, and then hold a meeting to discuss any improvements and receive suggestions of practices elsewhere as noted by the department heads or visiting safety inspector.

Although we have hopes of supplementing this safety campaign by frequent stereopticon and moving picture lectures, showing safe and dangerous practices, we have not as yet found a sufficient supply of such material pertinent to metal-mining practices to insure the proper development of a series of lectures.

It is noticeable that our safety organization does not require the formation of a special safety department, but places the responsibility upon the heads of departments with the expectation that they will exhibit the same zeal in safety as they do in production. In this way are avoided many occasions of staff friction between operating and safety control; and the work of the company is accomplished more efficiently because there is no division of authority in any department, and because the head of operations is best qualified to select the proper time for taking safety measures without undue increase of floating gangs and without waste of time. The success of this scheme really depends upon the earnestness of "the man higher up," for if he requires of his subordinates the same interest and results in safety work as he expects in production, the returns will be comparable.

In order to work intelligently in the development of safety work, it is highly important that each department head have sufficient clerical aid to attend to the routine of bulletins, the abstracting of safety literature, and most especially the recording of all accidents with classification of their causes, of their disposition among the various gangs, and of the number involving loss of time and the amount of time so lost. Our system of recording accidents is as follows, and we feel that we have obtained, during 1914, knowledge of almost all the accidents, including trivial ones such as grazed knuckles, and are sure that at least 50% more have been reported than in the previous year.

Blanks are furnished to the shift bosses for them to fill out with the following information concerning injuries sustained by any workmen of their gangs. These show whether they were injured in company work or off shift, stating particularly if the latter condition existed, so that the company will have information to [illegible] fraudulent claims for injuries in their employment; and give name, pay-roll number, address, age, occupation, place where accident occurred, date and hour of accident, where taken after accident, supervisor of the work, witnesses, description of the injury, manner in which the accident happened, and suggestions as to how it might have been avoided. These reports are kept by the mine foreman, who investigates the matter and makes a copy of the report, which is then forwarded to the time office, where information is entered as to weekly wages, [illegible] rate of [illegible] time, nationality, length of time [illegible] been employed at the work in which he was injured, how long he had been in the service of the company, [illegible] to whether he was married or single; and the report is then sent to the main-plant office, where the above information is typewritten in duplicate on large accident-report sheets and these are supplied with the added information of the probable length of disability (shown by the surgeon's prognosis), and the actual time of disability shown on the pay-roll sheets, also the dates that claims and settlements are made and their amounts, also the dates and amount of "surgeon's charges," "hospital charges," "sundry charges," and "compensation," and the "total burial expenses" and "total expenditures" are finally given. One of these reports is kept on file in the main-plant office and the copy is sent to the main company office. The State of New Jersey requires the immediate reporting of accidents to the Department of Labor, at Trenton, on a special form.

Comparison of Mine-Accident Records 1912, 1913 and 1914

THE NEW JERSEY ZINC CO., FRANKLIN, N. J.

Analysis of Mining Dept. Accidents.	1912						1913						Jan.-Oct., 1914							
	Killed		Injured				Killed		Injured				Killed		Injured					
Number and per cent. of underground men killed or injured			Seriously		Slightly				Seriously		Slightly				Seriously		Slightly		Trivially	
By fall of rock or ore from roof or wall	3	75%	8	30.8%	57	17.5%	3	100%	4	22.2%	30	16.1%			3	27.3%	11	13.0%	33	7.8%
By rock or ore while loading at working face	.	.		.		...				...	7	3.8%					1	1.2%	1	0.2%
By timber or hand tools			4	15.4%	75	23.0%			3	16.7%	39	21.0%			1	9.1%	18	21.2%	121	28.7%
By explosives			1	3.9%	2	0.6%			2	11.1%	1	0.5%			2	18.2%	1	1.1%	1	0.2%
By hauling (mine cars, locomotives, breaking of rope, etc.)			5	19.2%	47	14.4%			5	27.8%	29	15.6%		.	2	18.2%	12	14.1%	69	16.3%
By falling down chute, winze, raise, stope, etc	1	25%	3	11.5%	10	3.1%			1	5.6%	6	3.2%	1	100%	1	9.1%	13	15.3%	16	3.8%
By run of ore from chute or pocket			5	19.2%	98	30.1%			1	5.6%	49	23.6%		.	1	9.1%	12	14.1%	92	21.8%
By drilling (machine or hand drills)			.	.	28	8.6%					15	8.1%		. .			11	13.0%	34	8.2%
By machinery (pumps, hoisting engines and haulage)				. .	4	1.2%			1	5.5%	7	3.8%							..	.
By stepping or falling on nail or spike				. .		. .					1	0.5%					1	1.1%	5	1.2%
By sledging chunks and mucking					5	1.5%			1	5.5%	2	1.1%			1	9.0%	5	5.9%	50	11.8%
Total	4	100%	26	100%	326	100%	3	100%	18	100%	186	100%	1	100%	11	100%	85	100%	422	100%
Rate per 1000 employes on 300-day-year basis	14.55		94.6		1188		9.03		54.2		560		3.86		42.5		328		1630	
Per cent. decrease in underground accident rates							38.0%		42.7%		52.9%		57.3%		21.6%		41.4%		...	
Number and per cent. of surface men killed or injured																				
By falls or slides of rock or ore	1				2														1	2.4%
By haulage (cars, locomotives, etc.)																			6	14.3%
By falls of persons	1								2										7	16.7%
By timber or hand tools					4						2						1	14.3%	20	47.6%
By drilling																	1	14.3%	3	7.1%
By mucking															1		5	71.4%	5	11.9%
Total	2	100%			6	100%			2	100%	6	100%			1	100%	7	100%	42	100%
Rate per 1000 employees on 300-day year basis	133.3				400				41.4		133.2				14.7		103		617	
Per cent. decrease in surface accident rates							100%				66.7%				67.0%		22.6%		..	
Grand total mining	6		26		332		3		20		192		1		12		92		464	
Total mining rate per 1000 employees, 300 days	20.70		89.70		1145		7.96		53.10		509		3.06		36.70		281		1420	
Per cent. decrease in total mine accident rates							61.6%		40.8%		55.5%		61.6%		30.8%		44.8%			
Number of accidents without disabilities and total accidents	131				495		359				571		464				569			
Rate of total accidents per 1000 employees, 300 days	1707						1222						1740							
Number of days mine was operated	300						307						232							
Average number of men underground per day	275						324						335							
Average number of men, day, surface, excluding office	15						44						88							
Length of working shift in hours	10						10 from Jan.-June; 8 from July-Dec.						8							

The shift bosses are also equipped with forms admitting men to hospital service and these they fill out with the date, name, pay-roll number and occupation of any man injured in company work, no matter how slight the injury. In case of serious injuries first-aid is given, stretchers are employed if necessary, and the injured men are sent to the hospital in the company's ambulance. However, if the injuries are so slight as not to incapacitate the men, bandaging is performed by the shift boss (who carries in a tin tube on his person sterile roller bandages and gauze pads) the men receive their hospital slips at the end of the shifts. Since the hospital has dispensary hours at night as well as day, it is possible for men to report there for the inspection and dressing of wounds without interfering with attendance to work, and the shift bosses permit no men to return to work until they bring hospital discharge slips from the company surgeon, bearing the dates when they are considered fit for work. Thus the responsibility for the cleanliness of wounds, however slight, and resulting cases of blood poisoning, is placed where it belongs, directly upon the surgeon, and he has control over the injured men, since they cannot get work until he has had an opportunity for a final examination of their injuries and has formally discharged them. The shift bosses' supervision of the steadiness of their workmen is also aided, as they can note whether men have stayed away from work longer than their injuries warranted and can fairly exercise such discipline as seems proper. This system of reporting accidents seems quite efficient, for the shift bosses do not rely solely upon the voluntary report of their men, but also question and report any man who exhibits an injury, and if a man fails to report his injury it usually becomes known ultimately and results in the severe disciplining of such man by laying off from work for a period of time or else by his dismissal.

In classifying accidents as to their causes, we have adopted the heading employed by the U. S. Bureau of Mines in its accident reports, and the accompanying table shows the comparison for 1912, 1913 and the first nine months of 1914, during which period we have amplified its classification of "Killed," "Seriously Injured" (with disability of 20 days or more), and "Slightly Injured" (with disability of from 1 to 19 days), by the added group of "Trivially Injured," which includes all accidents in which men returned to work the day following the accident. It should be noted that two systems of safety work have been tried since 1912, as has been previously described, and the results have been very gratifying, for in 1913 the decreases in accident rates per 1000 men employed for a year of 300 days were as follows:

	Fatal. per Cent.	Serious. per Cent.	Slight. per Cent.
Underground mining............	38	42.7	52.9
Surface mining..................	100	(Increase)	66.7
Total mining	61.6	10.8	55.5

Since the changes in safety organization made at the beginning of 1914, the results have been still more gratifying, for the accident rates now show a considerable decrease from those in 1913 as the following percentages demonstrate.

Decrease of accident rates in the average of the first nine months of 1914, as compared to the average of 1913:

	Fatal. per Cent.	Serious. per Cent.	Slight. per Cent
Underground mining............	57.3	21.6	41.1
Surface mining............	(None possible)	67.0	[illegible]
Total mining....................	61.6	30.8	44.8

But still more marked is the reduction of accident rates shown by comparison of 1914 with 1912, and it should be remembered that the comparison would be more marked if the figures for the period of safety work did not include the first four months of 1913, when such work had not been inaugurated, and if the safety movement had been in progress for a period of time longer than 17 months.

The following percentages exhibit the decrease of accident rates, as based on 1000 employees for a 300-day year from December, 1912, to October, 1914:

	Fatal. per Cent.	Serious. per Cent.	Slight. per Cent.
Underground mining ..	73.7	55.2	[illegible]
Surface mining	100	(Increase)	71.3
Total mining	87.2	59.2	[illegible]

It is possible that some credit for the above reduction in accident rates is due to a change in July, 1913, from a 10-hr. to an 8-hr. working shift, with a chance of a laborer becoming less fatigued and careless from such a condition, but on the other hand, the system of reporting accidents now is so improved over the old methods that the actual decrease in serious and slight accidents must have been even greater than the above figures indicate.

In order that the mine foreman and his assistants may be conversant with the causes of accidents which need the most attention, they keep a chart showing a list of the various classifications with columns ruled for the shift bosses, and so keep an open list for each month of the fatal, serious, slight and trivial accidents credited to each boss' supervision. Such information is summarized on sheets and the percentage of various accident causes shows "falls of rock or ore" to be the most serious, with accidents from "haulage or tramming" next in importance, and the "falls of persons down chutes, raises and stopes" third.

The "handling of timber and hand tools" has sometimes been a source of serious accident, but plays a more important part in the causing of slight injuries, where it is rivaled by "runs of ore from chutes and pockets" and by "drilling operations." These respective positions of importance compared very similarly to those noted by the U. S. Bureau of Mines, as applying to the metal mines of the country, and we are gratified that at last our fatality rate has fallen to 3.06, a point below the average of either the coal- or metal-mining industries, whose rates were quoted as 4.36 and 4.09, respectively, for 1912, which is the latest for which the Bureau of Mines has published figures. It is only fair to the record of fatalities and serious injuries to call attention to the fact that this mine is an orebody which possesses the peculiar and unusual condition of a state of internal stress, so that ground which appears and sounds solid to all tests will suddenly crack with an explosive noise and will fall in masses from a fraction of a pound to many tons in weight, therefore the accidents from "falls of ore and rock" are extremely hard to control.

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Nickel-Plating Aluminum

A communication has recently been presented to the Academie des Sciences by M. Le Chatelier, in which the author states that he has succeeded in nickel-plating aluminum, hitherto unaccomplished. This has considerably prevented the extension of employment of this metal, which lends itself to so many purposes, since its dull appearance, especially after prolonged use, has been much against it. The difficulty has been surmounted by a preliminary scouring of the aluminum in a bath of hydrochloric acid containing iron. The iron precipitated on the surface of the aluminum forms a [illegible] and when the [illegible] metal is then [illegible] the nickel becomes [illegible] in this [illegible] firmly to the aluminum.

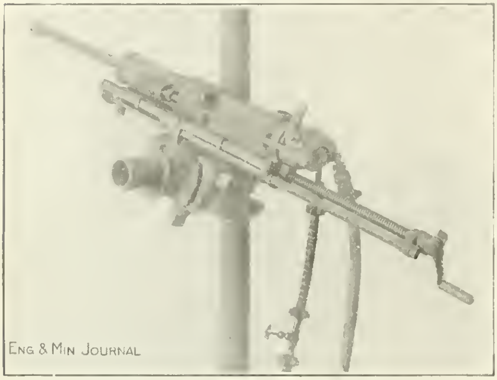
Modern American Rock Drills--VIII

By L. O. Kellogg

SYNOPSIS--Sullivan Machinery Co. now making a mounted hammer drill, hand-fed, with water attachment. Rotation effected as in Sullivan rotating plugger.

⁂

Since this series of descriptions was begun, the Sullivan Machinery Co. put on the market a mounted hammer drill with water attachment, which is more nearly comparable with the Leyner than with any other model. It uses the same system of rotation as does the Sullivan automatically rotating plugger, also recently brought out, and described in Part VII of this series. It differs, however, from this rotating plugger or sinker in several particulars, especially in its valve action, and to some extent, in the system of water control, in the arrangement of the front-head parts, and in the lubricator, as well as in the particulars arising from the difference in type.



Sullivan Mounted Hammer Drill

The valve is a hollow, axial, spool valve set at the back of the drilling cylinder, similar in appearance to that of the DA-21 Sullivan stoper, described in Part VI. In its action, however, it corresponds more closely with the DA-15 and the DC-19 machines of the same company. The valve proper works in a valve box and a valve-box cover, the several ports being contained in these last two parts. These three parts are held against the back end of the cylinder by the back head. The port *D* in the valve-box cover is subject to constant pressure, and the back end of the valve is turned down to a slightly smaller diameter at *F*. By this means, a differential pressure is obtained, tending constantly to force the valve forward to the position shown in the illustration.

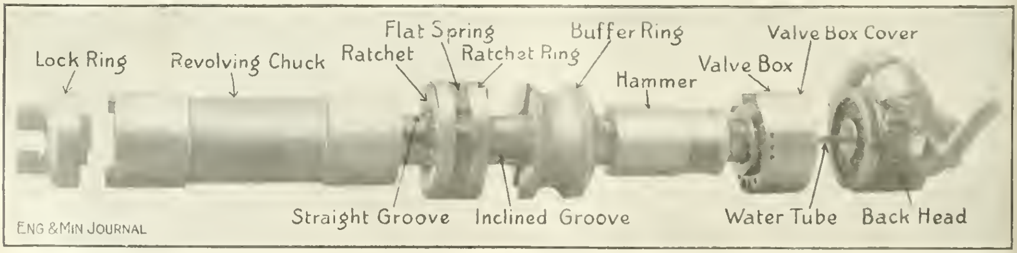
There is a groove, or spooled-out portion, in the main part of the hammer; as the hammer moves forward on its useful stroke, this groove establishes communication between a constant-pressure port in the cylinder wall and an intermittent-pressure port in the cylinder leading to the port *E*. The valve area thus subjected to backward pressure is greater than that subject to forward pressure so that the valve is thrown back, reversing the air supply and consequently the direction of movement of the hammer.

The rear end of the hammer is reduced in section to enter the valve itself and is grooved longitudinally to cushion its return. The same device is employed on the hammer of the DA-21 stoper.

All the exhaust takes place through the port along the top of the cylinder wall; this connects with a large radial port tapped to take an ell which will deflect the blast of the exhaust as may be desired.

The air-and-water control is ingenious; it is effected with a single throttle valve. This in its first position admits air to the drill steel only and thus to the bottom of the hole. In its second it admits both air and water to the steel. In its third it admits air to the valve and cylinder so that the hammer reciprocates, the air and water-supply to the dull steel being maintained. In closing, the action is just reversed. Thus the bottom of the hole is thoroughly cleaned by water and air, and then by air alone, just after drilling stops. This obviates the danger that water may find its way into the cylinder.

The operation of the water and air control is as follows: As the throttle is turned to start the machine, live air is admitted to the port *C*, and thus to the port *B*, then around the nozzle and into the end of the water tube, which extends through the machine and into the shank of the drill steel in the usual manner. The water is admitted through suitable passages to the space under the gland plug cap, and then passes through the port *A* to the nozzle, where it is taken up by the air from the port *B* and carried into the water tube along with it. This admission of the water is also controlled by the throttle valve. A final turn of the throttle connects the air supply with the ports to the spool valve.



Rotating and Striking Mechanism of Sullivan Mounted Hammer Drill

The lubricator is also situated in the back head. In its general principles it resembles other Sullivan lubricators, such as that used on the automatically rotating plugger, but it is set somewhat differently and differs in its shape. Two small check valves working in opposite directions communicate with an oil chamber on one side and are subjected to pulsating air pressure on the other, so that oil is drawn out and into the air current, thus circulating through the machine. The oil plug for filling this chamber is at the top of the back head.

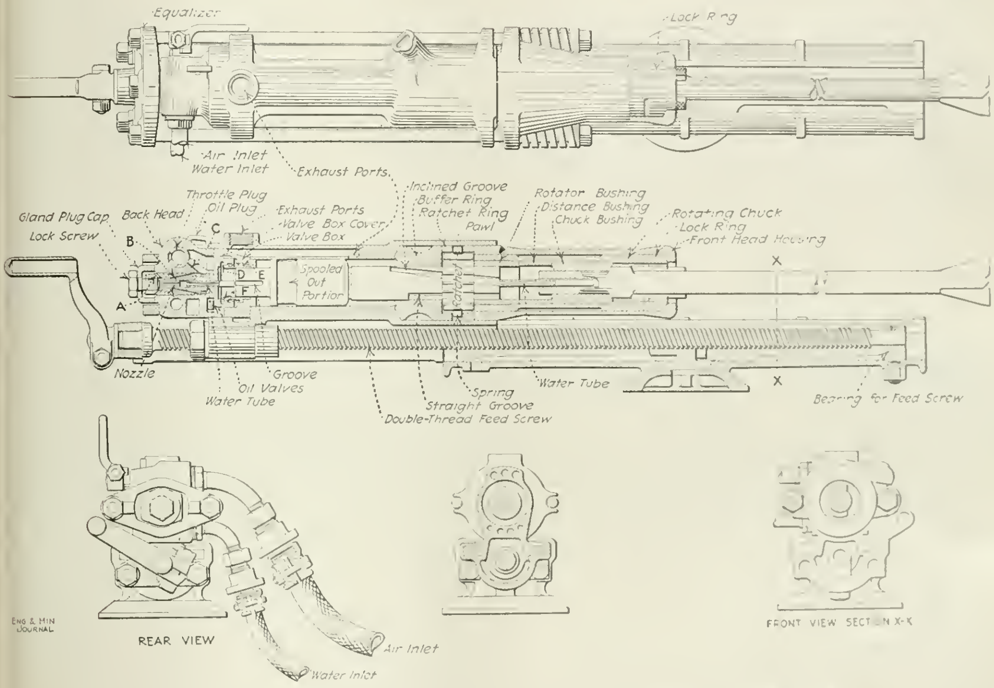
The front end of the hammer is of smaller section and in it both straight and inclined grooves are machined, which operate to rotate the steel just as in the case of the rotating plugger. Most of the front-head mechanism is contained in a housing which fits under the forward end of the cylinder. This housing bears against the ratchet ring, the ratchet ring bears against a buffer ring, and the buffer ring in turn bears against a shoulder on the inside of the cylinder itself. The chuck revolves in the front-head housing, and itself contains a chuck bushing for the shank of the steel, a distance bushing, and at the back a rotator bushing to engage the straight grooves of the hammer.

The hollow drill steel used has a lugged shank, which is held in the chuck by a lock ring. After inserting the steel the two projecting knurled lugs of this lock ring are twisted with the fingers, and the steel is thus fastened in the chuck.

The front head, cylinder and back head are held together with side rods in the usual manner, the helical springs being applied at the front end, while an equalizer across the back bears on the back head. There are grooved lugs on the sides of the cylinder, in which the side rods fit, thus holding the back head and chuck housing in alignment with the cylinder.

It will be noted that the cross-section of the machine is made as small in its overall dimensions as is possible. This is in order that it may be set close to the rock sides or the back when drifting, or when doing other close work.

The water-supply is obtained either from a gravity head, a pump, or from a tank under air pressure, as in the case of the Sullivan piston machine with water attachment and the Leyner.



Plan, Sections and Elevations of Sullivan Shell-Mounted Hammer Machine

The machine weighs 115 lb., has a 2¼-in. working stroke and a cylinder 2½ in. in diameter.

(To be concluded)

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Embargo on Italian Exports

According to press dispatches the Italian Government has placed an embargo on the export of the following among other commodities: Coal, petroleum, benzine, glycerin, lubricants, copper, aluminum, lead, silicon, sodium nitrate, sulphuric acid, nitric acid, calcium carbide, acetone, sulphuric anhydride, picric acid, and sodium carbonate.

⁂

Pitchblende Is Now Being Mined in India at [illegible] in the [illegible] district, in the province of [illegible] by M. C. A. Crane, of Bombay. The pitchblende [illegible] small quantities in a deposit of pegmatite which [illegible] mined for mica.

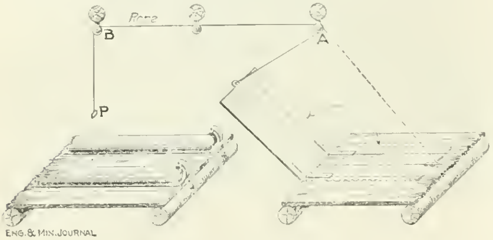
Details of Practical Mining

Safety Door for Dump

By H. H. Hodgkinson*

Underground trammers will persist in leaving open the doors over ore chutes, exposing others to the danger of falling in. Often the chutes are in the main traveling roads, the cars dumping between the rails. Such places should always be provided with doors, and they should be closed when not in use.

A piece of ¼-in. iron plate 22x42 in. will make a handy door between the rails when a 2-ft. gage track is used. A piece of ⅜-in. hemp rope about 18 ft. long and two small pulleys will not only save time and make it easier for the men pushing the cars to open and close the doors, but will help them to remember that they must do it. The arrangement is shown in the accompanying sketch.



A Safety Door for Dumps

By pulling the rope at *P* with a quick jerk, the door will swing all the way back and rest on the platform, and when in the latter position another jerk at the rope will close it.

Pulley *A* is directly over the hinges of the door and is fastened to the cap of a timber. Pulley *B* is also fastened to a cap about 12 ft. from *A* directly over the center of the track. The rope at *P* hangs down in the center of the track and is low enough to touch the trammers on the shoulder. The rope should always be long enough to enable the trammers to open the door just before they reach the dump, thus avoiding delay.

*

Copper Country Sand Filling

Sand filling has proved successful in the Copper Range group of mines in Michigan, it having been demonstrated conclusively that it is economical and safe. While particularly adapted to Copper Range conditions, several other mines of this district are contemplating installing the system. The Quincy already is making experiments to test its feasibility. It is figured that the method will not only make a large saving in timber costs but will help to prevent air-blasts. In the Copper Range mines the system has largely replaced the rock-filling method which Manager Denton introduced at the Champion mine some years ago, and which has come into rather general use, more or less modified, at various properties where good rock-pickers could be secured.

Record of Temple-Ingersoll Drills on the Mesabi Range

For five months, during 1913-14, some interesting drilling was done at the Virginia mine on the Mesabi range, under the direction of J. H. Eby, at that time superintendent. The machines used were Type 5-F Temple-Ingersoll drills, on tripods. It may be well to recall here that these drills employ both air and electricity in their operation, but not in the manner of some other electric air drills. The air is not used once and exhausted, but constitutes the manner of transmitting the electric power. The air circuit is a closed one, the air being returned for use again, excepting that small portion that escapes through leakage. The drill is connected to a separate carriage, holding the pulsator and motor, by two lines of air hose, acting as the supply and return lines.

At the Virginia mine the drills were operated on a 220-volt three-phase alternating current. They were manned by a runner, at $3 per day, and two helpers at $2.40 per day each. All the holes drilled were over 10 ft. deep and the majority over 24 ft. deep. Some of the holes were vertical and some were as flat as 5° from the horizontal. Incidentally, according to Mr. Eby, experience proved that cruciform steel was best adapted to the work, the great difficulty being in keeping the holes clear of sludge. The material drilled varied from soft hematite to extremely hard taconite. In the latter rock, three hand drillers, two striking and one turning, with an ample supply of sharp steel could drill not over 1 ft. per hr. Fissured ground was common, and the ore was exceedingly irregular, with hard seams in the soft ore. The softest ground was the most difficult to drill because of fissuring and caving.

The following tables show the data obtained from five months' operation:

TABLE 1—HOLES DRILLED

Number	818
	Feet
Solid taconite	826
Fissured taconite	402
Hard ore, solid	2346
Hard ore, fissured	518
Soft ore, solid	3875
Soft ore, fissured	1130
Total	9097

TABLE 2—TIME DRILLING

	Hours
Machines in place	1465
Delays, long moves	39
Power off	140½
Dull steel	11½
Bad order of machines	56
Net working time	1218

TABLE 3—COSTS

Labor	$1183.73
Repairs	25.00
Power	68.10
Total	$1276.83

Cost per foot, 14c.

The cost of drilling the same footage by hand on company account would have been 29c. per ft. This figure was obtained from four years' costs of the same class of work and covering the same amount of each class of material, but not taking into account the flat holes that could not be drilled by hand. These costs indicate a saving of 15c. per ft. by the use of this drill. Mr. Eby makes the interesting statement that it requires as much skill, if not a little more, to operate and properly handle this drill as it does any other. The costs given above include all the troubles incident to securing competent crews to handle the machines, and he believes that if operated regularly as efficiently as these were during the last month of work, the cost per foot could be reduced still further, perhaps to as low as 11 cents.

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*Mining engineer, Franklin Furnace, N. J.

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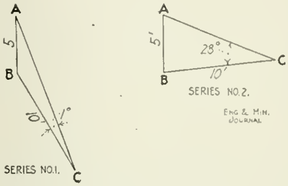
Triangulating from Two Plumb Wires

By Albert G. Wolf*

In carrying the bearing forward from two plumb wires in shaft plumbing, two methods are used. In one the transit is set up directly in line with both wires; in the other it is set to one side of them, the distance from the transit to each wire and the horizontal angle are measured and the triangle is calculated. In the first method the number of measurements is less than in the second and calculations are eliminated, but as a rule it takes longer to make the set-up. It is not the purpose of this discussion, however, to argue the respective merits of the two methods, but to point out the conditions under which the triangulation method can be used, when necessary or desired, with the least liability to error.



Diagrams of Two Methods of Setting Up

It is evident that a triangle with a small angle at the instrument, this angle small by reason of the instrument's being nearly in line with the two wires, not, however, at a great distance from them, will give the best results. If the instrument is in line with the two wires an error in chaining will make no difference in the bearing, as no horizontal angle is involved. To show exactly the relative errors involved, two series of triangles of three each have been assumed and errors in azimuth calculated for assumed errors in measurement of the various parts of the triangles.

In the first series the following assumptions have been made: Distance between wires, 5 ft.; short leg of triangle, successively, 10 ft., 25 ft. and 50 ft.; angle at instrument, 1°. In the second series: Distance between wires, 5 ft.; short leg of triangle, 10 ft., 25 ft. and 50 ft.; angles at instrument, 28°, 11° and 5°, respectively. The vertex angles of isosceles triangles with 5-ft. bases and sides 10, 25 and 50 ft. would be 28° 57′ 18″, 11° 28′ 42″ and 5° 13′ 51″, respectively, so it can be seen that the angles assumed in the second series approach nearly the maximum for triangles with the base and short side assumed. Errors of measurement assumed in each side are 0.02 ft. and in the angle at the instrument, 30″. The result in error in azimuth is calculated for each assumed error in measurement separately and the results are tabulated.

An inspection of the table shows that a small error in measuring either leg of a triangle in the first series makes an immaterial difference in azimuth, while in the second series an equal error in measuring makes an appreciable difference from the true azimuth. An error in measuring the angle at the instrument or the distance between wires, in either series, makes a large error in azimuth, but the error in a triangle of the first series is smaller than the error in a corresponding triangle of the second series. Now, referring to the first series of triangles only, it can be seen that the distance from the instrument to the wires makes no appreciable difference in the error in azimuth when an error in measuring to the wires is [illegible], but an error in azimuth caused by an error in measuring either the distance between the wires or the angle at the transit increases rapidly as the distance from the instrument to the wires increases. In any [illegible], therefore, [illegible]

ERRORS IN AZIMUTH, RESULTING FROM ERRORS IN MEASUREMENTS IN TRIANGULATION PLUMBING

Series No. 1. Triangle with Small Angle C

Error assumed In			0.02 ft. Short leg	0.02 ft Long leg	0.02 ft Base line	30″ Angle measured at C	
Short Leg	Lengths of Sides Long Leg (Calculated)	Base Line	Resultant Errors				
10 ft.	14.9954 ft.	5 ft.	in A = 14.4″ in B = 14.4″	in A = 2′ 7[illegible] in B = 43.1″	in A = [illegible] in B = 1′ [illegible]	[illegible]	C = [illegible] A = [illegible] B = 17[illegible]
25 ft.	29.9771 ft.	5 ft.	in A = 14.5″ in B = 14.5″	in A = 1′ 12″ in B = 1′ 26.5″	in A = 2′ [illegible] in B = 3′ [illegible]		C = 1[illegible] A = [illegible] B = 17[illegible]
50 ft.	54.9157 ft.	5 ft.	in A = 14.6″ in B = 14.7″	in A = 2′ 25.7″ in B = 2′ 40.5″	in A = [illegible] in B = [illegible] 35.7″		C = 1[illegible] A = 10[illegible] B = 10[illegible]

Series No. 2 Triangle with Large Angle C

Error assumed In			0.02 ft. Short leg	0.02 ft Long leg	0.02 ft Base line	30″ Angle measured at C	
Short Leg	Lengths of Sides Long Leg (Calculated)	Base Line	Resultant Errors				C = 28° [illegible]
10 ft.	10.5498 ft	5 ft	in A = 18′ 54.2″ in B = 19′ 37.5″	in A = [illegible] in B = [illegible]	in A = [illegible] in B = [illegible]		C = 2[illegible] A = [illegible] B = [illegible]
25 ft.	26.039 ft	5 ft	in A = 8′ 47.6″ in B = 24′ 9.2″	in A = 12′ [illegible] in B = 1° 16′ [illegible]	in A = [illegible] in B = [illegible]		C = 11° [illegible] A = 7[illegible] B = [illegible]
50 ft.	52.2612 ft	5 ft.	in A = 2′ 26.8″ in B = 22′ 54.6″	in A = 24′ 11.8″ in B = 2[illegible] 7.7″	in A = [illegible] in B = [illegible]		C = [illegible] A = [illegible] B = 11[illegible]

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*Mining engineer, Buckhorn, Nev.

tween wires at the collar of the shaft, or point of suspension, and at the level of the set-up. The error in measuring the angle is reduced to a minimum by repeating the measurement and taking the average. An error in taping either of the legs of any triangle as large as the error assumed is not liable to be made if the work is checked and care is taken to hold the tape level.

In conclusion, the set-up least liable to result in an error in azimuth in triangulating from two plumb wires is one near the wires and in such a position that the horizontal angle measured at the transit is small.

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Electro-Percussive Welding

A paper on this subject by C. E. Skinner and L. W. Chubb, of the Westinghouse company, was presented at the twenty-sixth general meeting of the American Electrochemical Society, held on Oct. 12 and 13, at Niagara Falls. The paper states that in the process of electro-percussive welding two wires are welded together by causing a condenser discharge to pass between the ends of the wires in the moment when they are pressed together by mechanical force. The generation of the heat is so localized, so sudden, and so intense, that there is no time for unequal heat conduction through the shanks of the wire, and the ends will be melted and even vaporized whether the melting point is high or low. For this reason metals of different kinds can be welded together independent of their electrical resistance, melting point, or heat conductance.

Any combination of metals which has ever been tried will weld together, but the joints will not be permanent with such combinations as aluminum and tin or lead and iron. Many alloy metals are hard and brittle. As an example, there are alloys near both ends of the copper-aluminum series which are unworkable, and yet electro-percussive welds between these two metals are so ductile that they may be worked in a die, forged, or rolled into thin foil. Any alloy formed at the weld must range from 100% copper on one side to 100% aluminum on the other; but possibly the brittle combinations are so thin that the joint as a whole is flexible and ductile. This joint between aluminum and copper is of great importance, as copper lead wires, which solder and connect easily, can readily be attached to aluminum coils.

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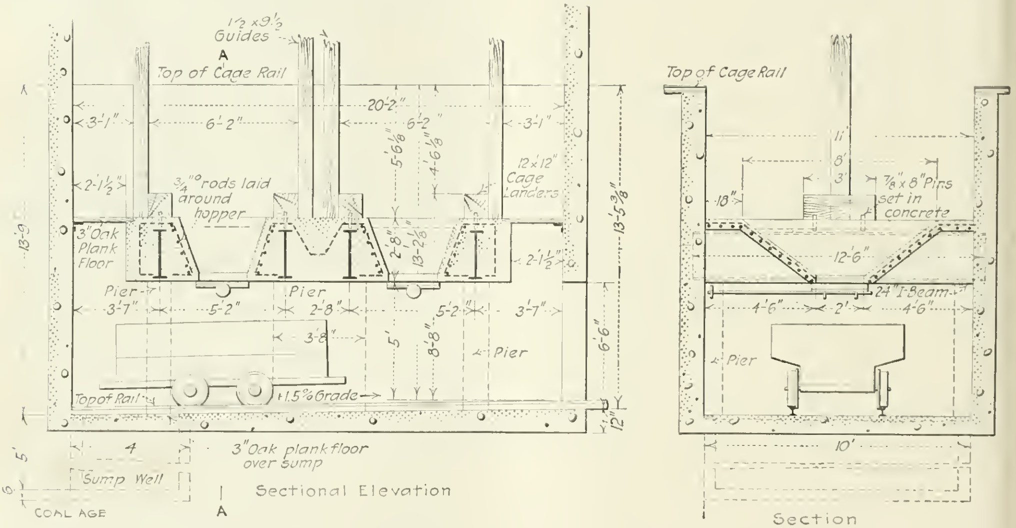
Débris Hoppers under Shaft Hoisting Compartments

The main shaft of the Bunsen Coal Co., of Danville, Ill., contains two hoisting compartments (*Coal Age*, Nov. 7, 1914). The shaft is vertical, of rectangular section, 20 ft. 2 in. by 11 ft., 204 ft. from collar to bottom level, with a 21-ft. sump below this.

The hoisting compartments terminate below in a horizontal concrete and steel partition, constructed as shown in the accompanying illustration. This is in the form of a double hopper and below it sufficient room is left to permit a standard car to be run in. A heavy steel sliding gate at the bottom of each hopper is operated by means of a chain and wheel at the side of the sump. By this means the accumulated droppings from hoisting operations can be run out as desired into a car. When a car is filled it can be pulled by motor through a concrete-lined tunnel on a sharp incline up to the haulage road.



LONGITUDINAL AND TRANSVERSE SECTIONS OF SUMP UNDER MAIN SHAFT

The walls and floor of the sump are of concrete 12 in. thick. At the low end of the sump bottom, extending across the full width of the shaft, is a well 4 ft. wide, which catches all seepage water and provides ample room for a pump-suction line.

⁂

A Refractory Furnace Lining may be made from asbestos and water-glass, according to the "Brass World." It is useful for patching or plugging cracks, as it does not crumble as readily as other similar compositions made from clay. The materials used are fine asbestos, 40%, and sodium water-glass, 60%. The asbestos and water-glass are mixed to a paste with water so that it can be worked.

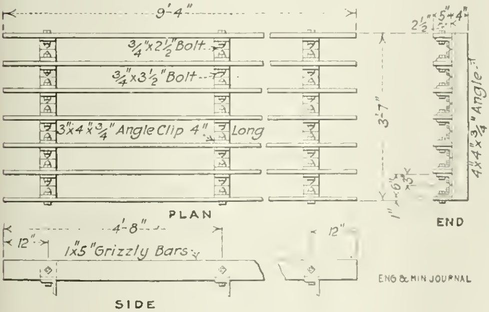
Details of Milling and Smelting

A Handy Grizzly for Heavy Work

By Kenneth C. Browne*

I designed a grizzly for a mine in northern New York to handle the run-of-mine ore which was dumped from a skip to the upper end of the screen, inclined at about 35°, the oversize at the lower end being fed to a 15x24-in. Blake-type crusher. This screen was subjected to blows from chunks of ore weighing sometimes 100 to 150 lb., and falling approximately 2 ft., but after long service showed none of the faults of the usual types.

This design can be applied to any similar condition, but in this case the screening area was approximately 4 ft. wide and 9½ ft. long on the incline, and the spaces in the screen were 6 in. in width. Previous experience demonstrated that with these wide spaces on the old-type grizzly, with rods passing through the center of the bars, these rods arrested the progress of the ore and often caused pieces to pass over the screen which should have gone through, and the result was reduction of screening capacity and quick destruction of the rods. Therefore such obstructions were eliminated as far as possible, the bars being supported from beneath, which reduces the above mentioned effect more and more as the bars are made higher and materially increased the screening efficiency.



Grizzly for Heavy Work

We used seven bars of 1x5-in. soft steel 9 ft. 4 in. long, giving a screen 9 ft. 4 in. by 43 in. over all. Careful work in the machine shop was necessary, but no difficulty was encountered in constructing or in assembling this screen in place. Three extra-heavy angles, 4x4x¾-in., were used for transverse members, being cut to proper length to drop into the screen area, and serve simply to hold the bars in their proper respective positions. The whole grizzly remained in place due to its weight, being supported at the upper end by a timber and at the lower end by a rail abutment which also prevented longitudinal motion. The construction of the grizzly is shown clearly in the drawing. It was put together entirely with ¾-in. bolts to allow ready replacement of any part.

We found it possible to replace bars in a short time, and by boring the bars accurately from a template they can be turned over or reversed end for end, or both, removed and straightened, and in almost every case the 5-in. bars could be worn down to 2 in. in height between the supports before discarding. Bars worn so badly as to be materially weakened were often replaced by new ones in the center and the worn ones put at the side where the strain was less. Angle clips and angle supports were readily replaced and new bolts inserted at a moment's notice.

This screen never lost its shape, and the spacing of the bars always remained correct. Repairs were few, and at the end of a year the screen had handled about 100,000 tons and was giving good service with some of the original parts still in use.

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*Mining engineer, New York City.

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Bosh of Lead Furnaces

With respect to the angle of bosh in lead blast furnaces, discussed by Irving A. Palmer in a paper before the Salt Lake meeting of the American Institute of Mining Engineers, L. D. Anderson of Midvale, Utah, comments in the November *Bulletin* as follows:

> A rebuilt furnace of only 10° or 11° of bosh has been running beside furnaces having the old angle of over 20°. As far as observed, the new furnace seems to run much better and obtain a larger percentage of the lead contents as direct bullion output. The matte fall, however, is considerably smaller, and it is necessary to carry more sulphur on the charge in order to maintain this fall high enough to insure clean slags. Judging from slag analysis and percentage of matte fall, the narrow furnace burns off half and even more of the sulphur as SO_2, as compared to a third or less for the wider furnace. In these instances, both furnaces are 48 in. at the tuyere, the difference in width being in the stack. The narrow furnace would appear to be superior to the wider furnace in that it has less tendency to form awkward hanging crusts, its crucible stays hotter and, considerable heat being supplied by the combustion of sulphur, a noticeable saving in fuel consumption can be effected. These remarks apply to rather coarse charges; for fine charges the difference would not be so marked.
>
> The matter of the correct furnace shape is yet far from being settled. Every metallurgist has undoubtedly noticed that often after a furnace has been in blast for some time its work improves and its slag becomes surprisingly clean. Furnaces have been observed with crusts in them so heavy as to make it almost imperative to take them out of blast, yet they produced slags so clean as to make the metallurgist reluctant to disturb them, until finally blowing out became necessary on account of reduced tonnage. Experiences of this kind lead to speculation as to whether better reductions might not be obtained by making the shaft walls converging instead of diverging, somewhat after the lines of the iron blast furnace. In other words, why not make the furnace of the ideal shape at the outset, instead of waiting for it to form its own "natural" shape, and running all the chances of irregularity in the formation of the crust?

Mr. Palmer's remarks on the desirability of a freer exchange of blast-furnace experiences were [illegible] seconded by Mr. Anderson. Independent [illegible] are freely visited by officials of the [illegible]

The industry as a whole suffers from a policy of uncommunicativeness. The handling of the blast furnace, after all is said and done, becomes finally a matter of personal judgment: exchange of ideas on details can therefore have scarcely any effect on competition.

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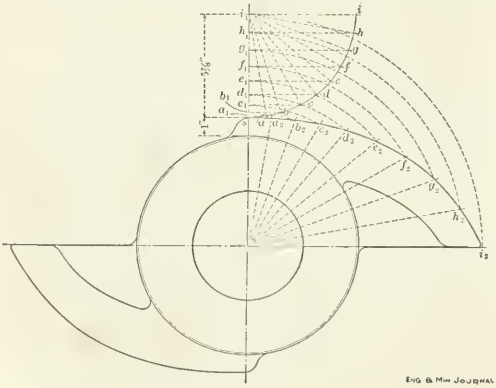
Improved Cam for Stamp Mills

An improved form of cam for use in stamp batteries has been designed by Arthur B. Foote, of Grass Valley, Calif., and described in *Bull. of A. I. M. E.,* December, 1914. The cam at present in use lifts the tappets with an involute form of curve, to which the surface of the tappet is always tangent. Moreover, the line of contact between tappet and cam, if produced, would pass through the center of the stamp. While this is a desirable feature, the inventor had believed that it would be more desirable if the cam were to pick up the stamp without shock, and gradually increase the upward velocity throughout its movement. The involute cam attempts to impart instantly a high upward velocity to the stamp, starting it from a state of rest, and the result is a destructive blow, a good deal of noise, and much wear and vibration.

The new form is one which is designed to lift the stamp with a motion similar to that of the piston of an engine between the end and middle of its stroke; in other words, harmonic motion, from the point of zero to maximum velocity. The curve will give this ideal motion only when the stamp is set for the exact drop for which the cam was designed, but the improved cam will not be as bad as the involute until the drop is reduced one-half. In other words, if a cam is designed for a 6-in. drop, it will be some improvement over the usual form of cam until the drop is only 3 inches.



IMPROVED STAMP-MILL CAM, WITH INVOLUTE CURVE

Any cam, of course, must lift its stamp in the same number of degrees of revolution, and therefore this new form, starting the stamp slowly, must end up by going faster, the average speed being the same. With this design, the surface of the tappet is not tangent to the surface of the cam throughout the lift. The possible consequences of this were studied with a full-sized model, and did not seem serious, since the engagement between the surfaces was an easy sliding motion instead of a blow. If the drop is shortened, the blow becomes more and more pronounced, but the surfaces also become more and more nearly tangent.

Five cams of this design have been running in one of the mills of the North Star Mines Co. for over a month, fulfilling every expectation. Holding the hand on the tappet it is impossible to feel the cam strike it, although the mill is running 107 drops per minute.

The accompanying drawing shows the method of laying off the curve of the cam, which will give approximately harmonic motion to the stamp. The spaces sa_1, a_1b_1, b_1c_1, etc., represent the distances traveled by the cam in equal intervals of time.

⁂

Desilverizing Copper Matte with Lead

Desilverizing copper matte in a metallic lead bath is an old process not often encountered in these days of converting plants and electrolytic refineries. The process depends upon the decomposition of the silver sulphides and the absorption of the silver by the lead. It was seldom completely accomplished in one operation, the "smelting-in" being usually repeated two or three times. The description by Manuel Eissler[1] of the process as practiced at the Tsubaki works in Japan is interesting.

At the Tsubaki mine there is a large body of silver ore which contains some lead, silver sulphide and metallic silver. This silver ore is smelted principally with copper ores purchased from outside mines. The imported copper ores contain about 4% of copper and 45% of sulphur. The first matte obtained from the blast furnaces contains about 20% of copper.

The matte is drawn from the forehearth into a near-by hole in the ground, lined with brasque and covered with a dome of fireclay. In the bottom of the cavity is about half a ton of molten lead. This lead is produced from the litharge resulting from the cupellation process. After the matte is introduced, more lead bars are put in until the requisite quantity is obtained. A log of wood is then placed on top of the bath and pushed to the bottom by means of an iron tool introduced through a hole in the cover and kept in position by a crosspiece held down by two men. This submerged wood causes an active ebullition in the bath and a thorough stirring of the lead with the matte. The bath is then allowed to settle; the matte is returned to the blast furnace; the lead bath is skimmed clean and the metal ladled into molds. To keep the bath in a fluid condition a few pieces of wood and charcoal are kept burning on the top. There are two cavities, one on each side of the forehearth, and they are used alternately for treating the matte in this manner. The lead bars produced contain 570 oz. of silver to the ton, and as the lead is impure it is next sent to the liquation furnace.

⁂

A New Type of Electrolytic-Tank Construction has recently been patented by William Thum, of Hammond, Ind. (U. S. Pat. 1,095,748). There is an independent bridge structure to take the weight of the electrodes, so that the tank is entirely relieved of it. This allows a much lighter form of tank construction, together with a substitution of asphalt or other linings for the usual hard-lead lining. A bridge type of tank side was proposed several years ago to take the weight of the plates, with the object of leaving out the tank partitions, allowing a side-to-side circulation of the electrolyte, instead of from end to end.

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[1] "Copper Smelting in Japan," Bull. of A. I. M. E., November, 1914.

The Cost of Doing Things

Details of Costs at El Tigre

The following tabulations give full details of the costs at the Tigre Mining Co., El Tigre, Sonora, Mexico, during 1913, as shown in the report published by the holding company, the Lucky Tiger-Combination Gold Mining Co., Kansas City, Mo.:

ORE TREATED AND SHIPPED

	Dry Tons	Ounces Au.	Ounces Ag.	% Cu.	% Pb.
Shipping ore	932	0.488	285.16	2.32	12.05
Mill ore	68,528	0.109	28.40	0.05	0.23
Total	69,460	0.113	31.85	0.166	0.772
Old dump tails cyanided	21,778	0.079	13.62		

DETAILS OF MINING COSTS

	Per Ton Produced
Development direct:	
Contractors	$0.148
Day's pay men	0.001
Air drills	0.138
Nippers and shovelers	0.001
Stoping direct:	
Miners	0.920
Nippers and shovelers	0.145
Air drills	0.216
Contractors	0.017
Filling, breaking waste	0.000
General tramming	0.399
Timbering	0.445
Hoisting	0.026
Pumping	0.000
Sorting:	
Underground	0.242
On patio	0.163
Blacksmithing	0.132
Sampling and assaying	0.093
Surveying	0.011
Superintendence	0.175
Mine construction	0.005
Diamond drilling	0.120
Total	$3.397
Charged to development	$0.592
Charged to mining	2.805
Total tons of ore produced	69,460
Total tons broken (ore)	56,081
Total feet of development	4,984
Total cost per foot of development	$8.25

Of the total cost, $2.451 was for labor, 31.5c. for explosives, 9.2c. for lighting, 37.6c. for general supplies, 16.3c. for power.

MILLING COSTS

Total mill extraction, 92.8%.

	Per Ton
Sorting 68,528 tons	$0.051
Old mill:	
Crushing	0.324
Regrinding	0.305
Concentrating	0.936
Total for 10,526 tons	$1.565

This cost is made up of 46.5% labor, 27.6% power, 14% repair parts, 3.2% superintendence and clerical work, 1.5% assaying and sampling, 5.5% chemicals and pebbles, 1.7% miscellaneous supplies.

Stamp mill:	
Crushing	$0.330
Regrinding	0.176
Concentrating	0.415
Alterations	0.002
Total for 56,510 tons	$0.923

This cost is made up of: General labor, 37.4%; power, 22%; repair parts, 17.2%; superintendence and clerical work, 2.3%; sampling and assaying, 2%; chemicals and pebbles, 17.6% and 1.5% for miscellaneous supplies.

Cyanide plant:	
Conveying and screening tailings	$0.120
Tube milling	0.540
Classification, elevating and dewatering	0.217
Treatment	1.728
Filtration	0.212
Precipitation	0.202
Melting	0.229
Dam and retreatment	0.061
Experimental	0.068
Alteration	0.002
Total for 86,536 tons	$3.379

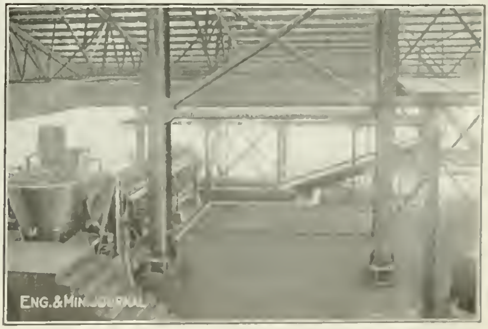
This cost is made up of 16.8% for general labor, 11.6% for power, 6.7% repairs, 1.6% superintendence and clerical work, 1.1% sampling and assaying, 59.4% chemicals and pebbles, and 2.8% for miscellaneous supplies.

Miscellaneous costs not charged to mining and milling are herewith given in detail. Cost of tramming to concentrator: Labor, 7.3c.; light, 0.2c.; supplies, 1.7c.; total, 9.2c. per ton. Marketing costs amounted to $1.76 per ton of ore produced for bullion from ore and tailings and $2.74 per ton of ore produced for marketing concentrates and shipping ore. General expenses amounted to 60.2c. per ton of ore produced and some of the principal items were: General office salaries, 11.1c.; general office expense, 3.5c.; mail service, 1.1c.; road repairs 5.4c.; fire insurance, 1.8c.; school expense, 1.1c.; legal expense, 1c.; camp maintenance, 5c.; taxes, 2.2c.; administration, 17c.; construction and improvement of buildings, 1.3c.; auto maintenance and operation, 1.2c.; and outside mine examinations, 1.5c. per ton of ore produced.

⁂

Cost of Casting Machines for Converter Plant

According to *Bull.* 91 of A. I. M. E., "Unit Construction Costs from the New Smelter of the Arizona Copper Co.," by E. Horton Jones, the total cost of installing two casting machines at this plant was $31,750.69, made up of: $520.82 for excavation, $1516.73 for foundations, $27,177.55 for cost and erection of machines, and $2[illegible] for repairs. The excavating work consisted of making two deep rectangular cuts in sand, gravel and big boulders, amounting to 512 cu.yd. This work was performed with picks and shovels, and the dirt loaded into carts and hauled 600 ft., at a total cost of $1.02 per cu.yd., 94% of the cost was for labor. The foundations for each machine consisted of a rectangular sump with plain concrete floor enclosed by reinforced-concrete retaining walls. The walls were about 6 in. thick, 8 ft. high, reinforced with [illegible] and ½-in. rods. The concrete was mixed, 6 parts sand and gravel to 1 of cement, hauled in cars 170 ft. [illegible] and hoisted 140 ft. to site in wheelbarrows. All exposed surfaces of the concrete work were [illegible]. Total



Casting Machine, Arizona Copper Co.

amount of concrete, 291.9 cu.yd., which was done at a cost of $12.05 per cu.yd., of which 46.2% was for labor.

Two casting machines	$18,657.89
Two 11-hp. and four 20-hp. motors	2,933.88
Two jib cranes	327.22
Two radial cranes	1,167.91
Two traveling switches	135.75
Two brakes for ladle tipping motors	176.51
Four circuit breakers	103.50
Molds, etc.	708.55
Total	$24,211.21

The cost of casting machines and erecting, $27,477.55, covers all the material composing two casting machines and all labor required to erect on their foundations ready to operate. Each machine has a steel cradle, to receive a ladle of molten copper. This cradle is controlled from a pulpit and is tipped by a 20-hp. motor. It is set high enough to pour into a casting spoon of 1½-in. cast iron. Approximate dimensions are 2 ft. wide, 3 ft. 6½ in. long and from 7 in. to 1 ft. 5½ in. deep. This casting spoon pours into the molds which are attached to a heavy steel conveyor. There are 39 molds made of 2½-in. cast iron reinforced with $\frac{5}{16}$-in. perforated plate. Their inside dimensions are 2 ft. 4 in. x 1 ft. 6¼ in. x 3¼ in. deep. From the pulpit, by use of power from a 20-hp. motor, the conveyor with the molds moves along under a spray of water from needle holes in pipes placed above them until they reach the end of the conveyor, where a device in the bottom of the molds loosens the ingots, allowing them to drop into a tank of water. This bosh is made of $\frac{5}{16}$-in. plate 3x3 and 4x3 angles. It is 7 ft. wide, 23 ft. 5¾ in. long, and varies in depth from 7 ft. 10 in. to 2 ft. 10 in. The copper bars are removed from here by a steel drag conveyor operated by a 11-hp. motor, controlled from the pulpit. When the bars leave the bosh and fall onto the striking plate, they are handled by a radial crane whose moving end travels on a 40-ft. curved I-beam. Along the radial crane beam travels a small air hoist capable of picking up a ton. It operates under an air pressure of 16 lb. A jib crane is so located, attached to a building column, that it can handle the molds for removing and replacing. It has a 3000-lb. capacity triplex block and 8-in. I-beam trolley.

Cost of Stocking Ore

There are presented here some tables showing the cost of stocking and rehandling ore at a Michigan iron mine, over a period of several years. In Table I is given the cost of stocking distributed per ton stocked and per ton shipped for the year. This cost includes erecting the trestles and replacing the trestle timber destroyed the previous year. This trestle was 45 ft. high. During 1906, 1907 and 1908 the ores was trammed by hand. For the last three years an electric locomotive was used.

TABLE I—COST OF STOCKING

Season	Cost of Labor	Cost of Supplies	Total Cost	Tons Stocked	Cost per Ton Stocked	Cost per Ton Shipped
1906	$2698	$324	$3022	46,068	$0.0653	$0.0181
1907	2006	352	2358	61,850	0.0381	0.0132
		Increase in wages in Jan.				
1908	837	226	1063	23,220	0.0157	0.0076
1909	2655	769	3424	58,919	0.0581	0.0143
1910	2410	534	2941	55,067	0.0535	0.0120
1911	1269	76	1345	37,245	0.0361	......

In Table II the cost of loading distributed per ton loaded and per ton shipped for the year are given. The loading was intermittent and poor switching arrangements for the cars caused considerable delay. The stockpile was built on a 2-in. plank floor. Loading was carried on with a 45-ton shovel. In 1909 and 1910, extensive repairs were made to this, wooden parts being replaced with steel: the cost of this is included.

TABLE II—COST OF LOADING

Season	Cost of Labor	Cost of Supplies	Total Cost	Tons Loaded	Cost per Ton Loaded	Cost per Ton Shipped
1906	$1337	$361	$1698	52,923	$0.0321	$0.0102
1907	1297	376	1673	49,245	0.0340	0.0093
1908	494	88	582	23,099	0.0252	0.0041
1909	1318	334	1652	50,576	0.0326	0.0069
1910	1082	497	1579	50,564	0.0312	0.0064

Retimbering Shaft in Lake Superior Iron District

By E. S. Dickinson*

The size of shaft was 6x16 ft. inside of the timbers, the timbers 12x12 in. In 1906 it was retimbered from 40 to 190 ft. deep. The cost was $87.53 per set.

	Total Cost	Cost per Ft.
Timber	$728.58	$48.57
Framing	462.84	30.86
Timbering (placing timber and taking out old timber)	996.91	66.46
Total	$2188.33	$145.89

This timber was painted on all joints with carbolineum.

In 1909, retimbering 78 ft. cost as follows, the timber being painted all over with carbolineum.

	Total Cost	Cost per Set
Timber	$944.98	$72.67
Framing	206.69	15.90
Timbering (taking out old and putting in new timber)	518.86	39.91
Total	$1670.53	$128.48

In another case retimbering from surface to 50 ft. in depth cost:

	Total Cost	Cost per Set
Timber and other supplies	$680.86	$75.65
Framing team shops, etc.	343.44	38.16
Timbering (removing old and placing new timber)	349.75	38.86
Total	$1374.05	$152.67

The timber was badly squeezed, making it necessary to jack all new timber into place. Surface caved and had to be held back.

Laying a 4-In. Wood Pipe Line

This 4-in. pipe line was laid in the Michigan iron region in a ditch 6 ft. deep, and old iron pipe removed. The soil was sandy, tunneling under railroad track was required and a team and scraper were used to refill ditch.

		Per Ft.
2070 ft. of wood pipe	$627.02	$0.303
Digging and filling ditch	222.05	0.107
Removing old pipe and laying new	102.56	0.050
Teaming	12.93	0.006
Repairing leak in pipe	8.74	0.004
Total	$973.30	$0.470

Cost of Keeping Live-Stock

With baled hay at $21 to $25 per ton, and corn at $1 per bushel, at the barn, it cost a total of $861.44 to keep three head of stock at the Montgomery mine, Candor, N. C., for a period of 16 months. This is at the rate of 58.9c. per head per day, and covers all expense chargeable to teaming, including feed, shoeing, harness repairs, etc. One head was a buggy horse and the other two were big, heavy mules.

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*Iron River, Mich.

New Smelting Works of the Mond Nickel Co.*

SYNOPSIS—A description of the new smelting plant of the Mond Nickel Co., Ltd., at Coniston, Ont. The new works comprises two blast furnaces, 50x240 in., and two Peirce-Smith converters. The plant is operated by electric power purchased from a neighboring power company on the Wanapitei River.

✱

At Coniston, Ont., about seven miles east of Sudbury, the Mond Nickel Co., Ltd., has recently completed a new smelting works for the treatment of its copper-nickel ores, most of which come from the Victoria and Garson mines.

The Mond Nickel Co. owns about 4500 acres of mining land in fee simple and controls about 2500 acres under lease, a total of 7000 acres, situated in the townships of Blezard, Denison, Snyder and Garson, in the Sudbury district of Ontario. Additional areas are also under option to this company. The ores mined are deposits of nickeliferous pyrrhotites, containing some chalcopyrite; they occur in norite and contain about 2.3% nickel and 1.75% copper, besides small amounts of gold, silver, platinum and palladium. For many years the company's ores were smelted at Victoria Mines; the old works comprised two 44x180-in. blast furnaces and two electrically operated 84x126-in. converter stands. The old plant was built in 1900 and was operated by electric power obtained from the Wabagishik Falls, on the Vermilion River.

The site for the new plant at Coniston is a rocky hillside, overlooking a large swampy flat, which gives ample storage room for large slag piles. The roast yards are situated about three-fourths of a mile from the main smelting building, on the other side of the ridge.

A new townsite has been laid out, north of the Canadian Pacific line and about one mile from the smelting works. Coniston is to be a model town provided with every modern convenience.

General Statement of Equipment

The main smelting building has a concrete substructure resting on bedrock and a structural-steel superstructure. In this building are placed two new water-jacketed blast furnaces, 50x240 in., and two Peirce-Smith basic converters, 10 ft. by 25 ft. 10 in. Provision has been made for an additional blast furnace, which will be added when required. The power building is a brick-and-steel structure with tile roof, situated on the fall above the smelting works. The ore bins are placed beyond this, and a rockhouse stands southeast of the smelting building, over the lower tracks. A semicircular track leads from beneath the ore bins to the charging floor of the main building; it is carried over the slag tracks on a steel trestle resting on concrete piers.

Mond Nickel Co.'s New Smelting Plant at Coniston, Ont.

Spur lines connect both the Canadian Pacific and the Canadian Northern railways with the roast yards, the smelting yards and ore bins. Ores from the mines to the north will come in to the roast yards over the tracks of the Canadian Northern Ry. and can be delivered directly to the yards or shunted over the company's spur line to the smelting plant bins. Ores from the west will be diverted to the Mond Nickel Co.'s spur line at Coniston, and can be run either to the bins or to the roast yards. Ores from the roast yards can also be conveyed over the spur line to the bins on the high line above the smelting works.

The main smelting building is of steel construction with a concrete substructure, 90x360 ft., resting on bedrock; there is a monitor on the roof running the length of the building. A lean-to shed, 21x[illegible] west side, houses the converter plant; a similar lean-to on the southeast side, 30x210 ft., covers the slag track and the main flue. A slag cut on the southeast side is provided with a standard-gage track; the tapping floor is 14 ft. higher, and the charging floor 24 ft. 2.5 in. above this. The furnace platform is 24 ft. in width and 210 ft. in length. The matte floor on the northwest side is 10 ft. below the level of the furnace floor and about 56 ft. in width.

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*Excerpt from "The Copper Smelting Industries of Canada," by Alfred W. G. Wilson, chief of the metal-mines division, Mines Branch, Can. Dept. of Mines.

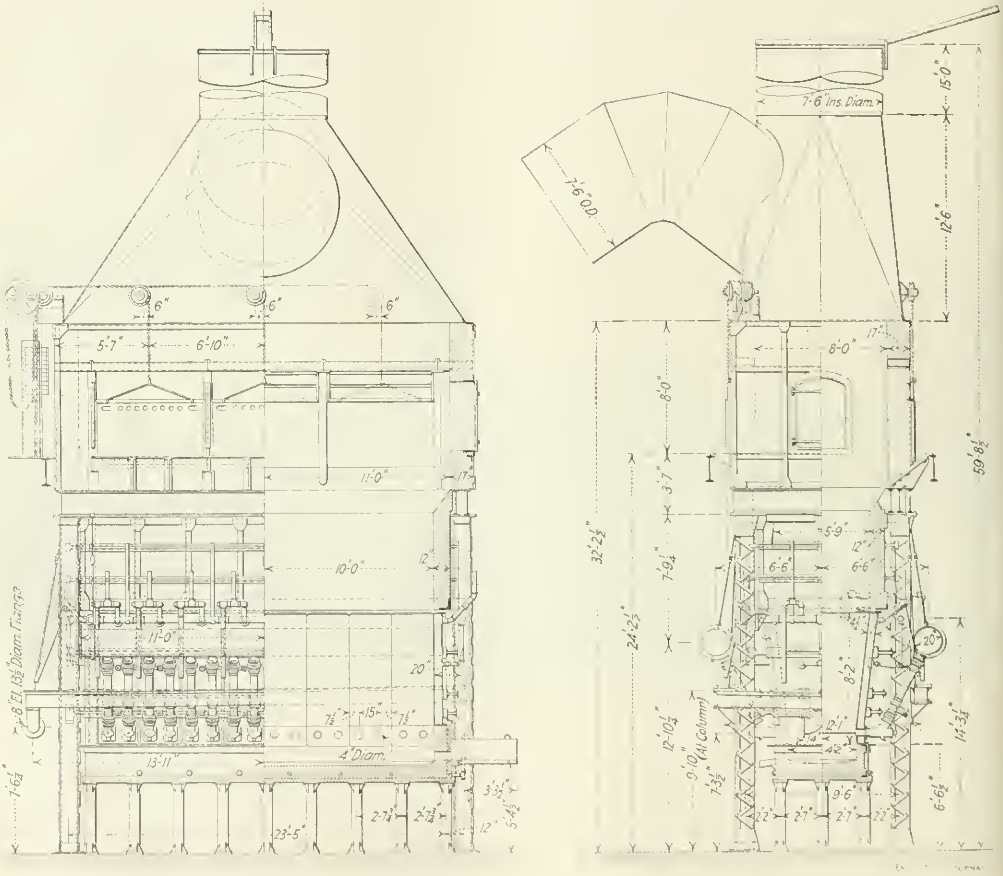
THE MOND BLAST FURNACES

There are two Allis-Chalmers rectangular water-jacketed copper blast furnaces, 50x240 in., each furnace being provided with a brick-lined steel crucible and a brick top above the single tier of jackets. The height of the furnace is 32 ft. 2.5 in. to the base of the hood; the hood measures 12 ft. 6 in., giving a total height of 44 ft. 8.5 in. A gooseneck, 7 ft. 6 in. in diameter, connects each furnace with the main flue, and a straight stack, closed by a damper, rises 15 ft. above the hood.

Each furnace is carried on structural-steel columns, the jackets being hung from I-beams. The crucible rests on three rows of nine supporting columns, each 5 ft. in height; it consists of a rectangular steel I-beam frame about 6 ft. in width, 21 ft. 9 in. in length, and 25 in. deep; the sole plate is of cast iron in four sections. This crucible box is lined with chrome brick around the sides, ends and bottom, reducing the internal width to 4 ft. 2 in.

Above the crucible there is a single tier of water-jackets, eight on each side, 8 ft. 2 in. in height. The width of the furnace is 4 ft. 2 in. at the tuyeres; at the top of the water jackets, 5 ft. 9 in. The furnace has thirty-two 4-in. tuyeres, 16 on each side. Each side jacket is 30 in. wide and carries two tuyeres. The total tuyere area is 402.28 sq.in. and the hearth area 83.33 sq.ft., or 4.82 sq.in. of tuyere opening per square foot of hearth area. The water space in the jackets is 4½ in.

The throat of the furnace above the water jackets is built of ordinary brick and lined with firebrick, forming a jacket 12 in. thick. The top of the brickwork is 3 ft. 7 in. below the charging floor, the available ore column being 13 ft. The space between the charging floor and the brickwork is bridged by inclined apron plates. At the ends of the furnace the brickwork is carried to the top



Blast Furnace of the Mond Nickel Co., Ltd., Coniston, Ont.

of the furnace, 8 ft. above the charging floor. The charge doors along the sides of the furnace are operated by counterweights.

The furnaces are placed parallel to the length of the building. Space has been provided for three, but only two have been installed. The settlers are of the circular type, about 15 ft. in diameter, and are placed between the furnaces.

FLUE SYSTEM AND STACK

The main flue is rectangular in cross-section, 10x15 ft., and is built of steel. It leads to a dust chamber, 30x50 ft., built of stack brick and connecting with the base of the stack. The main stack rests on bedrock; the lower 25 ft. of the stack is square in section and is built of red brick; the upper cylindrical portion, about 16 ft. in diameter, is built of Custodis stack brick. The height is about 200 ft.

The main flue is provided with 27 hoppers, placed at 7.5-ft. centers, in sets of two, between the main bents of the supporting structural-steel work. There are also four large hoppers placed between the main flue and the brick dust chamber. The bottom of the dust chamber is fitted with six rows of steel hoppers, nine to a row, the distance from center to center being 56 in. Each hopper is provided with a circular discharge gate 13 in. in diameter, closed by a lever-operated slide. The hopper chutes beneath the dust chamber deliver to a common space, so arranged that the flue dust can be run into a V-shaped auxiliary hopper of sheet steel hanging above a standard-gage track in the slag cut. Six chutes deliver from this hopper to a car placed beneath.

BLAST FURNACE FEED FLOOR AT CONISTON, ONT.

THE CONVERTING PLANT

The converters installed in the new smelting works are the Peirce-Smith type of basic converter, the shells being 10 ft. in diameter and 25 ft. 10 in. in length. Two have been installed.

The lining of each shell consists of 16-in. silica brick and 9-in. magnesite brick at the bottom; 9-in. magnesite brick at the top, and at the tuyeres, special 18-in. magnesite brick. Each shell is provided with 30 tuyeres, placed 14 on one side of the stack and 16 on the other, none coming directly below it. The blowing stack is 3 ft. 7 in. in diameter, but the lining reduces the free space to 2 ft. 9 in. It is placed near the median riding track, its center being 11 ft. 2 in. from the end of the shell opposite the bustle pipe. The pouring spout is placed 7 ft. 7.5 in. from the same end and about 77° of arc below the stack.

The ends of the shell serve as annular tracks upon which it may be rotated, and a third riding track placed 7.5 in. to one side of the middle of the shell has also been provided. The tracks rest on rollers carried by cast-iron bearing plates, bolted to a concrete foundation. The shell is turned by steel ropes, pulled by a sliding gear operated by an electric motor and a worm screw with an 8-ft. stroke. The converter floor is served by two 50-ton Whiting cranes.

BLOWING EQUIPMENT

Electric power to operate the works is purchased from the Wahnapitei Power Co., which has two power stations on the Wahnapitei River, not far from Coniston.

In the power building at the smelting works, foundations have been laid for three Connersville and two Nordberg blowers. The blowing machinery at the Victoria Mines plant was to be transferred to the new works, and one new Connersville and one Nordberg were to be added. The Connersville blowers at the old plant each had a capacity of 15,340 cu.ft. per min. at 40-oz. pressure when running at 130 r.p.m. Each was belt-connected to a 200-hp. constant-speed motor, taking current at 550 volts and running at 580 r.p.m. The air pressure at the furnaces was about 38 oz. Air for the converters was supplied by the Nordberg duplex air compressor, having a capacity, at 82 r.p.m., of 6000 cu.ft. of free air per min. compressed to 12-lb. pressure. The low-pressure cylinder is 30 in. in diameter and the stroke 12 in. This machine was driven by a constant-speed, 315-hp. induction motor, running at 315 r.p.m., receiving current at 550 volts. The blowing engine is fitted with mechanical-inlet corliss valves and poppet discharge, and is regulated by the air pressure from the receiver through floating levers to the governor.

* * *

Tom Reed Gold Mines

According to the annual report of the Tom Reed Gold Mines Co., Oatman, Ariz., for year ended Apr. 1, 1914, it made a net gain of $629,981 from the [illegible]8,100 tons of ore yielding $1,146,053 in bullion, and scraps treated that yielded $12,874 in bullion; total gross bullion production, $1,158,927. Mint and express charges on bullion were $5291, making net bullion returns $1,153,636. Other income totaling $13,270 made a gross income of $1,166,906 before deducting operating expenses. These charges amounted to $536,925, made up as follows: Production expenses, $296,863; general, administration and taxes, $60,824; depreciation of plant and mining claims, $174,198 and $5040 for extraordinary charges. The total cost per ton was $8.662, consisting of $7.520 for direct charges and $1.143 for indirect charges. Direct charges were: Mining, $4.153; milling, $1.661; cyaniding, $1.557, and marketing, 15.5c. per ton. Indirect charges consisted almost entirely of depreciation. Dividend payments for the year were $618,497; current assets and stores on hand amounted to $179,702, while current liabilities were $32,081, leaving a balance of $147,621 in current assets. Mine development totaled 5[illegible] ft. for the year, of which 465 ft. were shaft sinking. It is stated that the stopes contain more [illegible] than a year ago, also that the development [illegible] ahead of stoping than at any other time.

Photographs from the Field

Star of the Congo Mine, in Katanga, Belgian Congo

One of the large mines of the Union Miniere du Haut Katanga. The copper ore is worked principally through open pits. The ore zone is 4000 ft. long, 500 ft. wide, and has been proved to a depth of several hundred feet. Bucyrus steam shovels are used in the surface mining.

New Installations at the Copper Queen Mines, Bisbee, Ariz.

A large expansion joint installed in the water-supply line.

New change house for the convenience of miners at the Sacramento mine.

Station of the Southern Sierra Power Co., Johannesburg, Calif.

A type of the transformer stations in the West which supply hydro-electric power for mines and placer operations.

THE NORTHWESTERN BRITISH COLUMBIA GOLD COUNTRY

A district of growing importance, now being actively prospected. Outfits are packed in on horses, or go on scows up the rivers. In the Laird, Findlay and Parsnip River fields good results have been obtained. Peace River has produced many rich bar deposits.

OUTCROP OF COAL BEDS IN NENANA FIELDS, NEAR FAIRBANKS, ALASKA

A good grade of lignite. Some of the beds reach a thickness of 40 feet

Correspondence and Discussion

Should the A. I. M. E. Be Able to Express Itself?

Certain amendments to the constitution of the A. I. M. E. are to be settled at the forthcoming annual meeting. These are based upon the following proposal:

To the Board of Directors
Of the American Institute of Mining Engineers.
Gentlemen:—

In accordance with Article X, Sec. 1, of the Constitution, we, the undersigned members of the American Institute of Mining Engineers, propose the following amendment to the Constitution:

Article VIII, Sec. 2, all the words beginning with "neither" on the 2d line, and ending with "Directors" on the last line, be omitted, so that the Section as amended shall read:

Sec. 2. The Institute shall not assume responsibilities for any statements of fact or opinion advanced in the papers or discussions at its meetings.

instead of

Sec. 2. The Institute shall not assume responsibilities for any statements of fact or opinion advanced in the papers or discussions at its meetings. Neither the Board nor the Institute shall officially approve or disapprove any technical or scientific opinion, or of any proposed enterprise which is outside of the management of the meetings, discussions and publications of the Institute, and the conduct of its business affairs by the Board of Directors.

Article VIII, Sec. 3, omit all the words after "Institute" on the 2d line, and ending with "reports" on the last line, so that the Section as amended shall read:

Sec. 3. Special committees may from time to time be appointed by the Board to make investigations and prepare reports for presentation to the Institute.

instead of

Sec. 3. Special committees may from time to time be appointed by the Board to make investigations and prepare reports for presentation to the Institute, but no action shall be taken binding the Institute for or against the conclusions embodied in any such reports.

Respectfully submitted,

Eli T. Conner, Howard W. DuBois, J. Edward Spurr, S. W. Warriner, Morris Williams, Edward B. d'Invilliers, J. B. Dilworth, Walter Gilman, F. Lynwood Garrison, T. A. Rickard, Thomas T. Read, J. F. Kemp, R. V. Norris, L. H. Taylor, Jr.

The above amendments will be submitted to the Institute membership next week, together with a statement of the arguments pro and con, prepared by a committee appointed by the Institute directors. We have received numerous communications upon this subject. Out of these we have selected two for publication, which will give members of the Institute a fair idea of the views of the supporters and opposers of the proposed amendments.

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The Opposition's Case

These amendments remove the present prohibition of action by the Institute or the Board of Directors for or against anything not comprised in its declared purposes namely, the holding of meetings, the reading, discussion and publication of papers, etc. These purposes are stated in the Certificate of Incorporation, and apparently that document must be amended before amendments to the Constitution can have any effect. It has been said that other methods than those enumerated in the certificate, which might reasonably be held adapted to the general purposes of the Institute, are not prohibited simply because they are not mentioned in the certificate. This proposition is familiar to lawyers; but its application depends largely upon three questions: (1) Was it the intention of the framers of the certificate to exclude such other methods? (2) Would their employment impair the efficiency of the methods explicitly mentioned? (3) Do the new methods proposed meet the approval of all members, or is there considerable objection to them? In the present case, all these questions must be answered in such a way as to necessitate a strict construction of the certificate.

For there is no doubt that the amendments seek to change the immemorial policy of the Institute, which was formed for the attainment of certain enumerated ends by certain means and no others. The Certificate of Incorporation has been amended once, and certain other means have been specifically added. A similar amendment would be required to increase that list.

The list itself may be liberally construed so as to include acts fairly auxiliary to the authorized activity. But taking sides on scientific, political, commercial or even professional questions is not only not helpful, but positively injurious to the efficiency of the ordained functions of the Institute.

Let us speak plainly. The intention of these amendments is to make the Board of Directors free to express for the Institute or let the Institute express for itself through a mail-ballot, opinions on all subjects deemed pertinent to the welfare of mining, metallurgy, miners and metallurgists, employers and employees. At present we have full and free discussion, but no judicial decision. The Institute is a forum, but not a tribunal.

Of course, if these amendments are adopted, the questions on which the Directors will be asked to exercise their new freedom will be important ones, that is, they will be questions on which the members of the Institute will be divided. The effect of official action on any such question will be: First, to stop further free discussion of that question, because the defeated party will not bring additional facts or arguments before a prejudiced tribunal, and secondly, to alienate those members who feel that the authority of the Institute has been used against their views or interests. Sooner or later, the methods of politics will creep in. Parties will work and plan and make up tickets to secure a majority of the Board of Directors.

Let us speak more plainly yet. Last year the Institute Committee on Mining Law arranged a session for debate on that subject, the purpose of which was well known to be the support by the Institute of the movement for the amendment of the "law of the apex" by abolishing its "apex" and "extralateral right" provisions. The result was a series of papers and discussions all on one side, with the single exception of a member on the other side, who sent in a paper at the special request of the Chairman, saying that he didn't suppose it would do any good. Meanwhile, several able papers on the other side appeared in technical journals, where their authors felt that they had an impartial hearing. These papers contain many facts and arguments in favor of the present law which were not mentioned at all in the one-sided Institute session.

No great harm was done; for the session could take no action. But if these amendments pass, we may look for an earnest effort to put the Institute on record against the "apex law."

Take another burning question—the relation of the United States to the natural resources of the public domain, especially within existing states and territories. Many able and zealous members of the Institute are workers in executive departments of the Government, and doing splendid work. But they are claiming an ever wider field of authority and activity for the Federal Government, as against both the sovereignty of the states and the individual liberty of citizens. Their views are bitterly denounced by many land owners, mine owners and managers, and private engineers. In more than one state, the interference of the Federal officials and experts has produced widespread irritation. No matter which side is right, the Institute cannot afford to take either side. How would its primary aim, the interchange of knowledge, be affected by a state of feeling which made operators refuse information to its members, or cities cease to welcome its meetings, or labor unions denounce it, or politicians flatter or abuse it?

The object of the Institute is to draw its members together, not to divide them into parties branded respectively as victorious or defeated.

There is no objection to the expression of opinion by individual members. This is what was done in the case of the Panama Canal; and the result was as effective as it deserved to be—no less, no more. It had the weight of the reasons and character of the men who signed it; and it gave no cause of complaint to those who did not agree with it.

The foregoing objections to these amendments, and many others which the space prescribed for this article does not permit me to mention, are not in the least degree imaginary. They are based on the experience of 43 years, including both systems.

R. W. RAYMOND.

Washington, Conn., Nov. 30, 1914.

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The Affirmative View

In 1911, Charles Kirchhoff, when president of the Institute, introduced the custom of monthly meetings of the council, as the governing board was then called, and of the directors, who had come into existence with the necessary incorporation of the Institute, when it became part owner in the United Engineer Society's building in 1905. At Mr. Kirchhoff's suggestion, the members of the council and the directors dined together before the meeting and later assembled in the Institute's rooms at 8:30 in the evening.

This custom has continued ever since and with the revision of the constitution and bylaws in 1912 and the combination of the two bodies, the council and directors, into one board of directors, has proved one of the greatest improvements that could have been introduced into the methods of conducting the Institute's business. Since the organization of the technical committees, their chairmen are often specially invited to the dinner and subsequent meeting, as are also visiting members, whether Americans or from abroad. From 12 to 25 officers and members sit down together at table and subsequently reassemble to take up the Institute's business. The invitation to guests has often been extended to attend the business meeting and informally assist with advice. The directors resident near headquarters or who, when living at a distance, can so shape their engagements as to be in New York at the monthly meetings, do so, with the result that in the 10 working months (July and August not being considered working months), the business and the policy of the Institute are discussed and shaped by a representative body of appropriate size.

Experience in the last four years has abundantly shown that the directors take their duties very seriously and with great devotion to the best interests of the society. There is no reason to anticipate any change in these conditions in future years, but they have an important bearing upon the proposed greater freedom of action and increased responsibility of the boards. Members should further appreciate that the directors are geographically distributed by the constitution, and the board is made as representative in character as the circumstances permit. It is inconceivable that the directors would act hastily or imprudently in any important matter, if given authority to speak officially for the Institute.

While conditions have changed in a marked degree in the conduct of the Institute's affairs, they have changed in no less important matters in the world outside. To an extent not known a few years ago, the national and state governments are establishing relations with the mining and metallurgical industries and in instances assuming control over some of their operations. The conservation movement and the establishment of the forestry bureau have greatly restricted the old-time privileges of the prospector and the miner. One can hardly avoid the conviction that in instances undue authority has been given officers of the government and has been exercised in objectionable ways.

The Institute of Mining Engineers is the most influential of our societies in respect to both industries and [illegible] well advise Congress as to what could and [illegible] be wisely attempted. As matters now stand, no expression of its official or authoritative opinion [illegible], nor can any advice, even if desired, be obtained from the Institute as a body. The present year, when it was [illegible] desirable that the president of the Institute should have been able, as such, and with the endorsement of the directors behind him, to state to a congressional committee that a certain industrial commission should have a representative from the mining industry, the directors regretfully had to refrain from any official action. Although the elder statesmen of the Institute, they were forced to sidestep a question of no small moment.

The Bureau of Mines is now an important part of the national government and [illegible] been brought home to the directors of the Institute [illegible] quite often [illegible]. Yet no opinion can be expressed by the directors [illegible] a [illegible] to the [illegible] of the [illegible] than the [illegible].

In several of our states, notably New York and Pennsylvania, strong movements are under way looking toward the examination and licensing of engineers in much the same way as physicians must secure [illegible] civil, mechanical and electrical engineers are quite free to express their opinions and be represented by official committees, but the directors of the Institute of mining engineers, like a lot of irresponsible children, must avoid all representative participation.

The greatest and most serious opportunity has been of necessity lost in the recent discussions of the revision of the mining laws as affecting the location and property rights of claims, and for future locations the establishment of vertical planes and common-law ownership instead of the mazes, uncertainties and absurdities of the apex and extra-lateral rights. No one who has ever been personally familiar with one of these cases and the difficulties of establishing geological structure, or above all with an instance of broad lode apex rights, such as have come up in the Cœur d'Alenes, is without a feeling of amazement that the present conditions could be permitted to continue. But the American Institute of Mining Engineers, with its thousands of members, must sit tonguetied so far as advising Congress is concerned; while the Mining and Metallurgical Society, with about 6 or 8% as many members, does yeoman service and speaks its mind freely. As a useful body in the large questions of national import the Institute has suffered greatly in comparison with the smaller society in recent years.

While the cases cited are few, they are typical and there are certain to be others of similar import arising as the years pass. Practically the decision in every member's mind should reduce to the question as to whether he has confidence in the wisdom and sound judgment in these matters of a body of men such as make up the present board of directors of the Institute and such as are certain to continue to constitute it; or whether he feels that their wisdom and sound judgment are not to be trusted in matters of policy. After some years of experience under old conditions and present-day ones, and as one who will shortly retire from the board, I have no hesitation in voting to give the board the free hand which the proposed amendments contemplate.

J. F. Kemp.

New York, Dec. 1, 1914.

Science vs. Business

In the communication published in the Journal of Nov. 14, Henry A. Marvin states several truths which have long been recognized by many members of our profession, though possibly too long endured in patient silence. While argument upon the main point of his contention may be unseemly, a few random remarks by way of amending and elucidating the philological distinctions will no doubt contribute to a better understanding of the subject.

In the name of business there is a great deal of honest (and dishonest) effort wasted, often leading to no business at all. When the dishonest efforts produce tangible pecuniary results, known as "success," we are prone to consider it as business *de facto*, or even *de jure*, provided the principals manage to keep out of jail.

But it is not pure business, nor is it considered good form to talk too much about the unpleasant little details.

We have a habit of saying that "money talks"; but this may be amended by adding, "but capital whispers." When mere money talks, there is always someone ready to grab it, just as the fox is apt to grab the rooster who crows in the woods.

Labor talks to some extent, but experience shows us that the more labor talks the less it labors. Initiative is the fellow who must either talk or fail. When he wears diamonds or a plug hat, or both, we call him a promoter.

In general, neither capital nor labor possesses very much initiative. When capital possesses initiative, it whispers, as stated above. Labor listens for the call and sometimes hears it in time to respond. But during hard times the whisper is so faint that it is scarcely distinguishable above the hysterical clamor of the dissatisfied.

When labor possesses initiative of the right sort it is justly entitled to do some talking. But labor without capital can seldom accomplish much. Capital, being timid, is therefore haughty as a measure of self-protection. So, as a rule, labor must speak softly and with respect; for otherwise, capital refuses to listen.

The necessity for this lies in the fact that labor is merely capital of brawn, instead of money, and must cultivate some kind of protective timidity to make up for what it lacks in initiative. For every variety of rooster has some variety of fox hunting it. And the most dangerous fox is the one which tries to look like a rooster, for he generally gives a better imitation than the wolf in sheep's clothing.

In mining, business consists largely in the proper introductions and the maintenance of cordial relations between capital, initiative and labor. Technical science furnishes much of the initiative. But pure technical science is often reticent and requires the aid of business science, which latter may be considered as the twin brother of initiative.

Science is knowledge. Specifically, science is truth ascertained, classified and understood. Business devoid of science is failure. Science without business is pure or altruistic science. Applied science is business, and business is applied science. When applied technical science and applied business science work together, the result may be, and often is, "Big Business."

Whenever there is failure in business, investigation will almost invariably reveal a lack of some variety of science.

Wm. B. McKinlay.

New York City, Nov. 21, 1914.

Copper to Italy

The Journal of Nov. 7 has just reached me, and I note the contents of the editorial headed "The Copper Seizures." By the same mail I received figures of the New York Metal Exchange for October which show 7316 tons sent to Italy in that month against 11,995 tons for the preceding nine months of this year. There would seem to be only one explanation possible for the sudden jump in the exports. I incline to believe that if the United States were in our position, its authorities would act in much the same way as ours have done. After all, economic pressure, if it can be applied, is a powerful factor in the determination of war.

Norman Macdonald.

London, E. C., Nov. 16, 1914.

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A New Form of Electric Furnace for making steel directly from iron ore is in use at the Moffat-Irving steel works, Toronto, Ont. The furnace was designed by James W. Moffat and is the result of a series of experiments in smelting fine ores

Editorials

The A. I. M. E. Considering Changes

The members of the American Institute of Mining Engineers are presently to be requested to vote on certain constitutional changes. One of these is unimportant. The other is very important. This organization adopted a new constitution about two years ago. Unfortunately, it obtained an extraordinarily clumsy one. It goes far too much into details and incorporates in what ought to be a simple basic document of a few articles a multiplicity of prescriptions that ought to be engrossed as by-laws, capable of easy change, and many that should be classed merely as rules and regulations, capable of still easier change. The unfortunate thing about the present arrangement is that when the membership is asked to revise some trifling matter of administration routine that is voted upon by the membership without any special knowledge or consideration (the common assumption being that it has been proposed because the administration has found it necessary and therefore ought to be adopted), there is occasionally included something of basic importance which may escape a proper weighing.

In the present case the directors of the Institute fully appreciated this and appointed a committee to prepare a summary of the arguments of the proponents and opponents of the measure, which statement is to accompany the ballot. In other columns of this issue are printed the proposed amendments that are of importance, and out of the correspondence on this subject that has come to us we have selected the communications of Professor Kemp and Doctor Raymond, not that they are the leaders of the respective parties, but for the reason that their views will command universal respect.

The question is in brief whether the Institute shall depart from its historic policy of refusing to express formally its views respecting affairs of the day and shall begin to play an active part as a direct agent; in other words, doing something more than the mere presentation of information through the medium of its publications. For our own part we are not going to take sides strongly with either party, but we shall point out certain things that have been overlooked or have not been dwelled upon sufficiently, either by Professor Kemp or Doctor Raymond.

The idea of an active agency in the mining industry is by no means a new one. It was one of the fundamental conceptions of the American Mining Congress and was adopted by the Mining and Metallurgical Society of America at the time of its organization. In the A. I. M. E. ideas trending that way seem to have been crystallized by two specific matters, viz., the pending legislation for the licensing of engineers in certain states and the movement toward national legislation for revision of the mining laws. The proponents of the plan for liberalizing the Institute point also to the organizations of the civil, mechanical and electrical engineers as being ahead of it in this respect. We are of the opinion, however, that in this the proponents err, assuming that the other engineering organizations are able to do more than in fact their constitutions permit.

Doctor Raymond points out the basic objection to the proposed measure, viz., the seeds of dissension that may be sowed by the introduction of seriously controversial matters. An organization like the A. I. M. E. is loosely knit. Its greatest bond of union is the exchange of information among its members. There are but few public questions upon which they are united, for the reason that their interests are far from being the same. There would be no trouble so long as actions by the organization were confined to questions of abstract or academic interest, but how long would a minority continue the payment of dues after a majority began to act contrary to their interests?

Let us consider certain specific things. We may imagine the Institute opposing the licensing of engineers without exciting any hard feelings among its members, who would probably take overwhelmingly the same position. With regard to the revising of the mining laws there would be less agreement; a majority would probably say that they ought to be revised, but as to how they should be revised there would be strong differences of opinion. Go a step further, to the conservation question, and there would be as bitter a fight as there would have been 20 years ago over the silver question. Whichever party were victor or vanquished there would surely be withdrawals. This is no mere surmise. The chief accomplishment of the American Mining Congress was the establishment of the U. S. Bureau of Mines. There was opposition to that, but the question was of no such vital concern as to excite resentment among the vanquished. When, however, the Congress began to act in tariff and other commercial questions, it suffered. Members asked themselves why they should support an organization working against their deep-seated convictions or even their immediate interests, and stepped out.

But, supposing an organization is going to commit itself to this policy, what is to be its procedure? The amendments pending before the Institute are so broad as to permit almost anything, which in itself is hazardous, but the idea seems to be to authorize the board of directors to act for the organization; in other words, to be a small legislature within the organization. This is far more experimental than any other engineering society has ever been. The American Mining Congress has never gone, theoretically, beyond the idea of action in convention. Its trouble has been that its conventions have always been local affairs and nonrepresentative either of broad views or of deliberate action. The societies of civil and mechanical engineers act chiefly at their general meetings, which commonly are attended by members in large number. After actions at such meetings there must be in certain circumstances confirmation by letter-ballot of the entire membership. The ability of those societies to act in those ways is largely limited, however, to their internal affairs, and does not extend to public affairs at all.

Thus, the mechanical engineers met in New York last week, and among other things received the report of their commission which has been engaged for three years in standardizing steam-boiler design and practice to serve as a basis for uniform state legislation. This is a highly desirable thing. At present the several states have various laws and the conscientious boiler manufacturer is obliged to make conforming modifications in order to comply with specifications for which there is neither rhyme nor reason, but which simply happened. The engineering commission conducted an elaborate, painstaking and eminently competent study of this subject and rendered its report. The American Society of Mechanical Engineers was not constitutionally able to *adopt* that report and put out its findings as the society's standard. It could do nothing more than "accept" it as filed. If the A. S. M. E. cannot adopt a standard in such a matter, how much less could it take a position either for or against a revision of a basic law of an industry?

Now, there is, of course, no limitation upon the right of any society to change its constitution in order to become able to do such things if it wants to. It will be observed, however, that the professional societies that have done this have strictly reserved the right of action to the membership and have sought to adhere to the convention idea. There is a good reason for that. There are many instances of record where a minority in the Congress of the United States has been converted into a majority by the arguments of speakers on the floor. The directors of the Institute themselves recognize the importance of this in their efforts to get the pros and cons of the pending amendments before the membership in advance of their plebiscite by mail.

As is well known, the letter ballot has been a regular procedure of the Mining and Metallurgical Society for seven years and has been found to work well. This is not only conducted by strictly defined rules, but also the essence of any action is discussion and deliberation. Moreover, the convention idea is retained in the preliminary action by local sections in their physical meetings, while besides the discussion taking place in them, there is discussion in the pages of the bulletin. The lapse of 12 months between the introduction of a resolution and the final action of the membership upon it, making it an act of the society, is a common occurrence. The procedure was, indeed, found to be so excessively deliberate and slow that for the sake of quicker action in emergencies the bylaws were amended so that the council could introduce a resolution for vote upon it by the membership, but the council cannot do anything committing the Society, and moreover, the council of the Society is subject to immediate ousting if its course in any matter be unsatisfactory to the membership. The council cannot put the Society upon record in any way and may not even express itself as a council. Thus it could not participate in conferences at Albany upon the question of licensing engineers, beyond the sending of a committee of observation.

The plan that is now before the membership of the A. I. M. E. may be a good thing in increasing interest in the organization. It may be a bad thing in committing to a dangerous course leading to dissensions among its membership. The ability of the membership to take any direct action that would surely be representative is highly doubtful. Out of a total of about 5000 there are seldom more than 300 present at any one meeting. The ability to conduct a satisfactory letter ballot among so large a membership is also doubtful, and would surely be expensive. More doubtful still is the ability to present an adequate discussion before the balloting. What would probably happen would be the delegation to the board of directors of the right to act. Meetings of the board are attended by only a part of its membership, but in so small an organization a satisfactory system of mail-voting might be developed. If, however, the Institute board of directors is to act as a congress, it ought to be elected in a thoroughly representative way, i.e., there should not be a nominating committee selecting the best men they know how to find, but there should be an election of average men, just as the Congress of the United States is elected.

The Time to Build

Now is the time for anybody who is contemplating new mining and metallurgical construction to begin it, if he has got the money or can borrow it. Steel and cement are to be had at bed-rock prices, the manufacturers of machinery are in many cases making sharp concessions in order to get business, and the conditions for the employment of efficient labor are favorable. People are coming to see that the United States is not going to remain under a cloud, even if the European war drags on for a long time. If it should show signs of terminating soon, there would be something akin to a boom in business here. Anyway, optimism is increasing so rapidly that some industrial companies are giving orders to resume construction and to inaugurate new plans in order to be in a position to meet the increased demands for their products that are foreseen in the future.

Ocean Freights

Ocean freights, which dropped heavily at the opening of the war, have not only recovered but have advanced to points far above those of June and July last. The advance is independent of the war insurance rates and in many cases has been over 100%. This was to have been expected, notwithstanding the cutting off of a large part of the ocean trade which was furnished by Germany and Austria. To offset this it is estimated that something like 5,000,000 tons of cargo capacity is laid up and unable to compete for freights. The ocean trade is disorganized by the war, like everything else, but to the profit of the side which remains active.

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Villa and Zapata have entered the City of Mexico, while the impossible Carranza has retired to Vera Cruz, whence the American troops have been withdrawn. With Villa and Zapata in control of things, Mexico is in rude hands, but it must be conceded that the ex-highwayman and the ex-muleteer have exhibited more common sense than the cultivated Madero, the military Huerta, and the bombastic Carranza. Anyway, they won the election by rifles, and there is a possibility that Mexico may emerge slowly into a crude state of order.

Chronology of Mining for November, 1914

Quarterly reports of copper porphyries show no increase in costs despite curtailed operations.

Nov. 3—Election Day. Arizona accepts prohibition and 80%-native-labor laws.—Montana defeats workmen's compensation measure.—Alaska returns Delegate Wickersham.—Socialist defeat in Butte.—England holds copper shipped to Italy on American vessels.

Nov. 4—Death of Frederick Augustus Heinze.

Nov. 5—First trial run of Jones furnace at Marquette.

Nov. 6—Death of Henry Gannett, geographer of U. S. Geological Survey and president of the National Geographic Society.

Nov. 7—Beginning of sanitary survey of Joplin district by U. S. Public Health Service and U. S. Bureau of Mines, with object of combating miners' phthisis.—Missabe docks at Duluth close.

Nov. 9—New York Metal Exchange reopens.—London Metal Exchange reopens.—Caving shaft at Sibley mine of Oliver Iron Mining Co. on Vermilion range, Minn., catches six men, of whom only one is later taken out alive.

Nov. 11—Curb market resumes open and unrestricted trading with permission to publish prices.

Nov. 12—Demand sterling at 4.86¾, lowest since April.—Final withdrawal of troops from Butte.

Nov. 14—Publication of announcement by President Bradley of Bunker Hill & Sullivan that company expects eventually to eliminate smelting of its ores.

Nov. 16—Federal Reserve banking system inaugurated.—Conviction of Boris Thomasen, member of I. W. W., for arson, following confession of having helped to set recent fires in Tonopah and Goldfield.—Gary steel mills increase operations.

Nov. 18—First distillation furnace fired at Langeloth, Penn.

Nov. 22—Muckie McDonald and Joe Bradley convicted of kidnapping.

Nov. 28—New York Stock Exchange opens for bond trading at minimum prices.—Beginning of great storm at Nome.—Formation of Safety and Sanitary League in Joplin, Mo.

Nov. 30—Death of Prof. Samuel B. Christy.

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The John Fritz Medal

The Board of Award some time ago decided to confer the Medal for 1914 upon Prof. John Edson Sweet, of Syracuse, N. Y., for his achievements in machine design and pioneer work in applying sound engineering principles to the construction and developing of the high-speed steam engine. The presentation took place in the Auditorium of the Engineering Societies' Building, New York, on Dec. 2. An address was delivered by Dr. James Douglas, past-president of the American Institute of Mining Engineers, on "Engineering in the Development of Mining." There followed an address on "The Relation of Standards to the Development of Engineering," by Samuel W. Stratton, director of the National Bureau of Standards. John R. Freeman, past-president of the American Society of Mechanical Engineers, president of the Board of Award in 1913, spoke on the significance of the John Fritz Medal and the achievements of Professor Sweet and presented Professor Sweet for the award.

The John Fritz Medal is a distinction [illegible] scientific or industrial achievement conferred [illegible] to time out of the income from a fund [illegible] memory of the great engineering pioneer, John F[illegible] and the award of the medal is made by a permanent Board of Award, composed of four members from each of the great national engineering societies, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Mining Engineers.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALLOY of Nickel, Copper, Chromium, Etc. Samuel W. Parr, Urbana, Ill. (U. S. No. 1,115,239; Oct. 27, 1914.)

ALLOY STEELS—Process of Producing Alloy Steels. Byramji D. Saklatwalla, Crafton, Penn. (U. S. No. 1,119,643; Dec. 1, 1914.)

AMALGAMATING MACHINE. Edward E. Hedges, Boston, Mass. (U. S. No. 1,118,128; Nov. 24, 1914.)

AMMONIA AND ALUMINA FROM ALUMINUM NITRIDE, Process of Producing. Emil Milde, Goldschmieden, Germany, assignor to Aluminum Industrie Aktiengesellschaft, Neuhausen, Switzerland. (U. S. No. 1,115,003; Oct. 27, 1914.)

BLASTING CARTRIDGE. Peter M. Copps, Haileybury, Ont. (U. S. No. 1,117,794; Nov. 17, 1914.)

BRIQUETTES—Method of Making Briquettes. Fred A. Jordan, Sellwood, Ont., assignor to Moose Mountain, Ltd., Sellwood, Ont. (U. S. No. 1,117,853; Nov. 17, 1914.)

BRIQUETTING—Method of Briquetting Iron Ores and the Like. Georg Crusius, Gross-Ilsede, Germany. (U. S. No. 1,116,024; Nov. 3, 1914.)

CLAD METALS—Method of Making Clad Metals. John F. Monnot, Paris, France, assignor to Duplex Metals Co., New York, N. Y. (U. S. No. 1,114,792; Oct. 27, 1914.)

CLASSIFIER—Cone Classifier. Sylvester Clingmon Buchanan, Guanajuato, Mexico. (U. S. No. 1,115,897; Nov. 3, 1914.)

COATING STEEL OR IRON WITH COPPER, Process for. James E. Sheaffer, Burnham, Penn. (U. S. No. 1,115,870; Nov. 3, 1914.)

CONCENTRATING TABLES—Improvements in Head Motion for Concentrating Tables. Deister Machine Co., Fort Wayne, Ind. (Brit. No. 3113 of 1914.)

CONCENTRATOR. Harry P. [illegible] Colo. (U. S. No. 1,116,092; Nov. 3, 1914.)

CONCENTRATOR—Ore Concentrator. [illegible] Morenci, Ariz. (U. S. No. 1,116,246; Nov. 3, 1914.)

COPPER EXTRACTION—Process of Extracting Copper from Carbonate and Oxide Ores. Henry R. [illegible], Salt Lake City, Utah. (U. S. Nos. 1,117,[illegible] and 1,117,[illegible]; Nov. 17, 1914.)

CRUSHER—Gravity Ore Crusher. Russell Franklin Collins, Spokane, Wash. (U. S. No. 1,118,471; Nov. 24, 1914.)

CRUSHING and Pulverizing Machine. Joseph E. Kennedy, New York, N. Y. (U. S. No. 1,115,[illegible]; Nov. 3, 1914.)

CRUSHING—Chilean Mill. James B. [illegible], Oroville, Calif., assignor of one-half to Walter M. Smith, Oroville, Calif. (U. S. No. 1,115,[illegible]; Nov. 3, 1914.)

CRUSHING MILL. Thomas Joseph Sturtevant, [illegible] Mass., assignor to Sturtevant Mill Co. (U. S. No. [illegible]; Dec. 1, 1914.)

CYANOGEN COMPOUNDS—Process of [illegible] Cyanogen Compounds. John E. [illegible], Coventry, R. I., assignor to Nitrogen Products Co., Providence, R. I. (U. S. No. 1,116,[illegible]; Nov. 10, 1914.)

DRILL—Fluid Operated Tool. Lewis C. [illegible], Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,117,[illegible]; Nov. 17, 1914.)

DRILL. Hammer Drill. Andrew J. [illegible], Victor, Colo. (U. S. No. [illegible]; Nov. [illegible], 1914.)

DRILL—Machine Rock Drill. Thomas Albert Sene, [illegible] (U. S. No. [illegible]; Nov. 24, 1914.)

DRILL—Pneumatic Rock Drill. Clark J. Smith, Ottawa, [illegible] (U. S. No. [illegible]; Dec. 1, 1914.)

SCREEN—Vibrating Screen or Separator. Willard J. Bell, [illegible] Mich. (U. S. No. [illegible]; Oct. 20, 1914.)

SEPARATOR. [illegible] Mattson, Elbow Lake, Minn. (U. S. No. [illegible], 1914.)

SLAG—[illegible] Articles from Slag. [illegible] (U. S. No. 1,114,[illegible]; Oct. [illegible])

SMELTING—Apparatus for Smelting Ores. J[illegible] (U. S. No. [illegible]; Oct. 13, 1914.)

[illegible] Wallace S[illegible] (U. S. No. [illegible]; Oct. 13, 1914.)

PERSONALS

E. M. Hamilton is in New York and will remain there for some time.

F. W. Bradley expects to remain in New York until after the holidays.

J. B. Tyrrell has returned to Toronto from a visit to the Porcupine camp in Ontario.

Yolen Williams, of Spokane, Wash., is in the Tulameen District in British Columbia.

Howland Bancroft has returned to Denver after a business trip to New York and Boston.

B. B. Thayer went to Butte last week, expecting to be back in New York about Dec. 20.

H. P. McFadden, superintendent of the Hollis mine at Sandon, B. C., was in Chicago on business recently.

John Irwin Ballard, assistant engineer, Quincy Mining Co., Hancock, Mich., was in Chicago recently on his way west.

S. H. Brockunier is conducting some tests at the property of the Pittsburgh Tungsten Mines Co., 35 miles north of Phœnix, Arizona.

E. H. Sampson, formerly at the Bluebell Mine, Kootenay Lake, B. C., is now assayer at the Jewel gold mine in the Boundary District.

George Steidle, of Rescue Car No. 5, has gone to San Francisco to take charge of mine-rescue demonstration at the Panama-Pacific Exposition.

Prof. Andrew C. Lawson has been appointed dean of the School of Mining of the University of California in place of Samuel B. Christy, recently deceased.

George W. Boyce, of the Big Five Operating Co., Leadville, and manager of the Gordon-Tiger mining enterprise, Twin Lakes, Colo., has been in Denver on business.

Anyone knowing the present address of Harry B. Per Lee, a civil engineer, last known to be employed at Elephant Butte, N. M., is requested to advise William E. Per Lee, of Stillwater, Minn.

Dr. Richard P. Flower, the ex-promoter whose arrest was recently noted, has been convicted in the New York courts of grand larceny, and sentenced to serve two years in the pentitentiary.

Walter W. Johnson, president of the Union Construction Co., San Francisco, has returned from Alaska, having had a successful season in the North, both in construction and operation of gold dredges.

Prof. J. Nagazumi, of the Imperial University, Kiushiu, Japan, is making an investigation of the silver and gold mines of Northern Ontario and of the metallurgical processes for the treatment of the ores.

Charles M. Schwab, head of the Bethlehem Steel Co., paid a flying visit to Montreal on Dec. 4. His trip is supposed to be in connection with a project to build submarines in Canada for the British government. Another statement is that Mr. Schwab has decided to build no submarines.

Robert Sticht, general manager of the Mount Lyell Railway & Mining Co., who has been visiting New York, thus finishing a year's holiday, started homeward on Dec. 5. Mr. Sticht recently attended several meetings of the technical societies in New York and Boston, at which, upon invitation, he talked upon the subject of pyritic smelting, of which art he is the world's premier exponent.

Edward S. Wiard, of Denver, Colo., has been in New York on professional business. He took advantage of the opportunity to discuss with the McGraw-Hill Book Co., the publication of his book on the "Theory and Practice of Ore Dressing." The publishers already have the book in type, wherefore it ought to be ready for issue in about a month or six weeks.

OBITUARY

William Dorian, one of the pioneers of the Butte District, died at Anaconda, Mont., Nov. 21, aged 79 years. Born in Ireland, he came to America when a young man, and after some years spent at Shullsburg, Wis., went to Montana, where he was one of the earlier settlers.

Randall Hitchcock Kemp died at Victoria, B. C., Nov 13, aged 62 years. Born in West Virginia, he went to the Northwest when a young man. For nearly 30 years he had been a pioneer in British Columbia, at Ainsworth, Kaslo, Slocan and other camps. His later life was all passed in that province, with the exception of three years in Alaska.

Hugh T. Stewart, Struthers, Ohio, one of the founders of the Struthers Iron Co., which built Anna furnace in 1869, died Nov. 25, aged 71 years. He was associated with Thomas Struthers, T. W. Kennedy and others, in the Struthers Iron Co., which property was afterward taken over by the Struthers Furnace Co. Anna was one of the early furnaces in the district.

Samuel Benedict Christy, dean of the College of Mining of the University of California, died at his home in Oakland, Dec. 6, aged 61 years. He was born in California and graduated from the university with which he was later connected as instructor for 40 years. He earned a high reputation as metallurgist, author and teacher. We hope to publish a suitable account of his long and useful life at an early date.

Robert B. Estey died recently at Boulder, Colo., aged 79 years. He was born in Maine, went to California when a young man and worked his way eastward through Nevada and Utah to Colorado. For 35 years he had been closely connected with the Leadville district. He was connected with many of the well known mines of the district. Mr. Estey was an authority on the geology of the Leadville district. Mining men found him to be a storehouse of knowledge concerning the geological formations and ore deposits, and the promoters of many large mining enterprises in which he was not financially interested eagerly sought his advice and counsel.

SOCIETIES

Old Freibergers in America—The annual meeting of the Old Freibergers in America will be held on Saturday, Dec. 19, at 7 p.m., in the Hofbrau Haus, Broadway and 30th St., New York. The members are urged to attend and bring guests with them.

Mining & Metallurgical Society of America—A meeting of the New York section will be held at Browne's Chop House on Thursday, Dec. 17, a 8 p.m., preceded by the usual dinner (informal) at 6:30 p.m. Mr. Ingalls will give a talk on the metallurgical plants in Europe which are affected by the War, and a paper on mine water will be presented.

Copper Country M. C. M. Club—The first of the regular fall and winter meetings was held at the Douglass House, Houghton, Mich., on Dec. 7. A dinner was followed by a talk on "Safety First," by O. F. Bailey, of the Calumet & Hecla Mining Co. Mr. Bailey organized the safety and rescue crews of the Calumet & Hecla and subsidiary companies.

University of Nevada—Mining high schools may be established in Nevada; if plan is approved, first school will be at Tonopah. On recent visit to Tonopah, Prof. F. C. Lincoln, director of Mackay School of Mines, at Reno, found that 150 miners were taking correspondence courses in mining. Plan of high schools conforms to general purpose of university extension courses. Federal aid has been proposed, permitting use of federal funds in university extension work in mining as Smith-Lever fund is now used in agriculture.

University of Pittsburgh—The School of Mines has opened its University Extension classes in the mining towns of western Pennsylvania for the third year. Five classes have been organized to study the subjects of mine gases, ventilation, law and safety, in preparation for the fireboss examination. These are located at Uniontown, Mt. Pleasant, Leisenring, Yukon and Russellton. In addition, a class in more advanced subjects to prepare candidates for the mine foreman examination is being conducted at Irwin. The enrollment in the six towns is 157, exceeding that of the two previous years. Each class will be met once a week in the evening, from October to April, by a member of the School of Mines faculty. Notes covering the subjects taken up in the course have been prepared especially for this purpose, together with illustrative problems. The lectures are accompanied with demonstrations of the apparatus studied. The cost of these courses to the student has been reduced to a minimum. The School of Mines offers the instruction without charge, and expects only that the traveling expenses of the instructor be met by the class. The interest manifested in these courses, both on the part of the students and the coal operators, is very gratifying to the institution. It is hoped that in the near future, facilities will permit of complying with all requests received for organization of mining classes.

Editorial Correspondence

SAN FRANCISCO—Dec. 2

For the Hydraulicking season, weather conditions in California at the beginning of December are favorable. The first storm of the fall came on the last night of November and extended practically all over the state, including the principal mining regions. For some days prior the weather had been cold in the mountains and a storm was expected at the middle of November. The snow in the higher elevations is reported sufficient to warrant a good supply of water, provided the weather does not turn warm too early and provided also there should be a reasonable amount of snow during the winter. This condition is especially attractive to the hydraulic miners who are in various parts of the state preparing for resumption of operations in many of the old mines which have been prohibited from operation recently on account of liability to violation of the anti-débris law. The hydraulic miners have become somewhat encouraged after careful study of methods for handling hydraulic tailings. A better type of dam construction has been adopted and the miners are also learning that it is possible to stack their tailings along the creek banks instead of turning them into the creeks. Methods will also be adopted during the coming season for taking care of the flume water and preventing its flow into the streams.

Mine Insurance is under consideration by the California Metal Producers' Association. A committee has been appointed to formulate a definite plan of inter-insurance to be submitted to the association for consideration or approval. This committee is composed of Henry Mallock, of the South Eureka Mine, Mr. Rosenfeld, of the Eagle-Shawmut, and Newton Cleaveland, of the Yuba Construction Co. Another committee will investigate employers' liability insurance as furnished by insurance companies. This committee is composed of Mr. Rosenfeld, Senator Voorheis and John Mocine, secretary of the association. There have been some informal meetings with representatives of the Industrial Accident Commission and rates of insurance upon mine employees have been considered, but no definite proposal has been presented by the commission. The association is going into the matter carefully and thoroughly and whether insurance will be taken with the insurance department of the commission or with the stock companies, or whether the inter-insurance plan will be adopted, will be decided only after the entire matter has been gone over thoroughly. The membership of the association is increasing and the indications at the present are that a majority, if not all, of the operating mines in the state will come in.

Smelting Fume troubles in the Shasta County copper belt are again complained of by the farmers, who have instituted two proceedings in the courts, apparently in the hope that if one plan of attack fails the other may succeed. George Baker, hay rancher, has brought suit in the superior court for $10,000 damages against the Mammoth Copper Co., but the case was removed to the U. S. district court, as the Mammoth is a Maine corporation, a fact well known to the complainant. Erle Downing, farmer and a member of the Farmers' Protective Association, went direct to the U. S. court with a petition asking that the Mammoth be declared in contempt of the standing court decree, under which it has been conducting smelting operations for the past two or three years. The petitioner contends that the Mammoth during June and July, 1914, allowed the discharge of 600 tons of sulphur dioxide, more than 700 tons of sulphur trioxide, or more than 900 tons of sulphuric acid from its plant, to the damage of vegetation; that during those months at various times there were discharged from the baghouse, gases containing more than 0.75% SO_2. Examinations for the complainant were made by the Western Laboratories of Oakland, and upon the findings of its engineers the petition was filed. The hearing had been set for Oct. 26, but was postponed to a date not later than Nov. 16. While Downing and Baker are both members of the farmers' association, which in the past has made the attacks on the Mammoth and the other plants, it does not appear that the farmers are in common accord with the present suits. In fact the majority of the farmers in the county are generally too prosperous to worry about fumes, even if there were a sufficient amount escaping to attract the attention of the engineers making the investigation. Baker is the man who in May, 1913, stated to the "Journal" representative that if there was no smelting in the county he would not be operating a large and profitable hay ranch.

DENVER—Dec. 3

The Fire that has been smoldering in the Smuggler and Molly Gibson mines at Aspen for years is still defying extinction. The country rock is a shale containing considerable carbon as well as sulphur. These elements ignited spontaneously and for a long time the properties were operated only with great difficulty. In places, the mine workings were extremely hot, so that workmen could remain in them for short periods only. All sorts of remedies were tried without success. Flooding was resorted to, but, although the workings were kept submerged for a long time, when they were unwatered and reopened the fire was found still to exist. The U. S. Bureau of Mines rescue car spent a week on the ground this fall and again flooded the mine, but the recent unwatering showed the fire unextinguished. It now seems evident that the only solution is to permit the fire to continue its own course and to burn out the combustible materials as rapidly as possible.

Camp Hoericke has sprung into being. It is improbable that there will be a rush comparable to those attending the birth of most mining camps, for the mining ground tributary to this settlement is held by a single interest, the Primos Chemical Co. This new point of activity is well up on the eastern slope of the continental divide, in Clear Creek County, about 8 miles west of the formerly active little mining town of Empire. For years, prospectors named Young and Lively have held and done desultory work on a large group of claims containing gold-silver veins. They have always been aware of the presence of certain yellowish and black minerals in a belt about 400 ft. wide but they never learned the names or worth of these minerals until Alfred H. Hale, a technical representative of the Primos company, happened along and informed them that the minerals contained molybdenum. On behalf of his company, he secured options to purchase the property and, under his direction, systematic prospecting was undertaken. For about two months, at least 20 men have been kept actively digging, prospecting and erecting buildings. Results thus far have been highly encouraging and the first payment on purchase has been made. Water power is to be developed to drive a compressor. A concentrating mill will be built, as soon as the proper treatment has been determined.

The London Mine, on London Mountain, seven miles west of Alma, was for years famous as a producer of rich silver-gold-lead-copper ore from a strong vein which was often erroneously stated to be in the London fault but which is actually some distance from it and not genetically associated with it, although having a nearly parallel strike. Some years ago the owners, a close corporation or partnership, found that the approaching exhaustion of shoots above the level of the big tunnel through the mountain, had brought about conditions precluding further profitable operation with the methods then existing. Development of new ground could be done only at great outlay. Dissension having arisen among the three estates that had meanwhile acquired the ownership no concerted action could be taken looking to such expenditure. The portals of the mine being much above timber line in a severe climate, labor has always been difficult to retain at reasonable wages, while generation of power by coal hauled up the long, [illegible] was exceedingly expensive. Last spring Charles P. Archer secured a leasing control of the property and has introduced a subleasing system whereby blocks of the developed ground are allotted to parties of miners who come chiefly from Leadville, just over the Mosquito Range to the west. At present, 10 sets of lessees are succeeding in getting out considerable tonnages of ore from ground that could not be profitably worked by "days pay" men.

BUTTE—Dec. 3

Both Miners' Unions had members in consultation with United States Senator Walsh during his visit to Butte on Nov. [illegible]. The subject of discussion was the [illegible] of the two organizations or the merging of the membership of one into the other. What progress was made toward reaching an understanding, if any, is not made public.

SEATTLE—Dec. 2

The Atlin District of British Columbia according to the latest conservative estimates, yielded more gold this summer than in any recent year. Many of the mines which depend upon English capital were closed down, but most of the creeks report a material increase in production over 1913 and 1912. This is true of McKee, Ruby, Wright, Otter, and Boulder Creeks. Pine and Spruce Creeks, however, were not so productive as in 1913, since a great many of the miners on those creeks are now on the O'Donnell River, where the outlook is encouraging, although comparatively little work has been done. The O'Donnell Placers, Ltd., spent most of the summer installing a hydraulic elevator plant and did not commence operating until late in the season.

The Koyukuk production for the season past was about $280,000, a slight gain over 1913. This Alaskan camp is far north of the Arctic Circle and primitive methods of mining still prevail; the short season and the difficulty and expense of getting machinery and other supplies also tend to restrict the output. For many years the annual yield has been between $200,000 and $300,000. Most of the ground is extremely "spotted," but the spots are often rich. On No. 4 Above, Hammond River, J. C. Kinney and partners picked up nuggets from bedrock valued at about $20,000; one nugget, the second largest ever found in Alaska, was worth $2600. The rest of the dump when sluiced yielded a little less than the value of the "pickings."

The Alaska-Gastineau reduction plant at Thane, near Juneau, Alaska, is receiving the finishing touches and will without doubt be ready Jan. 1 as originally planned. The big steel buildings which constitute the first unit are entirely erected and the work of installing the machinery is now about 75% complete. The mine is now ready to deliver 6000 tons per day, traffic facilities being practically complete. All that remains to be done is to replace the storage-battery locomotives by the trolley system, and this work is under way. The building for the coarse-crushing plant, 100x100 ft. by 125 ft. high, is entirely finished and ready for operation. The crushing plant and the concentrating mills are in one large building. The treatment process is essentially concentration. Coarse crushing is done in two large jaw machines and four No. 8 gyratories. Succeeding operations involve a pair of 72-in. Garfield rolls, ten 54-in. Garfield rolls, impact screens, Garfield roughing tables, Wilfleys, Richards-Janney classifier and tube mills.

Seward Peninsula output for 1914, as previously stated in the "Journal," will be about $3,000,000, in spite of a dry season, which interfered with all forms of mining except dredging. This represents an increase of $500,000 over 1913. The superiority of the dredge over other methods of handling gravel under the conditions obtaining in this area has again been demonstrated. Several new machines were built during the year, bringing the total number up to 42. Of these, 11 are in the Nome district; 10 are in the Council district; 9 are in the Solomon district; 5 are in the Teller district, 4 in the Kougarok, and 2 each in the Candle and Inmachuck districts. One dredge is also used in the York district for recovering tin. All are small, with buckets of about 3 cu.ft. capacity, and capable of handling from 1500 to 2000 cu.yd. per day. Several large hydraulic plants were also operated when there was enough water.

Tin Mining in the Cape York district is making steady progress. The York Dredging Co.'s dredge on Buck Creek produced cassiterite to the value of $48,000 in 1912, and of $104,000 in 1913. For 1914 the actual output was greater than for the preceding year, but a smaller price was obtained. In 1913 the cassiterite, averaging 62½% metallic tin, brought $570 per ton. Although the placer deposits have received the most attention so far, promising lodes have also been found. The Lost River Tin Mining Co. has done a large amount of work on a 12-ft. vein on Lost River that is said to carry 3 to 4% tin. A small reduction plant, run by gasoline power, has been used for testing. Plans have been announced for the erection of a 60-ton mill in 1915. It is even reported that this company will build a smelting plant on Puget Sound to treat its own product and possibly ores from Bolivia. The Bartels Tin Mining Co., has 32 patented claims on Cape Mountain; 300 tons of ore tested in its 3-stamp mill averaged 3% metallic tin. The United States Tin Mining Co. has a 10-stamp mill on its claims; the main tunnel is in over 400 ft. and the vein is reported to average 4% tin. There is little doubt that an important tin-mining industry will, in time, be developed in this area, but at present it is held back by several disadvantages, of which the distance to a market for the product is causing the most thought. Shipping and treatment charges to England total $60 a ton—not a prohibitive charge on material worth $570 a ton, but serving to retard development. One of the worst features where companies and individuals with limited capital are developing mines is the length of time it takes to get returns from shipments, and the general uncertainty in doing a small business at such a distance. It is to be hoped that a smelting plant will be built on Puget Sound or elsewhere in America.

The Portage Bay district in southwestern Alaska is doing well. Between Valdez and Portage Bay several quartz mines have been put on a paying basis this summer and many prospectors are planning the installation of mills. The operations of the Granite Mine at Port Wells have been previously reported in the "Journal." Captain George has 20 men working and is putting in bunkers at Beetles Bay, a short distance from Portage Bay. He will ship to Tacoma. Two other prospects have been opened up in this section. A stamp mill is running steadily on the Golden Treasure property at the town of Golden and several properties there have been bonded. Gus Ohm is running a small mill on Colville Creek and Colin Murray, formerly of Nome, is opening up a property on Piggott Bay, a branch of Passage Canal. Colonel Millard also has a number of options in this section and is developing several. Harvey Sullivan, former U. S. Marshal, has uncovered a vein of free-milling ore near Portage Bay and promises active development work next spring.

The Copper Country in the vicinity of Surprise Creek is reported to be showing activity, according to operators coming into Cordova, Alaska, for winter supplies. Harry Grennig and John E. Drake, who have been doing development work, report opening up an oreshoot showing copper 45%, gold $ and silver 10 oz. The property consists of a group of 1 claims on Surprise Creek, a tributary of the Kotsina River, the ore consists of chalcocite in quartz. On the Hubbard-Elliott property on Nugget Creek, a crew has been working and results are satisfactory. A crosscut tunnel has tapped the vein at a depth of about 400 ft. revealing high-grade ore, it is stated. On the California-Alaska property where a showing of ore has been obtained, assessment work has been completed by Frank Boyle. W. H. Brown, representing the Great Northern Development Co., has finished assessment work on the Regal and Kotsina and now has a crew of men employed on the Copper Mountain property of his company. Tom Lynch, who has been doing development work for the Dillman company on the Kuskalina, has about completed the work for the season and will return to the States. Tom Kinney, who has a high-grade copper prospect on the Chokosna, a tributary of the Kuskalina, has closed down for the winter after running a full crew all summer. John Canning and Ben Bonito, whose remarkable strike of gold quartz about two years ago on Cow Creek, a tributary of the Kotsina about 11 miles from Strelna, created some excitement, are preparing to work their property on a large scale. The vein was covered to a considerable depth with slide gravel, muck and tundra. They are now groundsluicing off the overburden and this winter will sink on the vein.

JOPLIN—Dec. 2

A Safety and Sanitary League was organized among Joplin operators Nov. 28. One of its objects is to prevent accidents at the mines by improvement in equipment and by such uniform rules as will tend to educate the miners. Its prime object, however, will be to alleviate the conditions which make for the increase of miners' phthisis. The organization, working in conjunction with the state mine inspectors, the U. S. Bureau of Mines and the Public Health Service, will try to carry out measures for the prevention of rock dust, for better ventilation, and for more sanitary conditions underground and in the change rooms. A set of rules and recommendations will be made out immediately by the committee with the advice of the inspectors, which will be put into effect at all the mines connected with the organization. A campaign of education will be started to help the miners themselves to understand conditions and get them to assist in the measures being taken for their benefit. The campaign will also include the work of getting all the mine operators into the organization. It is believed that eventually all the good miners will want to work only for such companies as follow the recommended rules and preserve sanitary conditions, and that mines not belonging to the organization will find it difficult to get good help or to keep a steady force.

CHICAGO—Dec. 5

The Quinn mine's plans for a washing plant have been noted in the "Journal." Additional information is now available. The Quinn is a western Mesabi mine. Its ore does not need any treatment. However, the same interests control adjoining pieces of ore-bearing land, and this ore does need treatment. Butler Bros., who are operating the Quinn mine, are therefore constructing what is known on the range as a one-unit washing plant. It will be one-fifth the size of the Coleraine plant and a little larger than the one at Nashwauk. The treatment process and equipment will be similar to that at Nashwauk, except that concentrating tables will be employed. The tables will be installed this winter, although it is understood that the orders for the tables have not yet been placed.

The Rowe mine, operated by the Pittsburgh Steel Ore Co., at Riverton, Minn., on the Cuyuna range, has contemplated for some time the erection of a plant to treat its ores. Reports obtained within the last few days state that work on the plant is now actually started. It is also learned that the capacity of the plant will be sufficient to permit treating other ores than those of the Rowe. In other words, it is to be something of a custom plant.

HOUGHTON—Dec. 5

A Fifty per Cent. cut in production has not been made by the copper mines of Michigan. While there may be some criticism of the mines of the Michigan district for this failure to follow the general cut as made by producers in other parts of the United States, there is ample justification for their course based on the peculiar exigencies of the situation relative to labor and mine treasuries. The Michigan mines had just been through the heartrending experience of a long fight with the Western Federation. That strike partially shut off their production over a considerable period. Furthermore, it was an expensive proceeding for the mining corporations. For this reason, while the mines in most instances, made a partial reduction when the war began, they have by no means cut their output to one-half. The one exception is the Copper Range Consolidated, which is working its Champion, Baltic and Trimountain mines on half time. Other mines are working three-quarters time and in one or two instances the low grade of the rock makes full-time operation necessary to prevent actual loss. But even with reduced working forces and fewer working days the greater efficiency of the men and improved mining methods have brought about an unusual increase in rock tonnage, a phenomenon usually in evidence when there is a superfluity of workingmen and a sincere and ardent desire on the part of every man holding a job to keep it. Illustrative of the increase in rock tonnage per man employed and of the present output of the mines in this district, it can be said that the Mineral Range R.R., which serves the Osceola Consolidated, Ahmeek, Centennial, Allouez, Wolverine and Mohawk mines, handled in November, 300,000 tons of rock, within 10% of normal.

Copper Range Consolidated management has no intention of increasing production. The mines have operated on half time at reduced wages ever since the war began, the men working two weeks during each month. The mines lost few of their good miners, all of the men realizing that while they were compelled to suffer a hardship, it was a condition for which the war alone was to blame and that there was little to gain by seeking employment elsewhere. The announcement of the resumption of full time at the Centennial and Osceola branch of the Osceola Consolidated led to a belief that many of the other mines also would shortly resume full time. This is not so. The managements of the mines do not anticipate any sustained improvement in the copper situation until the war is ended, and they realize that it will then require a long time for business activity to reach normal conditions again, so as to call for any unusual quantity of copper.

ISHPEMING—Dec. 5

The Aid Fund of the Lake Angeline mine, a Marquette range property of Jones & Laughlin, is responsible for an interesting problem presented to the probate court. Prior to the enactment of the workmen's compensation law several years ago, it was the rather general practice of Michigan mine managements to create and maintain aid funds for the benefit of employees, both men and companies contributing stated sums monthly. Disbursements were made to the injured and the sick as needed. These disbursements fell below the receipts in some instances, and there gradually were accumulated considerable surpluses. This was the case with the Lake Angeline fund. The Lake Angeline is practically worked out, and a few months will witness the end of its career. Already it has been necessary to dispense with the services of a considerable number of the men, and most of these have long been contributors to the aid fund. The question is: To whom do the funds belong, and if there is to be a distribution, who is to share in it and in what proportion?

TORONTO—Dec. 5

Graphite Exportation outside the British E[illegible] prohibited by the Canadian government, which [illegible] order-in-council to that effect. The production [illegible] during 191[illegible] was 2162 tons, valued at $90,2[illegible], [illegible] exported to the United States.

On Assessment Work a further extension of six [illegible] from Nov. 1 has been granted by the Ontario Department of Lands, Forests & Mines. A previous order-in-council [illegible] a three-months extension from Aug. 15, owing to adverse financial conditions, and in this respect the situation shows but little change.

The Antimony demand created by the war has led to an attempt to revive the antimony mining industry in Canada. The deposits at Lake George, York County, N. B., which many years ago were worked by the Lake George Mining & Smelting Co. and subsequently by the [illegible] Antimony Co., Ltd., are being reopened. The operators had to contend with transportation difficulties necessitating a long haul which, combined with the low price of the metal, resulted in the suspension of operations. The increased price of antimony and the fact that railway facilities have been secured by the completion of the St. John Valley road to within three miles of the plant make conditions appear favorable to the success of the enterprise.

EDMONTON—Dec. 2

Northwestern British Columbia holds considerable promise as a gold field. In the Liard, Findlay and Parsnip River districts prospecting has been done for many years, but the enormous difficulties encountered in getting into the country and the high cost of provisions, all of which must be packed in by men or animals, have tended [illegible] thorough examination of the territory. Many outfits have however gone in and come out again and recently some of them returned with two and three thousand dollar pokes, gained in a few months panning. Doubtless more gold has come out than has been made known to the general public. At the present time there are several hundred men in the districts, according to reports from Hudson's Hope and Fort St. John, two points on the Peace River whence outfits go in. Hudson's Hope is [illegible] miles from Edmonton and Fort St. John is 625. Leaving Edmonton the first hundred miles of the distance can be traveled by train to Athabasca Landing. Thence to Peace River Crossing 295 miles is made by river steamer. From the Crossing the Peace runs to both Fort St. John and Hudson's Hope and this part of the journey can be made in scows which will carry two and three tons with ease. Should gold be found extensively the country offers fewer difficulties than the Yukon.

CHIHUAHUA—Dec. 1

The Chihuahua Smelting plant is running at about [illegible] capacity. It appears that there is [illegible] Chihuahua, which is the reason [illegible] of the eight furnaces. The [illegible] could easily furnish ore for all the [illegible] of the camps there is an abundance of [illegible]. It is reported that Donald B. Gillies has been appointed [illegible] of the Corrigan-McKinney properties at T[illegible] and [illegible]cheño, and that these properties are soon to [illegible] operations. There are copper mines and a smelting plant at T[illegible], and gold-silver [illegible] at C[illegible].

The Cusi Mexicana Mining Co., also under the management of Mr. Gillies, will, [illegible] days, resume [illegible] at Cusihuiriachic, where it has mines with [illegible] ore reserves and a 100-ton concentrating plant.

The Cusi Mining Co., owner of the [illegible] mine, is shipping all the ore to Chihuahua that the smelting plant will accept, which is only half [illegible] its present equipment. A [illegible] and should give this [illegible].

The [illegible] plant and [illegible] shaft, which is [illegible] of [illegible] encountered [illegible] owned by the same [illegible] cost. This property [illegible] oz. silver and [illegible] oz. [illegible] surface.

The [illegible] level. [illegible] in a drift [illegible] equipped with [illegible]

The Virginia C[illegible] Mining Co., owner [illegible]

The Mining News

ALASKA

FURIOUS BLIZZARD had been raging at Nome for three days on Dec. 1, forcing ice pack up against buildings and driving water farther inland than for several years. Trails impassable. Several shore mining camps surrounded by water. No loss of life reported.

EBNER (Juneau)—Consolidated California-Nevada Co. to be organized by A. W. Middleton, former treasurer of Alaska-Ebner Gold Mines Co., property of which was lately bought at foreclosure in behalf of bondholders' committee for $225,000. Shareholders of Alaska-Ebner company, whose equity in property was extinguished, have been asked to pay a 50c. assessment and receive new stock share for share. Supposedly best asset of Alaska-Ebner Gold Mines Co., namely, 100,000 shares of Ebner Gold Mines Co. stock, will not go into new company, as option on it was given to U. S. Smelting Co., until next spring. Latter understood to have spent on development work between $350,000 and $400,000.

ARIZONA

Cochise County

CALUMET & ARIZONA (Bisbee)—Some disposition to criticize management for paying $1 a share on Superior & Pittsburg and 50c. a share on Calumet & Arizona. Plain facts are that bulk of profit now accruing to this consolidated interest comes from Superior & Pittsburg ore. S. & P. dividend, of course, must go into C. & A. treasury, 94% of it at least, and deficit in that treasury, close to three-quarters of a million, must be made up before disbursement is made.

WOLVERINE & ARIZONA (Bisbee)—To pay first dividend Dec. 10. Organized soon after success of C. & A.'s Irish Mag shaft attracted attention to Bisbee district and new exploration companies were formed every third morning in Calumet, Mich. Had merit and developed rich sulphide orebody. Working only few miners, has been steady shipper of high-grade ore to Douglas and has accumulated surplus. Operations will continue and dividend will not take all of the treasury money. At different times there have been rumors that Copper Queen or C. & A. interests would buy Wolverine, but these were not founded on fact. Present dividend 20c. per share.

Santa Cruz County

CONNECTICUT (Alta)—Tom Tate has sold lease to Hudson & Gartley, who are prospecting orebodies and having good results in opening up new ore.

GOLD COIN (Amadoville)—Trial run made with mill on this property and clean-up retorted and sent off for assay. Upon result of run, future of work may depend. Gold claimed to be there, but point to be determined is amenability to straight amalgamation. Mill equipped with Kincaid mill and oil engine; capacity 20 tons. William Carnett in charge.

COLORADO

San Bernardino County

POTASH LAND CONTEST renewed by filing of suit in U. S. District Court at Los Angeles, involving lands under development and operation by American Trona Co. at Trona on Searles Lake. Suit filed by E. Thompson, H. A. Baker and others against Thomas W. Pack, Stella Schuler and Joseph K. Hutchinson, alleging Hutchinson and Foreign Mines Development Co., California Trona Co. and American Trona Co. are attempting to deprive complainants of interests in Searles Lake region. Alleged Hutchinson demands payment for moneys expended in improvement, and unless refunded complainants must forfeit interests.

UNITED GREENWATER (Dale)—Theft of $20,000 of bullion reported at Supply mine operated by this company under lease. Clarence Loyst, a student, of Los Angeles, said to have confessed that he and W. M. Scott, watchman at mine, stole bullion, and that such thefts had been going on about two years. Bullion last stolen recovered and the two men formally charged. Mines owned by H. A. Landwehr, of Los Angeles. John McGee, superintendent for operators.

Tuolumne County

DUTCH (Jamestown)—Mine reported sold to New York men represented by W. G. Devereaux, of Melones mine. Dutch has for past six years been developed and operated under management of Charles H. Segerstrom, who took charge at time when bad management had depleted ore reserves and placed mine among nonproducers. Mr. Segerstrom began campaign of practical development and installed modern machinery, including 40-stamp mill, electric hoist, compressors, and mile of narrow-gage railroad to connect with Sierra Ry. at Jamestown in order to facilitate shipment of concentrates and receiving of supplies. Mine brought back to producing class. Details and price of sale not now available.

COLORADO

Boulder County

CARIBOU (Caribou)—This property, about two miles above Cardinal, being worked by Henry T. Lowe. Old shafts unwatered, workings cleaned out and new development under way. Mr. Lowe has conducted experiments in milling and indications are that following present equipment for cyanidation will be retained: Blake crusher, 8-ft. Hardinge mill, 6-ft. Hardinge mill, Dorr classifier, four Card tables, three Dorr agitators, Dorr thickener, three 30-ft. leaching tanks.

Chaffee County

MOUNT CARMEL (Buena Vista)—J. I. De Remer has acquired control of this old property in South Cottonwood district and is putting it in shape to resume production. Ore carries gold, silver, lead and copper.

Gilpin County

MACKEY (Apex)—Mill, equipped years ago for stamping and cyanidation but never operated, being remodeled and will soon treat ore hoisted from shaft.

LONDON (Twelve Mile)—Three shifts employed sinking new shaft wholly in ore. Two feet of vein assays $50 per ton, shipped direct to Denver; rest goes to mill and produces concentrates averaging $55 to $60 per ton.

Lake County

ARKANSAS VALLEY smelting plant fire damage entirely repaired and operations again in full blast.

GORDON-TIGER (Twin Lakes)—Manager G. W. Boyce has cleaned out tunnels 3, 4 and 5 and is putting this old property into shipping shape again.

SIWATCH TUNNEL (Sugar Loaf)—Suicide of former manager Albert Teats, about a month ago, interfered with work, but Jeff Miller, now assigned to management, has resumed the various operations backed by local men.

TENDERFOOT (Leadville)—Now shipping fine ore from ground closed a few months ago by caving. Believed winter temperature has so congealed moisture in ground that it is now quite strong enough for mining operations. While this strikes one as risky work, it is proposed to continue with steady shipments.

NEW MONARCH (Leadville)—Thomas Raney has contract to sink Monarch shaft another 100-ft. lift and will keep three shifts at work. Upon completion of sinking, specific exploration is planned. Lessees on Cleveland and Winnie claims shipping heavy tonnages of fair-grade ore. Nordella lease produces 50 tons daily assaying close to $100. Bona lease ships about 40 tons per day.

PENROSE (Leadville)—As this shaft is center of proposed operations by Downtown Mines Pumping Co., repairs and improvements are being made. Shaft itself repaired down to water level; foundations placed for machinery; old buildings renovated and improved; electric power transmission line erected; railroad spurs improved. Delivery of machinery promised by manufacturers soon after Jan. 1.

IBEX (Leadville)—Connors lease in this famous Little Jonny mine continues to produce usual small quantity of extremely rich gold ore. Kinney & Gilovich lease directly above ground worked by Connors; miners expecting to catch upper portions of same rich shoots. Jacketts & Co. produces three to four cars per month of rich zinc-carbonate as well as some good gold ore. C. & G. lease ships 100 tons of low-grade ore per day. Magnee lease has opened gold oreshoot in oxidized ground and ships small, steady tonnages. Recently Clemmons & Co. delivered about one-half ton of sulphide ore to Arkansas Valley plant; during screening of rolled ore, 41 oz. of gold metallics recovered while balance of stuff assayed 190 oz. gold per ton. Ore comes from 1-in. vein at present, but lessees hope it will widen.

San Miguel County

BLACK BEAR (Telluride)—Upper tramway completed; buildings wrecked by snowslides a few years ago being rebuilt.

PRIMOS CHEMICAL CO. (Vanadium)—Main operations closed down two months ago because of general depression, but supplies are arriving and it is planned to resume work in reduction plant on ores from company's rare-mineral claims in western part of county.

Teller County

CRESSON (Cripple Creek)—Important strike of bonanza ore reported. Stuff running $3 per lb. sacked behind closed doors with armed guards on watch.

IDAHO

AJAX (Mullan)—This mine in Burke Cañon, starting development work, consisting of crosscut from the lower tunnel to cut vein.

INTERSTATE-CALLAHAN (Wallace)—Company shipping 60 to 75 tons a month. Ore graded up to minimum of 50% zinc content. Working full capacity, three shifts in mine and mill. Production will be greatly increased as soon as company can decide on new milling plant.

MICHIGAN

Copper

ISLE ROYALE (Houghton)—For first time in history mine not losing money on low-price copper. Asserted that during November it showed small profit. Better than 15 lb. recovery.

SUPERIOR (Houghton)—Less than three weeks after mine fire, hoisting normal tonnage. Remarkable reconstruction, due to good organization of Calumet & Hecla's whole plant and emergency force.

WYANDOT (Winona)—No operations, either exploratory or productive. Manager Van Orden has miners at work logging timber; 90,000 feet will be cut during winter, already marketed at a profit. Treasury has $20,000 balance to pay taxes.

CHAMPION (Painesdale)—Ten drifts pushed south of E shaft, most southerly on Copper Range property, for three-quarters of mile with fair showing in each. Particularly interesting since property adjoins Globe tract on south, owned by interests associated with Stantons. For long time Copper Range had this property optioned. Shaft sunk and development work done, but option permitted to lapse after considerable outlay, as results did not indicate property worth option price. Development work attended by difficulties (see E. & M. J., Jan. 24, 1914, p. 225.)

Iron

GEORGE S. PORTER has given 000 volumes and equipment for library in school of town of Alpha. Porter owner of tract of land on which Mastodon ore find was made. Alpha is town for Balkan and Judson mines opened on orebody.

MISSOURI-KANSAS-OKLAHOMA

JOE ALDRICH and others are installing modern pumps in old discovery shaft on Bonanza land west of Galena, Kan., to take place of smaller pumps found too light to handle water. Many years ago this old tract of land was mined to some extent but operators were forced to leave good ore in lower ground, being unable to lower water with crude pumping devices in use at that time. Modern equipment makes task comparatively easy. Mines situated near Short Creek, along bank of which levee has been constructed to prevent high water flooding mines.

DIPLOMAT (Galena, Kan.)—Mill and mines shut down for month or six weeks to make needed improvements on mill and do development in mill shaft.

MONTANA

Carbon County

LOST CABIN mine reported rediscovered. P. B. Stark and associates of Fromberg convinced they have found it near head of Lime Creek, south of Red Lodge. Assays from ore picked up near cabin ran $20. Men found remains of cabin while hunting, with rusty tools and quantity of ore near mouth of old 50-ft. tunnel.

Deer Lodge County

WASHOE PLANT (Anaconda)—Construction of lead condensing chambers in new sulphuric-acid manufacturing plant recently begun. There will be six, each 40x96 ft. by 36 ft. high. There will be also 23 cooling chambers, each 11 ft. in diameter, 36 ft. high. Side walls hung in several of chambers and well started in others; no floors or ceilings yet in place; work not started on cooling tanks. Plant will be completed ready for production next spring. Work under direction of H. W. Dederick, expert engineer in construction of chemical buildings.

Flathead County

BEAR CREEK MINING CO. (Libby)—Company installing steam shovel to work the placer deposits, 18 miles from Libby. The property comprises old Lake Bed, formerly owned by C. Lindholm, of Spokane, Wash. There are about 15 men at work about camp. Drain 100 ft. long through rock completed and working satisfactorily. Cabins for accommodation of men about completed.

Lewis and Clark County

DRUMLUMMON (Marysville)—Mine sold, Nov. 28, by sheriff for $11,486 to satisfy judgment of $12,000. Was famous gold producer, while operated by English syndicate paid large dividends. Col. Thomas Cruse, of Helena, discoverer, sold property in 1887 to syndicate for $1,500,000. For several years gold production was enormous; at depth of 1600 ft., low-grade ore was struck which made further operations unprofitable. For some years St. Louis Mining & Milling Co. has been in possession of property. Future of mine not determined.

Madison County

SILVER STAR mining district reports more than usual activity this fall. Number of gold properties being operated by leasers. On Hudson claim leasers are sinking shaft 100 ft. below water level, making good progress, are installing new boiler, pumps and hoist. Broadway mine also being operated by leasers shipping small quantity of ore regularly.

Silver Bow County

CLARK-MONTANA vs. FERGUSON SUIT—Trial started Dec. 1, before Judge Bourquin in the Federal court, of Butte. Case involves title to mining ground on South Montana street, Butte, opposite new Milwaukee station site. Land in controversy is 50 ft. wide and 800 ft. long. Plaintiff claims it under placer patent and the defendants claim it as quartz land, with well known and well defined vein. Hearing completed Dec. 2, and case taken under advisement by judge.

EAST BUTTE (Butte)—Reported negotiations for purchase by North Butte under way, probably on basis of exchange of shares. Said North Butte wants East Butte smelting plant. Latter thoroughly modern and on completion of alterations could treat ore of both mines, making 40,000,000 to 45,000,000 lb. copper per year. North Butte has 430,000 shares out. East Butte, 411,000. Latter still owes $600,000 on Pittsmont purchase but has quick assets of about same value. North Butte has about $800,000 working capital and 190,000 shares in treasury.

NEVADA

Clark County

FREDERICKSON—Small concentrating mill to treat mixed lead-zinc carbonate ore to be erected by O'Kelly & Munzberg who recently purchased property. Tests made with Stebbins dry concentrator, but no decision made as to equipment to be installed.

MOBILE—Wadey & Frederickson, of Goodsprings, have leased property, and have installed aërial tramway. Motor trucks ordered from Los Angeles, which will be used to haul ore from mine to Jean. Expected about 300 tons of zinc carbonate ore monthly will be produced.

Lyon County

BLAINE (Pine Grove)—Lease on this and Sugar Loaf Microbe and East Wing claims taken for two years, with option to purchase for $15,000

Ormsby County

GOLD STRIKE made in Brunswick Cañon, five miles from Carson City. Rich sample taken from discovery shaft. Shaft-sinking under way.

ADVERSES to patent applications of Central Pacific R.R. to land grant along right-of-way filed by owners of mining properties. Land granted under act of July 1, 1862, and amendatory act of July 2, 1864, comprising in Nevada [illegible] acres, according to statement of Clay Tallman, commissioner of general land office. Area includes some important mining properties.

RAISES IN ASSESSMENT values on mining improvements and milling property discussed at Carson City, Nov. 25, at informal conference of tax commission with Henry M. Hoyt, W. B. Alexander, W. H. Blackburn and Frederick Bradshaw. Action of tax commission reported satisfactory. Stated Nevada Consolidated has protested to tax commission against assessed valuation. No decision rendered yet.

NEW MEXICO

Socorro County

CLEAVELAND & WEATHERHEAD (Mogollon)—Changes to be made in Deadwood and Sunburst mines and Deadwood custom mill during temporary shutdown. Company in market for 50-hp. internal-combustion hoist, new cages and drill sharpener.

TREASURE MINING & REDUCTION CO. (Mogollon)—Decree of foreclosure granted in case of Thomas E. Waters vs. company, involving property at Mogollon with valuation of $287,395. Property includes Confidence group, mill, mill site and water rights.

SOUTH DAKOTA

HOMESTAKE (Lead)—Company announces Christmas present of 7% of his total year's wages to each employee on payroll for December, payable by check at regular January paydays.

UTAH

Juab County

CHIEF CONSOLIDATED (Eureka)—Company has taken option on Scotia property in West Tintic. Shaft down 150 ft. and winze sunk in ore from this level. Development will be undertaken in neighborhood. Two small engines will be used, one for shaft, other for winze. These, as well as machine drills, will be operated by crude-oil air compressor.

Salt Lake County

PERUVIAN (Alta)—Five-year lease taken by the Miller Investment & Leasing Co. of Salt Lake. Work started to reach ore opened in winze from one of tunnel levels.

MAXFIELD (Salt Lake)—F. H. Fahrenkamp has taken bond and lease. Compressor, pump, etc., will be installed for unwatering below tunnel level. Operations in Big Cottonwood stimulated by Cardiff strike.

Summit County

SILVER KING CONSOLIDATED (Park City)—Statement sent to stockholders, by Solon Spiro, president, advises that all matters in litigation have been settled. Permanent peace established between Consolidated and Coalition.

Tooele County

BULLION COALITION (Stockton)—Work of sinking below Honorine drain tunnel under consideration for [illegible] now started. Ore extends below tunnel level; [illegible] question whether it can be opened without handling [illegible] water.

WASHINGTON

ALLIANCE MINING CO. (Republic)—Company has taken over mines and equipment of Anaconda Gold Mining & Reduction Co. for $171,000, $120,000 paid in Alliance stock and remaining $50,000 represented by indebtedness assumed by purchasers. Alliance company already had acquired old Princess Maud property and now has group comprising [illegible] acres of patented land. All properties will be worked through long lower tunnel of Princess Maud. Latter was developed extensively under former ownership and will require only a few hundred feet of tunneling to connect with Anaconda group, thus eliminating hoisting and long haul to get ore to railway.

CANADA

Ontario

HAYDEN (Porcupine)—Company will [illegible] work; has already let contract for [illegible] ft. of crosscutting.

TOUGH OAKES (Swastika)—All work stopped, believed due to trouble between English and Canadian interests.

DOME (South Porcupine)—Diamond drilling [illegible] partly abandoned on account of inability to put down vertical holes.

PETERSON LAKE (Cobalt)—Calcite vein [illegible] silver content cut in the Keewatin at [illegible] level. [illegible] followed into conglomerate.

TECK HUGHES (Swastika)—Recent level [illegible] unsatisfactory; oreshoot on [illegible]-ft. level much shorter than on [illegible]-ft. Nipissing in doubt as to advisability of continuing development but on payment being reduced to $1500 decided to go ahead.

HOLLINGER (Timmins)—The usual four-weekly statement for period ended Nov. 1 shows gross profits of $16[illegible] from treatment of 18,6[illegible] tons; average value $14.[illegible], working cost $4.18 per ton milled. Not definitely determined whether ore that came into winze at 800-ft. level is No. 1 vein or not.

SOUTH AMERICA

Bolivia

HUANCHACA—Statement in "Journal" Nov. [illegible] company did not intend to dispose of silver [illegible] should have read "under [illegible] pence."

The Market Report

METAL MARKETS

NEW YORK—Dec. 9

All of the metals have been dull but have not exhibited any weakness except spelter, which has been decidedly stronger by virtue of important buying from Europe.

Copper, Tin, Lead and Zinc

Copper—Following three or four weeks of active buying and large transactions, it was not unnatural to have the lull that was experienced during our last week of record. In the offices of the big sellers this was regarded merely as a temporary halt, and certainly there was no exhibition of anxiety among first hands to keep on selling, although there were reports of shading among dealers. The largest producers held their metal for 12⅞@13c., regular terms, and early in the week some sales were reported at around those figures, but later business was entertained in some quarters at 12¾@12⅞c., regular terms. The differences in price demanded according to time of delivery became less sharply marked than they were during the previous week, and at the close, copper was available at 12⅞c. for all positions, with a possibility that December business could be done at 12¾c. However, the market became distinctly firmer on Dec. 9, when there was a renewal of good selling to Europe.

The aggregate of transactions during the last week was very small and up to Wednesday was almost entirely for domestic account, the price for electrolytic in London having been about £58@58½ (12.66@12.88c.), which was below our parity. The opinion was held here, however, that English consumers would shortly be obliged to come into the market, and the renewed buying from England, which stiffened the market on Wednesday, lent some color to that belief.

Copper sheets, base price is now 18c. for hot rolled and 19c. for cold rolled. The usual extras are charged and higher prices for small quantities.

Copper Exports from New York during the month of October were: Pigs, ingots and bars, 55,980,643 lb.; wire rods and wire, 2,683,994; plates and sheets, 174,681; other forms, 4577; total, 58,843,895 lb. The larger exports were 21,270,187 lb. to Italy; 18,449,511 to Great Britain; 7,453,411 to Norway; 5,351,864 to France; 5,342,340 to Sweden; 358,547 lb. to Denmark.

Exports from New York, Philadelphia and Baltimore for the first week in November were 15,805,440 lb. copper.

Visible Stocks of Copper in Europe, Nov. 30, are reported as follows: Great Britain and France, 21,090; Rotterdam, 1150; total, 22,240 long tons, an increase of 181 tons over Nov. 15. In addition 100 tons were reported afloat from Chile and 3900 tons from Australia, making a total of 26,240 tons.

Tin—In the early part of our week the market was firm on bull speculation in London. Business in this market was active among dealers, but consumers did not evince much interest at the higher prices. With the decline in London, starting on Monday, interest in this metal in this market subsided.

Visible Stocks of Tin on Nov. 30, are reported as follows: London, 7502; Holland, none; United States, excluding Pacific ports, 3981; total, 11,483 long tons, an increase of 589 tons over Oct. 31. Of the stocks reported 4558 tons were in store and 6925 tons afloat.

Lead—Business was light and such as there was apparently was taken chiefly by the principal producer. The independent producers in St. Louis were a little less firm than in the previous week. Some curiosity was aroused by the prospective appearance of some large orders from Japan and Russia. Russia is said to be inquiring with respect to several thousands of tons to be shipped to Vladivostock by way of the Panama Canal.

Russia is reported to have been recently a large buyer of white lead in this market, needing it for the manufacture of rubber for automobile tires.

Spelter—On Dec. 3, the market leaped sharply on orders from Europe. During the following days a further demand came from that quarter, in meeting which the sales aggregated several thousands of tons. American consumers did not become excited in the least about the advance in the market and the business done with them was insignificant.

Other Metals

Aluminum—Business has been slow and sales small. Quotations hold about 19c. per lb. for No. 1 ingots.

Antimony—Business for the past week has been small. Prices are weaker, ordinary brands—Chinese, Hungarian, etc.—being quoted at 13@13½c. per lb., while Cookson's is held at 16@16½c. There has been some inquiry for futures, but dealers are reluctant to quote ahead.

Quicksilver—The market has been rather quiet, but there is very little change in quotations, which are about $52.50 per flask of 75 lb. London price is £11 5s. per flask.

DAILY PRICES OF METALS

NEW YORK

Dec	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
3	4.8825	49⅞	12.70 @12.80	33½	3.80	3.70 @3.72½	5.40 @5.50	5.25 @5.35
4	4.8825	49⅝	12.70 @12.75	33¼	3.80	3.70 @3.72	5.55 @5.60	5.40 @5.45
5	4.8750	49¾	12.70 @12.75	33¾	3.80	3.67½ @3.72½	5.55 @5.60	5.40 @5.45
7	4.8763	50⅛	12.60 @12.70	33	3.80	3.67½ @3.72½	5.60 @5.65	5.45 @5.50
8	4.8700	50¼	12.60 @12.70	32¾	3.80	3.67½ @3.72½	5.65	5.50
9	4.8700	49¾	12.65 @12.75	32⅝	3.80	3.67½ @3.72	5.65	5.50

The quotations herein are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Dec.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts per Lb	3 Mos	Best Sel'td	Spot	3 Mos	£ per Ton	Cts. per Lb.	£ per Ton	Cts per Lb.
3	23 1/16	56½	12.28	56⅝	*	147½	115¾	19	4.13	26¼	5.70
4	23	56⅜	12.25	56⅜	*	149½	147½	19	4.13	27	5.87
5	23 1/16					....					
7	23¼	55½	12.06	55½	*	147½	145½	19	4.13	27½	5.97
8	23¼	55⅜	12.03	55⅝	*	146¼	144¾	19	4.13	27½	5.97
9	23 1/16	56¼	12.22	56⅜	*	146	144½	19	4.13	27¾	6.06

*No quotations.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26¼c. = £25 = 5.44c.; £50 = 10.88c. Variations, £1 = 0.21¾c.

Nickel—Ordinary forms—shot, blocks or plaquettes—are 40@45c. per lb., according to size and terms of order. Electrolytic metal is 5c. per lb. higher.

Gold, Silver and Platinum

Gold in the United States, Dec. 1, is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, $972,298,869; in Treasury current balances, $207,269,388; in banks and circulation, $637,553,443; total, $1,817,121,700, which is a decrease of $18,291,598 from the November statement.

Platinum—Sales have been made at $42.50@44 per oz. for refined platinum. The market is quiet, and the demand from the jewelry trade is small. Hard metal is quoted at $51@52 per oz. for 15% iridium.

Our Russian correspondent writes that the market shows no change. The policy of the Imperial Bank in making advances on crude platinum has much improved the position of the small and medium producers. It is reported that small quantities of metal can be bought at Ekaterinburg at low prices; but no quotations can be given either there or at Petrograd. High prices are expected after the war, owing to the present small production.

Silver has shown some improvement the last few days. The market has been broader, but having been satisfied yesterday at 23¼d. in London, it has receded today to 23[illegible]d., at which price it is steady.

Coined silver in the United States, Dec. 1, is estimated by the Treasury Department as follows, on face value: Standard dollars, $565,904,478—of which $485,218,000 are held in Treasury against silver certificates outstanding; subsidiary coins, $184,100,675; totals, $650,005,153, a change of only $474,478 during the month of November.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Dec. 5

The base price paid this week for 60% zinc ore was $45 per ton. The base price paid for 80% lead ore was $45@46 per ton.

SHIPMENTS WEEK ENDED DEC. 5

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	3,718,830	160,000	246,900
Year	155,907,820	4,998,890	30,911,550

Shipped during week to separating plants—4,084,540 lb. zinc ore.

JOPLIN, MO.—Dec. 5

Blende, high price, $49; assay base, 60% zinc, $45@46.50; metal base, 60% zinc, $43.50@44.50; calamine, base, 40% zinc, $22@24; average, all grades of zinc, $42.46 per ton.

Lead, high price, $48; base, $47 per ton, 80% metal content; average, all grades lead, $46.46 per ton.

Zinc-ore prices are coming up a little each week, and spelter is responding, yet the margin of profit is not evident for the smelter of spelter.

SHIPMENTS, WEEK ENDED DEC. 5

	Blende	Calamine	Lead	Values
Totals this week	9,211,870	1,013,920	1,598,120	$254,340
Totals this year	480,464,460	36,474,500	83,044,220	$11,982,400

Blende value, the week, $204,390; 49 weeks, $9,616,660.

Calamine value, the week, $12,820; 49 weeks, $429,190.

Lead value, the week, $37,130; 49 weeks, $1,936,120.

IRON TRADE REVIEW

NEW YORK—Dec. 9

We can still note the more confident feeling in the iron trade, based on improved buying of material and on the increase in specifications on contracts.

The renewal of activity, which was first seen in the pig-iron market is beginning to extend to various forms of finished steel. It is evident that manufacturers see increased consumption ahead, or else that they have made up their minds that prices are at the lowest notch, and that any change now is quite likely to be in the nature of an upward movement. Both influences may be at work.

Pig Iron Production in November again showed a considerable decrease. On Dec. 1, there were 150 coke and anthracite stacks in blast, having a total daily capacity of 50,430 tons; a decrease of 2820 tons from Nov. 1. Allowing for the charcoal furnaces the estimated production of pig iron in the United States in November was 1,510,000 long tons. For the 11 months ended Nov. 30 the total was 21,616,000 tons. Of this make 15,259,000 tons or 70.5% were turned out by the furnaces owned or operated by the steel companies.

PITTSBURGH—Dec. 8

There has been a measurable improvement [illegible] actual shipping orders for finished steel products, [illegible] interests reporting as much as 50% increase in the [illegible] over the previous week. The total is still small, however, and does not warrant any increase in steel-mill operations over the present rate of not more than 35% of capacity.

The buying movement in Northern pig iron continues, [illegible] is not as heavy as a week or two ago. Interest is beginning to center in Southern iron, on which some concessions will probably have to be made to induce the large buyers to close.

The most interesting concrete development in the market in the past week was the announcement on Thursday by the American Sheet & Tin Plate Co. that its price on tin plate for the coming season will be $3.20, for 100-lb. coke plates, against a season price of $3.40 named a year ago. What the actual settling basis on large contracts will be remains to be seen, but the mills assert that prices are not going to be shaded as much as was the case a year ago. Prospects [illegible] for very heavy consumption. The mills are now operating at about 50% of capacity, a fairly good rate at the moment as this is the dullest season of the twelvemonth.

The market for bars, plates and shapes for desirable lots for immediate specification and prompt shipment continues at 1.05c., and predictions are made that this figure will be found to be bottom. There has been somewhat more buying since this price came out. For first quarter contracts 1.10c. is generally named, but the volume of contracting thus far is not large. One mill is understood to have receded slightly from 1.10c. on contracts.

Pig Iron—The Standard Sanitary Manufacturing Co. has bought 8000 tons of foundry pig iron for its Allegheny plant and an equal tonnage for its New Brighton plant, for delivery over the first six months of next year. The purchases were made from four or five interests at [illegible] delivered, and an interesting feature is that one portion of the iron is to come from a Cleveland furnace, the balance [illegible] from the Valleys and detached western Pennsylvania stacks. The company also bought 8000 tons of Southern iron for its Louisville plant, paying $9, Birmingham, for No. [illegible], and $9.[illegible]@9.75 for different lots of No. 2. There has been fair buying of foundry iron apart from these purchases, but basic has become quiet again and bessemer remains quiet. We quote: Bessemer, $13.75; basic, $12.50; No. 2 foundry, $12.75@13; gray forge, $12.50; malleable, $12.75, at Valley furnaces, [illegible] higher delivered Pittsburgh. There are occasional lots of foundry iron available from other furnaces at $12.[illegible], delivered Pittsburgh.

Ferromanganese—The market [illegible] at $68, Baltimore, with $2.16 freight to Pittsburgh. [illegible] renewed that there will be a [illegible] eventually. There are large stocks [illegible] might be entirely different if [illegible] normal.

Steel—An important tinplate interest is [illegible] covered sheet bars for the [illegible] portion of 1915 at about $20 at maker's mill. For [illegible] deliveries [illegible] through March, lower prices are quoted, [illegible] for billets and $19 for sheet bars, maker's mill, Pittsburgh or Youngstown. These are the lowest [illegible] quotations [illegible]. Rods are $24.50@25, Pittsburgh.

COKE

Connellsville—The movement [illegible] continues, with two or three contracts [illegible] last report and several fresh inquiries put out, [illegible] the latest [illegible] from a steel interest. [illegible] to the merchant furnaces. Contracts [illegible] be estimated as involving about 7[illegible] tons a month [illegible] Jan. 1. One contract is for first [illegible] $1.70 for a very good brand of [illegible]. Another [illegible] grade, [illegible] what is considered [illegible] the first half and $[illegible] for the second half. Two other contracts are for two years, [illegible] on the current [illegible].

Inquiry now [illegible]

[illegible]

Anthracite Shipments in November were 5,928,286 long tons, an increase of 141,355 tons over November, 1913. For the 11 months ended Nov. 30, the total shipments were 63,407,010 tons in 1913, and 62,640,343 tons in 1914; a decrease of 766,667 tons, or 1.2%, this year.

IRON ORE

Iron-ore shipments from the Lake Superior region in November, practically closing the season, were 1,068,682 long tons, making the total for the season 32,020,487 tons, 17,049,991 tons less than in 1913. This is the smallest report since 1908. To this total is to be added one small cargo, loaded at Escanaba, which did not get away till Dec. 1. The rail shipments, also to be added, will probably bring the total for 1914 up to about 32,800,000 tons.

It is announced that the Hill ore-land trustees have completed arrangements, by lease or otherwise, to operate the large mines which will be surrendered by the Steel Corporation Jan. 1, 1915. It is also announced that a contract has been made with M. A. Hanna & Co., of Cleveland, Ohio, to sell the ore from the mines operated by or for the trustees.

FOREIGN IRON

Foreign Iron Trade of Great Britain, 10 months ended Oct. 31, as valued by the Board of Trade returns:

	Exports	Imports	Excess
Iron and steel........	£36,787,046	£9,917,456	Exp. £26,869,590
Machinery, hardware, etc	42,683,635	11,607,419	Exp. 31,076,216
Totals	£79,470,681	£21,524,875	Exp. £57,945,806
Totals, 1913	97,324,791	25,952,898	Exp. 71,371,893

Actual tonnage of iron and steel exported was 4,151,081 tons in 1913, and 3,441,157 in 1914; imported, 1,816,107 tons in 1913, and 1,502,648 tons this year.

Fuel Production of Germany in September shows decreases of 6,360,232 tons in coal and 1,484,418 in brown coal, as compared with September, 1913. For the nine months ended Sept. 30, the totals were, in metric tons:

	1913	1914	Changes
Coal.	143,674,282	129,182,989	D 14,491,293
Brown coal..	64,132,286	62,389 948	D 1,742,338
Coke	21,096,556	21,773,458	D. 2,323,098
Briquettes. ..	20,400,060	20,554,036	I. 153,976

Of the briquettes reported this year 16,434,409 tons were made from brown coal or lignite.

Fuel Exports of Great Britain, 10 months ended Oct. 31, in long tons:

	1913	1914	Changes
Coal	61,257,261	52,060,846	D. 9,196,415
Coke	989,010	975,204	D. 13,806
Briquettes	1,711,865	1,487,943	D. 223,922
Steamer coal	17,434,411	16,037,409	D. 1,397,002
Total	81,392,547	70,561,402	D. 10,831,145

Imports are insignificant, being only 16,450 tons in 1913, and 42,962 tons this year.

CHEMICALS

NEW YORK—Dec. 9

The general market in chemicals is dull and very little business is forward.

Arsenic—Business continues slow and demand is small. Current quotations are \$3.75@4 per 100 lb. for both spot and futures.

Copper Sulphate—The market is quiet and prices unchanged. Quotations are \$4.35 per 100 lb. for carload lots and \$4.60 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is dull and sales small. Prices are nominally the same as by last report, 1.85c. per lb. for both spot and futures.

Imports and Exports of Fertilizing Material in the United States, nine months ended Sept. 30, in long tons.

	Imports		Exports	
	1913	1914	1913	1914
Kainit	292,555	329,041	140	. .
Manure salts	145,432	157,710		......
Other potash salts.	176,288	186,034	3,086	2,746
Nitrate of soda.. .	524,831	430,136	4,276	7,381
Sulphate of ammonia	33,313	59,064		150
Phosphates	. .		1,146,104	915,760

Exports include reëxports of foreign material. Some phosphates are imported, but are not given separately in the returns.

Imports and Exports of Raw Material for chemical manufacture, nine months ended Sept. 30, in long tons:

	Imports		Exports	
	1913	1914	1913	1914
Sulphur	10,868	15,036	71,705	96,614
Pyrites	716,085	776,871		
Chrome ore	50,779	56,081		
Magnesite .	123,661	92,925	1,648	1,196

Exports include reëxports of foreign material. Exports of calcium carbide were 24,593,899 lb. in 1913, and 26,361,723 lb. this year.

PETROLEUM

The monthly statement of the "Oil City Derrick" shows new wells completed in November as follows: Pennsylvania grade, 282; Lima-Indiana, 47; Central Ohio, 92; Kentucky, 10; Illinois, 63; Kansas-Oklahoma, 396; Texas-Louisiana, 108. The summary shows 998 wells completed, a decrease of 175 from October. New production amounted to 96,641 bbl., or 8691 bbl. less than the previous report. Kentucky, Texas and Louisiana are the only fields showing an increase in the new production. New work under way at the close of the month shows a net increase of 41, which comes from Oklahoma and Texas chiefly

STOCK QUOTATIONS

It is announced that the Boston Stock Exchange will open on Thursday, Dec. 10, and the New York Exchange will open Dec. 12, for trading in a number of stocks (19 of those we ordinarily quote), with minimum price restrictions to act as a safety valve on European selling.

COLO. SPRINGS Dec. 8

Name of Comp.	Bid.
Acacia	.03½
Cripple Cr'k Con.	.006
C. K & N	.05
Doctor Jack Pot	07½
Elkton Con	.42
El Paso	1 20
Findlay.	.01½
Gold Dollar	03½
Gold Sovereign	01
Isabella	11½
Jack Pot	.06
Jennie Sample	.02
Jerry Johnson .	.03
Lexington .	.003
Old Gold. .	.006
Mary McKinney.	41
Pharmacist. . .	003
Portland	1 15
Raven B. H.	.03
Vindicator.........	1 10

SALT LAKE Dec. 8

Name of Comp.	Bid
Beck Tunnel	04½
Black Jack	.04½
Colorado Mining.	.10
Crown Point	.01
Daly-Judge	4 65
Gold Chain	10
Grand Central.	61
Iron Blossom.	1 10
Little Bell	10
Lower Mammoth	01½
Mason Valley	‡ 50
May Day	.10½
Opohongo	.01½
Prince Con .	.18
Silver King Coal'n.	2 30
Silver King Con.	1 65
Sioux Con.	02
Uncle Sam	05
Utah Con . ..	00½
Yankee	01

SAN FRANCISCO Dec. 8

Name of Comp.	Bid.	Name of Comp.	Bid
Comstock Stocks.		Misc. Nev. & Cal	
Alta	.05	Belmont	4 50
Belcher	75	Jim Butler	71
Best & Belcher	05	Lone Star	07
Caledonia	34	MacNamara.	05
Challenge Con	06	Midway	08
Confidence	21	Mont.-Tonopah	35
Con. Virginia	11	North Star	16
Crown Point (Nev.)	40	Rescue Eula	07
Gould & Curry	.02	West End Con	53
Hale & Norcross	.01	Atlanta	56
Julia ...	.01	Booth.	14
Mexican	.30	C.O.D. Con	11
Occidental.	.85	Comb. Frac	12
Ophir	.09	Jumbo Extension	2 35
Overman	.11	Pitts.-Silver Peak	20
Potosi	.01	Round Mountain	39
Savage	.03	Sandstorm Kendall	13
Sierra Nevada	.04	Silver Pick	14
Union Con	.07	Central Eureka	25
Yellow Jacket.	40	So. Eureka	‡1 80

TORONTO Dec. 4

Name of Comp.	Bid	Name of Comp.	Bid
Bailey .	01½	Foley O'Brien.	20
City of Cobalt .	‡ 30	Hollinger	8 25
Coniagas	5 50	Imperial	01
Peterson Lake	.27	Jupiter	16½
Right of Way.	.02	McIntyre	22½
T & Hudson Bay.	30.00	Pearl Lake	03¾
Timiskaming	.11	Porcu. Gold	05
Wettlaufer-Lor.	.06	Preston E. D. ..	03
Big Dome	7 00	Rea ...	12
Dome Exten.	05	Seneca Superior. .	2 00

N. Y. CURB Dec. 8

Name of Comp.	Clg.
Beaver Con	20
Big Four.	05
Blue Bell	06
Braden Copper	6¼
B. C. Copper	50
Buffalo Mines.	¾
Can. Cop. Corpn	1¼
Can. G. & S	04
Caribou.	67
Chambers Ferland	14
Con. Ariz Sm	$\frac{1}{16}$
Coppermines Cons	1¼
Davis-Daly	85
Diam'field-Daisy..	.06
Dia. Black B. ..	.06
Ely Con .	‡.01
Florence	.62½
Goldfield Con	$1\frac{11}{16}$
Goldfield Merger	39
Greene Cananea.	26
Kerr Lake	4½
La Rose	$\frac{11}{16}$
McKinley-Dar-Sa	60
Mines of Am	2½
Mutual Min. pf	2¾
Nevada Hills	32
New Utah Bingham	‡½
Nipissing Mines.	5½
North Star .	.18
Ohio Copper.....	.11
Oro...... . .	.14
Pacific Smelt .	½
Stand'd Oil of N.J.	405
Stewart ...	1¼
Tonopah.	7½
Tonopah Ex. .	2½
Tonopah Merger..	39
Tularosa	½
West End Ex.. ..	02
Yukon Gold . .	2½

BOSTON CURB Dec. 8

Name of Comp.	Bid
Alvarado.	65
Bingham Mines.	‡4 04½
Boston Ely	15
Butte & Lon'n Dev.	23
Calaveras	93
Calumet-Corbin.	07
Chief Con .	80
Corbin.	‡ 90
Cortez	20
Crown Reserve.	75
Eagle & Blue Bell	90
First Nat. Cop	$1\frac{1}{16}$
Houghton Copper	2½
Iron Cap Cop. pf.	5
Majestic	18
Mexican Metals	16
Nevada-Douglas	55
New Baltic	1¼
Oneco.	70
Raven Copper	10
Smokey Dev	.25
So. Lake	04½
Tonopah Victor.	.29
Trethewey	14
United Verde Ext	$1\frac{11}{16}$

LONDON Nov 26

Name of Comp.	Clg
Alaska Tre'dwell	£8 2s 6d
Camp Bird	0 6 0
El Oro.	0 11 0
Esperanza	0 8 9
Mexico Mines.	4 0 0
Oroville.	0 7 0
Santa Gert'dis	0 10 0
Tomboy	1 1 3

The Engineering and Mining Journal

VOLUME 98 DECEMBER 19, 1914 NUMBER 25

Unwatering Carson Lake

By L. D. Davenport*

SYNOPSIS—Carson Lake on the Mesabi range covered desirable orebodies. To make these available for mining, the Oliver Iron Mining Co. pumped out the lake and filled the basin with surface stripping.

⁂

Carson Lake was situated in Sec. 10, T. 57 N., R. 21 W., 2½ miles southwest of Hibbing, Minn., and recently has been unwatered to make the ore below its basin available for mining. The work presented conditions seldom encountered in the preliminary work of opening underground mines on the Mesabi range.

A Mud Island Pushed Up by North Dump

Pumps, Discharge and Rafts, Carson Lake

Conditions to Be Met

In July, 1913, the engineering department of the Oliver Iron Mining Co. made a report showing the results of work done to determine the feasibility of draining the lake by deepening the natural drainage channel; the quantities involved in unwatering the lake by pumping; and the ditches, culverts and flumes required to drain the surface and mine water permanently from the lake basin. Following is a portion of the report:

"The present elevation of the lake is 916.4 ft., Lake Superior datum, and it is 28 ft. deep at its deepest point. The water draining out of the lake from the southwest corner flows southwesterly for about ¾ mile, when the stream widens out into Snowshoe Lake and Kelly Lake. The elevation of the surface of the water in Snowshoe Lake is 913.4 ft., with a maximum depth of about 10 ft. The stream joining these two lakes with Carson Lake has, therefore, a fall of only 3 ft. or a grade of approximately 0.07%. It is from 8 to 10 ft. wide, 12 to 18 in. deep, and sluggish and irregular in its course."

Following the route of the creek for approximately 2¼ miles south of Kelly Lake, the elevation of the water was found to be 906.4 ft., making a total fall from the surface of Carson Lake to the creek, at this point, of 10 ft. in a distance of about 3½ miles. For the next 1000 ft. the water flows through a cut made for it. This cut is from 4 to 10 ft. deep. The Great Northern Ry. pumps water from Kelly Lake to supply its locomotives. From a consideration of these facts, it was thought impracticable to go further into the matter of draining the lake by deep ditching.

The lake contained at its original elevation of 916.4 ft. the following quantities of water:

Elevation	Gallons	Elevation	Gallons
910-916	129,470,000	890-895	7,600,000
905-910	76,190,000	Below 890	1,360,000
900-905	44,850,000		
895-900	20,930,000	Total	280,400,000

As shown on the map, two ditches were dug to divert the surface water from the lake basin and to handle the water from the surrounding mines. No. 1 ditch on the west side of the lake was required: First, to catch the natural drainage from rainfall on about 200 acres of land west side of the lake was required. first, to catch the of about 800 gal. per min. from a lake a mile north which is artificially impounded by waste dumps from open-pit stripping—this lake has an area of about 100 acres and drains an additional area of 600 acres; third, to carry the discharge from the Leetonia shaft situated at the northwest corner of Carson Lake—this flow was about [illegible] gal. per min. No. 2 ditch was required [illegible] discharge from the north shaft of the Leetonia mine, about 400 gal. per min.; second, to catch the natural drainage from about 30 acres of land east of the Leetonia dump; third, to carry the water which formerly flowed into the lake through a culvert under the Leetonia and Dale mine spurs near the Great Northern main line—this amounted to about 4500 gal. per min. and came from the Morton, Agnew and Utica mines, together with the natural drainage from a considerable area east and north of the lake. Both ditches were dug by contract, the total excavation amounting to about 22,000 cubic yards.

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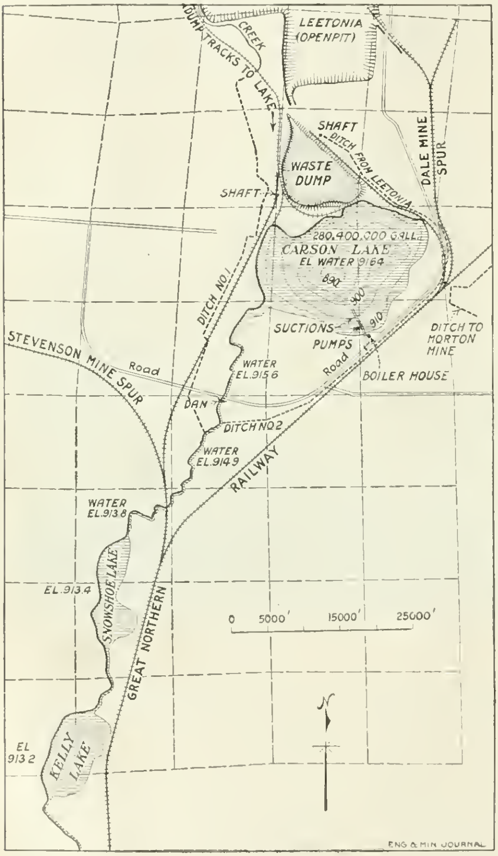
*Assistant chief engineer, Oliver Iron Mining Co., Hibbing district, Minn.



Map of Carson Lake and Vicinity with General Drainage Layout

The pumping plant was placed on the south shore of the lake where the ground is low, with sand immediately below a few inches of soil. One 66-in. by 12-ft. firebox boiler and one 60-in. by 14-ft. steam-shovel boiler furnished steam for the pumps. Two Morris centrifugal pumps, rated at 2500 gal. each, with 12-in. suctions, discharged through 10-in. pipes into a tank of 3-in. plank, sunk level with the ground. From this tank the water flowed through three corrugated-iron culvert pipes under the road and into No. 2 ditch. A No. 9 Cameron pump primed the centrifugal pumps. To handle the suctions, two 16x32-ft. rafts were made of timber, covered with 2-in. plank. These rafts were not sufficiently buoyant, so the plank was covered with tar paper together with a layer of matched pine flooring, and sides 3 ft. high were added, forming square-sided scows. A third scow, 10x16 ft., was built and fitted with a short gin pole at its center to raise the suctions.

The two 32-ft. scows carried the last 30 to 40 ft. of the suction pipes, that section having been connected to the main line with a swinging joint. When the scows were moved ahead, the additional pipe inserted behind them was supported on cribs made of old railroad ties.

For measuring the discharge from the pumps, two sets of pitot tubes were made and installed near the boiler house. A curve was worked out so that by measuring the difference in elevation of the water in the gage-glasses of the tubes, the discharge in gallons per minute could be picked off.

The water flowing into the lake was diverted into the ditches on June 29 and the lake level was lowered by natural drainage to an elevation of 915.88 ft. on July 1, when the outlet was dammed and the pumps started. Beginning in May, surface material from an openpit was dumped in the lake from the north and west sides. Much trouble was encountered through the dump's settling suddenly. The soft silt and blue clay of the lake bottom in some cases were forced above the lake surface by the weight of the dump. These mud islands usually appeared from 100 to 300 ft. from the edge of the dump. After the water had been lowered about 10 ft., less trouble was experienced with the dump. The intention is to fill the lake basin with stripping material to a height of about 4 ft. above the original water line.

Carson Lake Pumping Plant, July 8, 1914

The draining of the lake was completed in November. The centrifugal pumps were used until the water was extremely low, then a shaft was dropped through the mud to the gravel and a small pump placed in the shaft to drain the mud as much as possible. The shaft was 52 ft. deep, 6x8 ft. inside, cribbed with 8-in. round timbers and covered on the outside with a double layer of boards with the joints broken. About the middle of November, however, the pressure of the soft mud, due probably to the weight of the waste dump, caused the shaft to crush about 35 ft. below the collar.

Modern American Rock Drill--IX

By L. O. Kellogg

SYNOPSIS—Cleveland Rock Drill Co. now bringing out new line of stopers using new valve and provided with reservoir back of valve to insure adequate air supply. One model has rotation mechanism in front head similar to Mucker plugger machine.

⁂

As was the case with the Sullivan company, the Cleveland Rock Drill Co. has just brought out some new models in hammer machines which require description here in a separate installment of this series of articles. The machines are stopers, one nonrotating and one rotating. The nonrotating model is interesting for certain changes in details of design, while the rotator is important as being among the first two or three brought out in this country, and probably the first in which the rotation is effected separately from the reciprocation or striking, this being done in approximately the same way as in the Cleveland Mucker drill.

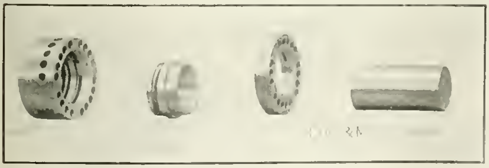
The nonrotating stopers are designated as 2S and 4S. The rotator is 2SR. The principal dimensions and weight of the machines follow:

	2 S	4 S	2 SR
	Inches	Inches	Inches
Length over all, air feed closed	54	54½	55
Air feed piston rod travel	24	24	24
Piston stroke	3½	3½	3½
Piston diameter	2	2½	2
	Pounds	Pounds	Pounds
Weight complete	80	100	102

The two principal innovations on the nonrotating machines are the air reservoir provided directly back of the valve, and the valve itself which is of a type believed to be here used for the first time.

The Valve

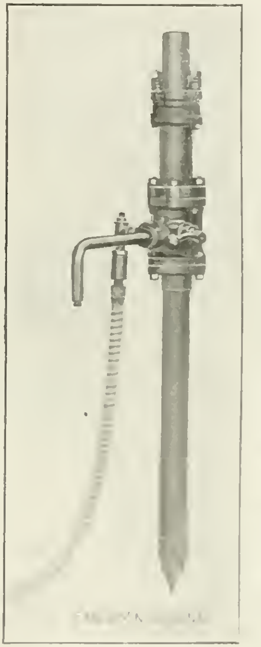
The valve is a sleeve valve, inasmuch as it is so set at the back of the cylinder as to allow the hammer, which is of uniform diameter, to pass through it on its return stroke. The valve is set in a valve block, or box, and a valve cover, or button, which themselves occupy the rear end of the drilling cylinder, or more properly speaking, are set between the drilling cylinder and the back head of the machine.


Valve Block Valve Valve Button Piston

Disassembled Parts of Valve Action

Since this valve is new, its operation is interesting and may be followed through here in some detail. The supply of air is taken in through the throttle valve shown in the section; in drilling position, the air is admitted through the ports in the throttle valve and the bushing surrounding it to the reservoir in the back head. From the reservoir it passes through the port A to the circumferential port B in the back head, which communicates with the port C in the valve block. These ports communicate with the circumferential port D, which is alternately covered and uncovered by the valve in its reciprocation. Another longitudinal port E also communicates at the back with the groove B in the back head and by means of the radial ports F and G communicates with the cylinder and with the pressure face H of the valve itself. Thus the ports G and F always are subject to live-air pressure.

With the valve in the position shown, live air is passing through the ports indicated to the port D then around the groove I in the valve itself, then through ports J, K, L, M, to the front end of the cylinder, thus tending to force the hammer toward the rear. From behind the hammer the air is exhausting through ports N, O, P, Q, R, to the atmosphere, and also through the grooves and ports S, P, Q, R. As the hammer uncovers the port G on its backward stroke, the constant pressure on the valve area H is reduced to that of the pressure below the piston chamber. When the hammer travels still farther back and covers the pressure area T of the valve, compression is set up between the returning hammer and the back of the cylinder, which acts on the pressure area U. This pressure added to that on the pressure area V of the valve overcomes the pressure on the area H and throws the valve forward.

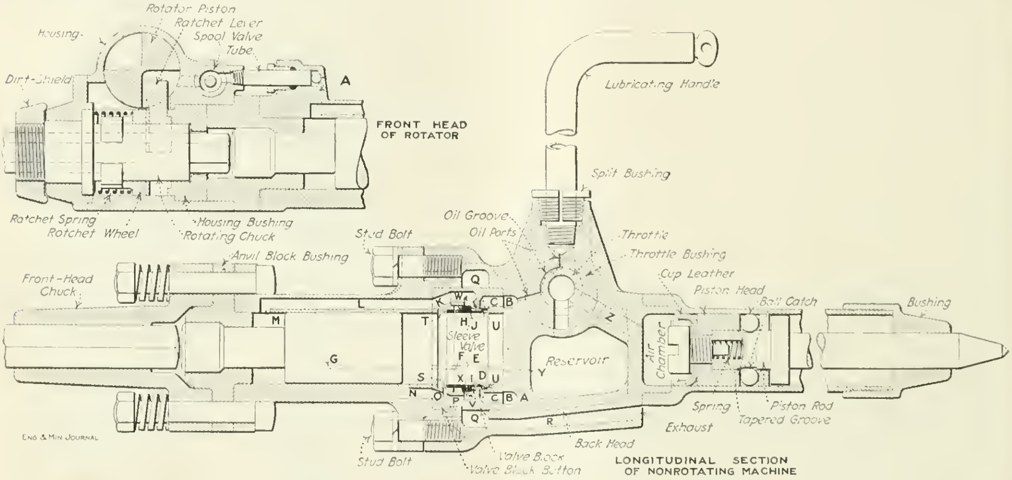

The New Cleveland Hand-Rotated Stoper

In this new position the valve groove I connects the slot W in the valve box with the slot X and thus connects the forward part of the cylinder with exhaust through the ports M, L, K, W, X, P, Q, R. Live air is now admitted through the port C around the rear face U of the valve, to the rear of the cylinder, and acts on the rear of the hammer to start it forward on its useful stroke. When the hammer is in its retracted position, it receives its initial impulse forward by means of live-air pressure admitted through the port Y from the reservoir. There is at this time no pressure on the face H of the valve, inasmuch as air flowing to this space through the ports E and F is exhausted by means of the port G to the front end of the cylinder, and thus to atmosphere. When the piston moving forward passes the face T of the valve, air pressure is effective on both faces T and U, tending to put the valve in a balanced position. As soon as the port *G* is covered by the forward-moving hammer, the live-air supply to the face *H* is no longer exhausted, and the pressure on this face added to that on the face *T* overcomes the pressure urging the valve forward and throws it to the rear.

It will be noted that the cylinder is short and consequently the air ports are short. They are also large, and these features, together with the introduction of the reservoir immediately behind the valve, in which the volume of air is twice that necessary for a stroke, result in furnishing a full supply of air at full pressure during the whole stroke of the hammer, thus adding to the force of its blow and consequently to its drilling efficiency. Wire drawing or throttling is reduced to the minimum.

Other Features of Machine

It will be noted that the hammer is symmetrical, whereas, heretofore, the Cleveland drills have usually had unsymmetrical hammers. The front head, or chuck, is bolted to the cylinder with two short through-bolts, having helical springs, and between these two parts is held the bushing for the anvil block. The anvil block itself presents no new features. The back head is held to the cylinder by means of two stud-bolts, which are shown in the longitudinal section, and also by means of two through-bolts, which are not shown. These two through-bolts are set at 90° with the studs, and hold the outer tube of the air feed to the cylinder with the back head set between.



FRONT HEAD OF ROTATOR

LONGITUDINAL SECTION OF NONROTATING MACHINE

Sections of New Models of Cleveland Stopers

The rotating handle is attached to the back head. It is screwed into the position desired, and then a split bushing screwed down to lock it, as shown. The handle also acts as an oil reservoir. Its inner end communicates through a series of ports to the port *B* supplying air to the cylinder. The series of ports includes a groove in the throttle. When the air is shut off, the ports and the groove are filled with oil, and when it is turned on this oil is discharged into the valve and cylinder.

The telescope feed is of the ordinary type, the outer tube moving with the drilling end of the machine. It is controlled by the throttle valve, air being admitted through the port *Z* to a chamber in the back head, where it subjects the piston of the feed to pressure. When the throttle is shut off, the air in the feed is allowed to exhaust through the leak hole in the throttle valve to the atmosphere, and thus permits the feed to be collapsed.

The locking device for the air feed is unique. The air-feed piston rod has a little play in the piston head. Normally, the two parts are held a little separated by the spring shown. There is a taper groove around the piston rod, which registers with two holes in the piston head. Two steel balls operate in the holes and the groove. With the piston head and the piston rod forced apart by the spring, the effect of the tapered groove is to force the balls out against the outer tube when the piston rod and head move outward, and thus prevent such motion. When the piston rod is pushed inward, however, the balls do not act in the same fashion. When the drill is operating, the air pressure is on the piston head, while the point of the piston rod is on the rock; these two parts are therefore forced together, partially collapsing the spring which normally holds them apart. This brings the tapered side of the piston-rod groove out of contact with the balls, so that these permit free motion in either direction.

The net result of this is that the air feed is locked in position, wherever it may be, so far as pulling out is concerned, although it may always be run in. And when the air pressure is turned on it can easily move out. The piston head is made tight against the outer tube by the cup leather shown, and the piston rod works through a bushing screwed on the bottom of the outer tube, to act as a bearing.

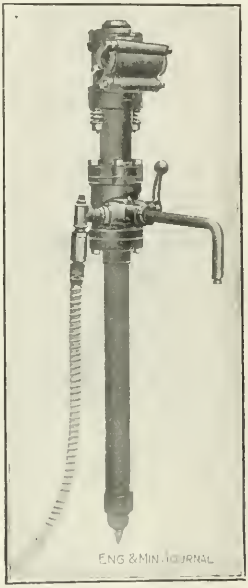
The Rotator

The rotating stoper resembles the smaller of the nonrotating machines, except for the rotation itself. The lubrication, valve mechanism, hammer, back head and air feed are identical. The sectional illustration, therefore, represents only the rotating end of the machine. The air supply passes through the valve block, and the cylinder shell, by means of longitudinal ports, to the forward end of the cylinder, then through the port *A'*, to the tube which communicates with the rotation valve.

The rotation valve and the rotation piston drive a ratchet mechanism identical in principle and similar in design to that used on the Mucker drill and described in part VII of this series of articles. This ratchet mechanism revolves a chuck which, in turn, revolves the steel. A shield is screwed to the end of the revolving chuck to prevent the entrance of dirt. The rotation device is held to the cylinder by means of two through-bolts, which are not shown in the drawing, but which resemble in general the bolts on the end of the nonrotating cylinder, being equipped with helical springs to take up shock.

The rotating model further differs in its control valve. This is so arranged that either the hammer or the rotator may be operated separately. The control valve has five positions. In the first, no air is admitted to the machine; in the second, air is supplied to the telescope-feed only; in the third, the hammer reciprocates slowly, the rotation being inoperative; in the fourth, the hammer does not operate but the rotation operates slowly; and in the fifth both hammer and rotation operate at full speed.

There is no slip device in the rotating mechanism, since, if for any reason the drill steel becomes jammed too tight to be pulled around by the rotating engine, the valve in the latter simply stalls until the steel is free again to turn. In such a case the ordinary rotating handle is brought into play and the machine rotated by hand until the difficult section of rock is passed through. The advantages of independent rotation in bad ground are obvious.



THE CLEVELAND ROTATING STOPER

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Amber

According to the London *Mining Journal*, the war is likely to have a serious effect on the amber trade, as the great bulk of supplies is derived from the deposits in the neighborhood of Dantzig and Königsberg. The production from the Royal amber mines in 1913 amounted to 427 metric tons, as compared with 100 tons in 1912. There is an increasing demand for raw material to the extent of 20%, so much so that the price was advanced by the State Factory at the beginning of 1911. In addition to the ordinary requirements for Europe and America, a good trade is done in amber beads for Asia and Africa. Some amber is found on the Baltic coast in Russian territory in the neighborhood of Libau, and its occurrence has been noticed in various places in Siberia. [There would seem to be a possibility that the war may seriously cripple the amber trade permanently, as we understand that Dr. L. H. Baekland has produced a modification of bakelite that has all the physical and electrical properties of amber and can only be distinguished from it by ultimate analysis.—EDITOR.]

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The Cost of Producing Lead

The recent decline in the price for lead to 3½c., N. Y., which led to curtailment in production by the principal operators both in Missouri and Idaho, gave interest to the discussion of what is the average cost of producing lead in the United States. Bearing upon this subject, the following paragraphs from "Lead and Zinc in the United States," by W. R. Ingalls, published in 1908, are of interest.

While the tariff wall inclosing the lead industry of the United States remained practically unchanged from 1861 to 1894, the conditions of production in the United States experienced great alterations. From 1871 to 1880, and in the early '80s, the bulk of the domestic lead production came from ores of comparatively high grade in lead and silver, which in spite of high mining and smelting expenses caused the cost per pound of lead to be relatively low, but the producers were handicapped by the long and costly railway carriage on the metal. In 1872 the cost of transporting bullion from Eureka to San Francisco was about 3c. per lb.; in 1874 it was about 1.6c. From Salt Lake to Omaha the cost was 1c. per lb. in 1871; from Salt Lake to Chicago, 1.4c. per lb. in 1872. In 1880 the cost from Leadville to New York was 1.75c. per lb. Until the latter part of the '80s the producers of the West were under such heavy handicaps of freight rates. Even at the present time, when freight rates have come down to extraordinarily low points—0.32c. from Pueblo and Denver, and 0.54c. from Salt Lake City to New York—the Western producers suffer from their distance—2000 to 2500 miles—from the principal markets, the cost of carrying lead from Monterey, Mexico, to New York being only 0.2c. per lb. However there has been a vast improvement in this respect from the conditions of 1870-1885.

But in the meanwhile the ores of high grade in lead and silver have disappeared and it has come to pass that the bulk of the lead production of the United States is obtained from very low-grade ore. It is undeniable that the tariff on lead has raised the price which American consumers have had to pay. It is doubtless true that at certain periods the price has been maintained in this way at figures which have given unnecessary advantage to the producers. But on the other hand it is evident from a study of the history of the industry that the increase in domestic lead production, which has not more than corresponded with the increase in domestic consumption, has been greatly stimulated by the advantage in price which the tariff has bestowed, and moreover, this has fostered not only the lead industry alone but also the mining and smelting of ores containing the precious metals, which in the absence of an abundant supply of lead ore would have to be worked by less economical methods.

It is dangerous to generalize the cost of producing lead for the whole country, or even for a particular district. In the case of southeastern Missouri this can be done with more safety than in any other, because there the only value of the ore is in its lead content, and the grade of the ore, the conditions of occurrence, and methods of mining are rather uniform throughout the district. In 1882 the cost of pig-lead delivered at St. Louis by the large producers was 3 to 3.5c. per lb. In 1884 the "Engineering and Mining Journal" expressed the opinion that if freights were better adjusted the majority of the producers of the United States could stand a price of 3.5c., or even 3.25c., but the pressure of lead at 2.75c. would be such that as that figure was approached the number of idle mines would increase in geometrical ratio.

In 1899 the cost to the principal producers of southeastern Missouri was 2.25c. per lb., delivered at St. Louis. However none of the figures above given include interest on the [illegible]

Mineral Resources of the United States, 1883, p. [illegible]

[illegible], 1884

money invested, return of the principal, etc.[3] The purchase of an acreage of land sufficient to warrant development on a large scale, the sinking of shafts and equipment of plant a few years ago would cost about $1,000,000 for a productive capacity of 10,000 tons of pig-lead per annum. Estimating amortization at 10% and interest at 5%, the annual fixed charge would have been $150,000 or 0.75c. per lb. of lead. A total cost of production of 3c. per lb., basis St. Louis, is probably the lowest on record for the southeastern Missouri lead. At present the cost is considerably higher. It is a fact that this lead has been sold at a lower price than 3c., but it has been at a loss, all charges considered.

In a previous chapter, it was estimated that the cost of producing lead in the Coeur d'Alene in 1907 was in the neighborhood of 3.3 to 3.5c. per lb., basis New York delivery; i.e., if the price of lead should be 3.5c. per lb. and the price of silver 50c. per oz. at New York, some of the Coeur d'Alene large producers would realize no profit, even after disregarding allowances for amortization. It would be highly difficult to generalize the capital account in this district, but probably it would not be far out of the way to say that the total cost of producing lead in the Coeur d'Alene is in the neighborhood of 4c. per lb., when silver is worth only 50c. per oz.

The Coeur d'Alene and southeastern Missouri together furnish nearly 60% of all the lead now produced in the United States. The actual cost of this lead has been about 3c. per lb. under the most favorable conditions. The average cost of all the lead produced in the United States is probably considerably higher than that.

There is no question that lead can be produced more cheaply in Mexico, Europe and Australia than in the United States, inasmuch as the price at London for long periods has been lower than 3c. per lb., and the output of the mines is maintained. The superior advantage of the foreign countries is partly in cheaper labor, partly higher grades of ore, which more frequently than in America yield two valuable products, e.g., zinc and lead, as in Australia, and partly to shorter railway hauls. The cost of smelting and refining is as low in the United States as anywhere in the world; the freights on the whole are higher—not per ton-mile, but in the aggregate of miles; the cost of mining per ton of concentrated product is doubtless higher on the whole.

Since the date of the last figures quoted above, conditions certainly have not changed for the worse among the lead producers. In 1912 and 1913 the cost of lead to the Bunker Hill & Sullivan, the leading Cœur d'Alene producer, was about 2.5c. per lb. The cost to the Federal Mining & Smelting Co. in 1913 was about 3¼c. per lb. There are no published data respecting the Hercules, Hecla, Stewart and other important producers, but their figures probably fall between 2½ and 3¼c., and more nearly the former than the latter.

Although the average cost in Missouri is now somewhat higher than it was 10 to 15 years ago, it is not, probably, higher to any great degree. Such increase as there has been is ascribable to the mining of lower grade of ore, yielding less lead per ton and to increased wage-scale. On the other hand, these adverse factors have been almost offset by improvements in mining, milling and metallurgical methods. It seems to be reasonably assured that the Missouri lead costs a little less on the average than the Idaho lead, and that neither the Missouri nor the Idaho producers would fail to meet direct operating expenses even if they should receive only 3c. per lb. for their product, but they would not have anything to make good the wear and tear of their plants and give them a reasonable profit on their invested capital unless they should receive at least considerably more than 3½c. per lb., which price must be uncomfortable to all but the very favorably situated producers. Their willingness to curtail when that figure was reached supports the conclusions herein drawn. Equally clear is it that the big producers must make a great deal of money when lead is at 4c. We can therefore understand why the lead miners maintained their enormous production until the screws were turned against them.

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Precipitation from Cyanide Solutions

Precipitation of metal from cyanide solutions has been accomplished by several different methods since the origination of the process, but those methods which make use of zinc in a finely divided form have been by far the most successful and widely used. Zinc in the form of shavings has been a standard process since the introduction of cyanidation, and has maintained its supremacy in spite of efforts to establish such systems as electrolysis, charcoal, or other metals as precipitants. The two objections to zinc shavings have been the waste of zinc and the inconvenience of handling it. Efforts to avoid those difficulties led to the attempt to use zinc dust.

The first attempt to use zinc dust was unsuccessful because, on account of the failure to remove the precipitate immediately from the solution, re-solution occurred. C. W. Merrill introduced, at the Homestake mill, the process of putting zinc dust into the suction of a pump carrying pregnant solution, and pumping it through a long pipe line and directly through a filter press. This process proved successful.

In an entirely different class are those instances in which recourse is had to make-shift methods, where a problem is to be solved quickly. Such is the canvas-bag system devised at the Lluvia de Oro mill in Mexico, and adopted at the McIntyre, at Porcupine, Ont. This system solved an urgent difficulty cheaply and quickly, and served until a more permanent system could be installed. There are, of course, methods of precipitation using zinc dust which do not conflict with the Merrill patent, and which may or may not be as efficient, but Merrill was the first to solve this problem and make zinc-dust precipitation a commercial success.

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Analyses of Antimony

W. A. Cowan, in a paper presented at the meeting of the American Institute of Metals, Sept. 7-11, 1914, gave the following analyses of ingots of antimony bought in the market, as follows: Cookson's, branded "C"; Hallett's, branded "H"; Japanese, branded MC; and Chinese, branded with two overlapping circles. Each sample was analyzed by two independent chemists. Their results were as follows:

	Cookson's %		Hallett's %		Japanese %		Chinese %	
	A	D	A	D	A	D	A	D
Lead	0.041	0.102	0.669	0.718	0.443	0.424	0.018	0.029
Tin	0.035	trace	0.175	0.012	0.175	0.012	0.035	none
Arsenic	trace	0.092	trace	0.210	0.008	0.095	0.017	0.090
Bismuth		none		none		none		none
Copper	0.040	0.046	0.038	0.046	0.034	0.043	0.008	0.012
Cadmium		none		none		none		none
Iron	0.010	0.001	0.014	0.007	0.015	0.007	0.007	0.004
Zinc	trace	0.034	trace	0.023	trace	0.023	trace	0.027
Ni and Co		0.028		none		none		trace
Sulphur		0.086		0.128		0.201		0.078
Antimony*		99.608		98.856		99.195		99.700
Total		100.000		100.000		100.000		100.000

* By difference.

It is noteworthy that the Chinese metal contained less of every impurity than the Cookson's, which is the premier brand of the market.

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[3] It is utterly misleading to draw conclusions from figures which do not take those factors into account. Producers who are already established may be willing for a time to sell their output at a price which returns only the direct cost, or even less, rather than incur the greater loss of suspending operations, but so long as such a condition exists no new capital will go into a business where the adventurers can not see a return of the principal and a proper interest upon it.

Report of the Selby Smelting-Smoke Commission

SYNOPSIS—The report of the Selby Smelter Commission was filed with the Superior Court of Solano County, Calif., Dec. 8, 1914. This report settles finally and conclusively the controversy between the residents of Benicia and adjacent agricultural country and the Selby Smelting & Lead Co. concerning alleged disagreeable and injurious effects produced by the smoke from the Selby smelting works. The commission finds that the Selby company does not violate the court injunction respecting nuisance nor with respect to injury to crops or vegetation through emitting sulphur dioxide into the atmosphere. No damage to animals since installation of baghouse.

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The Selby smelting plant is situated near Vallejo Junction, Contra Costa County, Calif., at the western end of Carquinez Strait. Benicia is in Solano County, at the eastern end of the strait and about five miles from the smelting works.

SMELTING COMPANY LOST THE ORIGINAL ACTION

On Mar. 14, 1905, action was brought by the district attorney in the Superior Court of Solano County, Calif., praying for an injunction which would restrain and enjoin the Selby Smelting & Lead Co. from permitting injurious smoke and gas from the Selby smelting works to blow over and upon the city of Benicia and the tributary country. The case was brought to trial on Aug. 7. 1906, and judgment of the court in favor of the plaintiff was rendered on July 16, 1908. The decree enjoined the Selby company from discharging noxious gases and fumes into the open air in such manner as to affect Benicia and the tributary country, between Mar. 15 and Nov. 15 of each year. A motion for new trial was denied, and the Supreme Court of California on June 12, 1912, affirmed a judgment of the trial court.

During the period covered by this litigation the Selby company had succeeded in removing the major portion of lead, arsenic and sulphur trioxide from the smoke. In the spring of 1913 complaints were made that a nuisance still existed. Finally, it was agreed between the complainants and the Selby company that the question of fact as to violation of the decree of the court might be submitted to a board of technically trained men. A stipulation to this effect was filed in the record of the case.

PERSONNEL OF THE SELBY SMELTER COMMISSION

On May 22, 1913, the following named were selected and organized as the Selby Smelter Commission: J. A. Holmes, director, U. S. Bureau of Mines; E. C. Franklin, professor of organic chemistry, Leland Stanford, Jr., University; Ralph A. Gould, chemical engineer, San Francisco, secretary of the commission.

The function of the commission was to determine the facts and report its findings on the following: (1) Is the Selby smelting plant operating in such a manner as to violate the decree of the court dated July 16, 1908? (2) If the defendant company is violating the decree, what is the extent of the violation? (3) If the defendant company is violating the decree, what steps must be taken by the defendant to avoid a violation of the decree?

The investigations were made by the following staff of scientific and technical men who had no interest directly or indirectly in the findings of the commission:

A. E. Wells, metallurgist and chief chemist, in charge smelting investigations and field work; C. B. Dutton, special legal agent, U. S. Bureau of Mines; Charles F. Shaw, professor of agronomy, college of agriculture, University of California; E. E. Free, soil expert and agronomist; J. W. Blankinship, plant pathologist; Wyatt W. Jones, plant pathologist; R. W. Doane, professor of entomology, Leland Stanford, Jr., University; C. M. Haring, professor of veterinary science, college of agriculture, University of California; K. F. Meyer, professor of bacteriology and protozoölogy, University of California. Through the courtesy of Dean Thomas Forsyth Hunt, of the college of agriculture, and Prof. F. T. Gay, of the department of pathology, the commission had the coöperation of several of the staff of the University of California. Experts of the U. S. Bureau of Mines, especially Dr. F. C. Cottrell and Dr. L. H. Duschak, rendered assistance.

SUBJECTS INVESTIGATED

The results of the investigations were presented to the commission in the form of reports as follows: (1) A detailed study of statements of residents of the Selby "smoke zone" as regards the presence of a nuisance, by C. B. Dutton. (2) Conditions in and around the smelting plant and the "smoke zone," by A. E. Wells. (3) Investigations to determine the extent of contamination of the atmosphere by smelting emanations, by A. E. Wells. (4) Investigations to determine the sulphur dioxide present in the atmosphere in places outside the "zone," by A. E. Wells. (5) Conditions of plant life, by J. W. Blankinship. (6) The occurrence of sulphur dioxide injury to plants, by Wyatt W. Jones. (7) Insect pests, by R. W. Doane. (8) Agronomic and soil conditions, by Charles F. Shaw. (9) Investigation of live-stock conditions and losses, by C. M. Haring and K. F. Meyer. (10) Fumigation experiments to determine the effect of highly diluted sulphur dioxide upon a growing grain crop, by A. E. Wells. (11) Investigations to determine the effects of sulphur dioxide on man, by A. E. Wells. (12) Possibility of reducing the sulphur-dioxide output from the Selby plant: (a) Investigations of the gases from the Dwight-Lloyd sintering machines of the Selby works; (b) studies in the commercial utilization of the sulphur dioxide produced by the Selby works, by A. E. Wells. (13) Bibliography: The effect of sulphur dioxide on vegetation and animal life, the Chemists' Club Library, New York.

EFFECT OF "SMELTER SMOKE" ON RESIDENTS LARGELY IMAGINARY

The field investigations on which these reports were based were conducted between June, 1913, and September, 1914. Mr. Dutton's report showed that two classes of odors have been described by residents of the "smoke zone" as "smelter smoke." One was found to be due to sulphur dioxide; the other due to certain products from the refining of petroleum, the so-called "oil [illegible]."

NOTE—Condensed from a statement, prepared by the commission, reviewing the facts and the findings presented in the report filed with the Superior Court of Solano County up to 1910 or 1911 was present at times in the form of fumes and gases which could not possibly have been due to smelter emanations. Subsequent to 1911 "oil fumes" have not been so prevalent, but occasionally the odor of sulphur dioxide has been detected. The conclusions from Mr. Dutton's report are that among the greater proportion of the residents there is at present only slight if any legitimate objection to the presence of smelting smoke in the atmosphere in the "smoke zone," and that the occasional presence of smelting smoke occurring under unfavorable conditions does not prevent enjoyment of life and is not detrimental to health.

Over 5000 SO$_2$ Determinations

Investigations for the direct determination by chemical analysis of the sulphur dioxide contained in the atmosphere were conducted by A. E. Wells, with the assistance of eight trained chemists and six helpers. The commission believes this to be the most extensive and exhaustive of its kind. For the determination of sulphur dioxide, a method has been developed which is believed to be by far the best yet used in work of this character, in that it combines in a most satisfactory manner those characteristics which permit "instantaneous sampling," rapidity of execution, easy field manipulation, and high degree of accuracy. Concentrations of sulphur dioxide as low as 0.2 parts per million of air are rapidly and easily determined by the method as developed and finally adopted by the commission. For the essential features of the method, the commission is indebted to J. R. Marsden, chief chemist of the Selby works. For making observations in the field, two permanent laboratories were established, where sulphur-dioxide determinations were made at brief intervals daily, and an automobile was equipped as a portable laboratory, by means of which determinations were made in all parts of the "smoke zone" as well as in many places outside.

The field investigations to determine the sulphur-dioxide content of the atmosphere extended from Sept. 17 to Dec. 15, 1913, and from Mar. 4 to Apr. 15, 1914, during which time 4862 determinations were made in the Selby "smoke zone" and 700 determinations were made in places outside.

During the entire course of the investigations especial attention was given to the metallurgical processes going on at the smelting works, and the amount of sulphur dioxide from the plant during the tests was checked. Determinations were made when wind conditions were the worst possible for the area, and when, at the request of the commission and under its supervision, the output of sulphur dioxide was the highest possible. Other tests were made with the smelting works entirely closed down, and with the wind conditions favorable and unfavorable. Every attempt has been made to obtain maximum, average and minimum figures as to the sulphur-dioxide content of the atmosphere.

Most Determinations Showed Less than 0.2 Part SO$_2$ per Million of Air

Of the total number of "instantaneous" samples (4862) taken in the Selby "smoke zone" during the period of field work, 75% contained less than 0.2 part SO$_2$ per million of air; 86% contained less than 0.4 part SO$_2$ per million; and over 97% contained less than 1 part SO$_2$ per million parts of air. Only 21 samples, or 0.43% of the total, contained more than 2 parts SO$_2$ and no sample analyzed more than 7.1 parts SO$_2$ per million.

The higher concentrations were found only when puffs of the smoke from the smelting works were drifted by a gentle breeze over the most exposed portions of the "smoke zone," and at no time did a concentration greater than 2 parts SO$_2$ per million persist for a continuous period of more than 30 min. The total time during the whole period of the commission's investigation that the concentration of sulphur dioxide was more than 2 parts per million at any part of the "smoke zone" was 220 minutes.

Only on six occasions was the concentration above 3 parts SO$_2$ per million, and the total time that the concentration was above that amount was 65 min. Within the city limits of Benicia, the maximum concentration of sulphur dioxide found was 2.4 parts per million, and only 22 out of the 2840 samples taken in this portion of the "smoke zone" contained more than 1 part SO$_2$ per million.

Higher SO$_2$ in San Francisco

In the business section of San Francisco during calm mornings, the concentration of sulphur dioxide was found to be as high as 1.8 parts SO$_2$ per million. Under brisk wind conditions, as are prevalent during the late morning and early afternoon during the period of trade winds, the sulphur dioxide content was seldom over 0.2 part SO$_2$ per million. On the ocean beach no determinable quantity of sulphur dioxide was found. In Oakland and Berkeley, of the 148 determinations made, none showed a concentration of sulphur dioxide higher than 1 part per million. In the vicinity of Richmond, 103 determinations were made which showed an average value of 1.1 parts SO$_2$ per million, and a maximum content of 4.5 parts SO$_2$ per million. In Martinez and vicinity, 168 determinations were made. The average of these determinations was 0.23 part SO$_2$ per million, and the maximum 1.7 parts SO$_2$ per million.

The results of these investigations show that, on the one hand, although the atmosphere of other areas investigated shows a higher constant concentration of sulphur dioxide than the Selby "smoke zone," the maximum concentrations in the Selby zone, on the other hand, are higher than any of the other areas investigated. These higher concentrations, however, never persist for more than a few minutes.

"Smoke Zone" Residents Unable to Detect One Part SO$_2$ per Million

In order to determine whether the concentration of sulphur dioxide found in the "smoke zone" was sufficient cause for nuisance complaint or could be injurious to health, it became necessary to study the effects of high dilutions of sulphur dioxide upon man and to determine the sensitiveness of various persons to the gas. Sixty subjects were experimented upon, 32 of whom were previously acquainted with the gas, and no one was able to detect the presence of 1 part SO$_2$ per million of air. With concentrations of 2 parts SO$_2$ per million, several subjects detected the presence of something foreign in the air, but could not identify it, and two subjects identified the gas by taste. With concentrations of 3 parts SO$_2$ per million, the greater proportion of the subjects acquainted with the gas were able to identify it, and at 4 parts practically all were able to do so. The greater proportion of subjects unacquainted with the gas did not identify it until the concentration was greater than 4 parts per million. As a general statement it may be said that concentrations of 3, 4 and even 5 parts per million were not considered by the subjects to be a nuisance, even if continued for a considerable period of time; concentrations of from 5 to 10 parts SO_2 per million if continued 10 to 15 min. would be considered a nuisance; and above 10 parts, if existing for only a few minutes would certainly be called a nuisance. It was definitely determined that concentrations below 3 parts SO_2 per million cannot possibly be considered a nuisance or a cause for discomfort.

Benicia Residents Not Subjected to "Nuisance"

In view of the established facts it is quite impossible to maintain that during the period of investigations by the commission the residents of Benicia or of any other part of the "smoke zone" have been subjected to a nuisance as the result of discharge of sulphur dioxide from the Selby plant.

Extended experiments were conducted to determine whether such concentrations of sulphur dioxide as are found in the Selby "smoke zone" are capable of doing any injury to crops or other vegetation. Barley plants were allowed to grow normally in an open field and occasionally for definite periods the plants were subjected to definite concentrations of sulphur dioxide. The object was to determine: (1) The visible injury produced; (2) the economic injury or decrease in yield resulting from the visible injury produced; (3) a possibility of "invisible injury" to a growing grain crop and the extent to which this may take place.

In a field of growing barley, experimental plots 4x20 ft. in area were laid out and covered during periods of fumigation with a cabinet so designed as to interfere as little as possible with the illumination of the plot. The sulphur-dioxide-and-air mixture was blown in at one end and allowed to escape at the other, in such a way as to maintain a steady stream of air containing sulphur dioxide through the cabinet during the fumigation periods. The length of time of each fumigation varied between two minutes and one hour. Simultaneously, experiments were carried on, on 106 plots near Vallejo and 35 plots at the University farm at Davis, with results which were concordant in every respect.

SO_2 Limits for Growing Plants

A concentration of 5 parts sulphur dioxide applied for an hour under ordinary humidity conditions produced considerable visible injury. Visible injury is produced on growing barley by concentrations of 1 part SO_2 per million of air if the length of time of application is sufficiently great. Thus, three fumigations of 7 hr. each produced slight visible injury and no reduction in yield, with air containing 1 part sulphur dioxide per million. Sixty-two fumigations of one hour each, with 0.5 part SO_2 per million, irregularly continued through the growing period, produced very slight visible injury and no reduction in yield.

No Economic Damage to Plants

The commission has found that from time to time conditions may arise under which slight visible injury will be visited upon susceptible plants growing on the more exposed portions of the "smoke zone." Since, however, plants will endure a considerable amount of visible injury without any diminution of crop yield, the commission concludes that within the "smoke zone" no economic damage results from the smoke of the Selby smelting plant. This conclusion received convincing confirmation from the observations of the commission's plant pathologists, who have found no indications whatever of economic sulphur-dioxide damage within the area of the "smoke zone."

A number of plots badly bleached in the early stages of growth were observed to recover rapidly and their yield at maturity averaged within 3% of the yield from the check plots. Short-time fumigations repeated a great many times, and of sufficient intensity to keep the foliage bleached throughout the season, were much more effective in reducing the yield than were one or two very strong fumigations. No economic damage or loss as expressed in decreased yield of crops or decrease in the fertility of the seed resulted from the treatment.

Poor Yields in "Smoke Zone" Due to Neglect

For the determination of the condition existing in the "smoke zone" regarding crops of various kinds and the many kinds of plant life found in the zone, two plant pathologists of a high degree of training and extensive study were employed. The only conclusions which can be drawn from their survey are that such poor conditions of plant growth as exist are directly traceable to one or more of the following causes: Plant diseases, predacious insects, poor soil, poor cultivation, lack of water, and indifference to all these conditions by the farmers of the area. None of the conditions existing, so far as vegetation is concerned, can be attributed to the effects of the smoke from the Selby smelting works.

The conclusion reached from consideration of the data collected during the entomological survey is that lack of cultivation, lack of proper pruning, absence of spraying and fumigation with insecticides are mainly responsible for the unusually bad condition which exists among the trees, vines and shrubs. The indifference of certain farmers is illustrated by the fact that Professor Doane volunteered advice free of charge and to supervise their attempts at combating insects, yet none of them accepted his service.

The yield of crops is below the average for areas in other sections having the same climate. The poor quality of the soil and poor agricultural practices are sufficient to account for existing bad conditions as to crops and yields. No soil trouble exists other than poor quality, to which the existing conditions as to plant growth can be traced. Samples of soil were taken from various portions of the area and subjected to examination to determine the presence of lead and arsenic. These metals were found to be natural constituents of the soil.

The data collected by Mr. Wells on the presence of lead and arsenic in the soil since the installation of the roaster baghouse proved that no amount of lead and arsenic [illegible] from the point of view of soil contamination.

Damage to Horses

The veterinary survey included examination of every horse and the enumeration of all the cases reported to have occurred within the zone; [illegible] of 308 were suspected as being of the type known as "roarers;" 12 of the 3[illegible] were so diagnosed; the animals so affected breathed with a peculiar roaring sound. In the opinion of the experts this condition was due to chronic lead poisoning and the animals had been injured by smelter smoke.

BAGHOUSE NOW IN USE FOR ROASTER GASES

The study of the atmosphere uncontaminated by a visible element of the smoke of the Selby plant was permissible by the fact that at the request of the commission the Selby Smelting & Lead Co. installed a baghouse by which means the visible smoke was eliminated. The installation was requested Oct. 25, 1913, and was completed Apr. 1, 1914, at the expense of approximately $35,000. In order that full information might be at hand upon which to base recommendations for the subsequent operation of the smelting plant in the event a nuisance was found to exist, a commission early undertook certain studies to determine the possibility of eliminating the sulphur dioxide before the smoke is sent into the atmosphere.

Investigation of the operation of the Dwight-Lloyd sintering machines showed that, by a proper preparation of the charge and a recirculation of a part of the gases, 80% of the total sulphur dioxide eliminated by the machines can be concentrated in a volume containing 7.5% sulphur dioxide. With this concentration it is possible to apply a commercial scheme for recovery by the production of sulphuric acid, liquid sulphur dioxide or sulphur.

NO DAMAGE NOW BY SELBY PLANT

From personal investigations and study of the various reports the commission finds that the Selby company violated the injunction up to April, 1914, with respect to damage to certain horses in the "smoke zone" and that this violation ceased when the roaster-stack baghouse was installed; but has not violated the injunction with respect to disagreeable odor maintained in the "smoke zone," nor with respect to injury produced on crops or vegetation or on domestic animals through emitting sulphur dioxide into the atmosphere; and that the company will not violate the injunction if it discharges less than 80 tons of sulphur dioxide per 24 hr. into the atmosphere, and cleans the smoke of its visible element; that the company will not violate the injunction, if for the purpose of cleaning or repairing the baghouse visible smoke is discharged for periods not to exceed a total of 48 hr. in any one month.

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Miner's Right to Recover for Injury

By A. L. H. STREET*

In ore mining, miners, trammers and timbermen are engaged in one common undertaking in such sense that each is a fellow servant of the other, within the rule of law which exempts an employer from responsibility for injury to one worker caused by negligence of a fellow servant. So, a trammer who was injured through fall of ore could not recover against the mining company for which he was working, on the theory that his brother miners failed to properly examine an excavation and trim down and sound, as they should have done. (Michigan Supreme Court, Koskell vs. Newport Mining Co., 148 *Northwestern Reporter* 699.) It was further decided in the same case that the injured trammer could not recover on the theory that the defendant negligently failed to provide a reasonably safe place for work, since the legal doctrine relating to safe places of work does not apply to a place in a mine which is in the process of change, especially when the work in hand is designed to make the place safe. As an additional reason for denying plaintiff the right to recover for his injury it was held by the Michigan Supreme Court that he assumed the risk of continuing his work in face of the fact that he had observed that the place where he was injured had not been trimmed down and sounded, as was customary to his knowledge.

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*Attorney, St. Paul, Minn.

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Production of Tube-Mill Pebbles in Nevada

The production of pebbles for tube-mill work is being undertaken at the Maris chalcedony quarry, near Manhattan, Nev., and 39 miles from Tonopah. The local mills have been experimenting with this rock for use in tube mills, and have found it to be satisfactory in most cases. On the soft ore of the Big Pine, the chalcedony is even more satisfactory than Danish pebbles. A test has just been completed in the mill of the West End Consolidated Mining Co., lasting six weeks. The conclusion is said to be that in comparison with Danish pebbles the Maris pebble wears as well, and in a tube mill with smooth lining the efficiency is practically the same.

The latest order for pebbles for a test run comes from the Goldfield Consolidated mill, an order for 22 tons now being filled. The shortage of pebbles from Europe, due to the war, gives an added impetus to the production from the Maris quarry and insures trials for the rock which might otherwise not have been granted to it.

Some improvement in making and sizing the pebbles is now under way. A new tube mill, 6x4 ft., with cast lining, is being built at Tonopah. This mill is to be driven by a 30-hp. gas engine. It is proposed to turn out two tons of the finished product every hour, and the pebbles will be in three sizes. Late work in the quarry has indicated that the character of the chalcedony is improving as mining progresses into the big reef. The owners of the quarry have made arrangements to place a 7-ton auto truck in commission to deliver the pebbles to the Tonopah mills.

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Chile Nitrate and the War

The disastrous effect on the nitrate industry of Chile of the war has been several times referred to, says the *Mining Journal*. According to estimates, production since the war began has been rather under 10%, without prospect of increase. Labor is greatly affected. The population of the province of Tarapaca is about 111,000, of whom, say 54,000 are in the fields, 10,000 at the ports, and 20,000 in the villages. Of these, it is estimated that 33,000 are entirely out of work; 35,000 are stated to have left the Province.

The general situation of the Province is described as appalling. Nearly all the *oficinas* are at a standstill, and general paralysis of trade is feared.

Pulp Constants

By G. H. Clevenger*, H. W. Young† and T. N. Turner‡

SYNOPSIS—Heretofore the specific gravity of the solution has been generally taken as unity. The degree of error arising through this source is shown, together with corrections for it and the method of applying them. The error which may be introduced through variations in temperature is discussed. Extensive tables have been calculated from which corrected values may be read for the generally used constants. Logarithms are also given for use where desired. Methods which compensate for differences in temperature are given for determining the specific gravities of dry slime, pulp and solution. Illustrative curves are shown embodying a portion of the data of the tables.

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The development of the various hydrometallurgical processes for the treatment of ores has made necessary the establishment of certain constants for calculating the various factors used in the handling of ore pulps. This need was early recognized in South Africa in connection with the cyanide process, when the first serious attempts were made to treat slime. Caldecott[1], in 1897 and 1898, published various slime-pulp formulas. At a somewhat later date tables had been calculated for special cases and were in private use at a number of mills. Lamb[2], early in 1910, published a small table showing the capacity per foot of depth for circular tanks, 12, 16, 20, 24, 28 and 30 ft. in diameter, as well as weight per cubic foot in tons, cubic feet per ton, cubic feet of pulp per ton of dry slime, and percentage of water in pulp, for a specific gravity of dry slime of 2.5 and for pulps weighing from 1012 to 1924 grams per liter. This table gives only approximate values. Sharwood[3], in 1910, published a contribution upon the subject of the measurement of pulp and tailing, in which he discussed sampling and the general formulas for the calculation of the various constants. In this article attention was called to the desirability of preparing tables to meet special cases, and several samples of such tables were given. Caldecott[4], later in 1910, published a table in which he combined slime and sand data. This table covered only the values for a specific gravity of dry slime[5] of 2.7. The values were necessarily taken at rather long intervals on account of the large range covered within the scope of one page. Hyder[6], in 1911, called attention to the serious errors which may arise when the specific gravity of the solution is assumed to be 1. He also called attention to the fact that a variation in the specific gravity of the solution produces a much greater effect than a similar variation in the specific gravity of the dry slime. Later in 1911, Stadler[7] published an account of an investigation carried on in South Africa on behalf of the Mines Trials Committee regarding the practical application of the specific-gravity flask, in which he calls attention to the accuracy of the method of determining tonnages and to its application in the control of classifiers. Early in 1912, Allen, in discussing the estimation of tonnage, gives several methods, and among others discusses the specific-gravity method as applied to ore pulps. McLain, in 1912, published a straight-line diagram which showed the percentage of moisture and of solids for pulps of varying specific gravities. The specific gravity of the dry slime was assumed to be 2.65. Lowden[10], in 1912, published a table of slime-density relations, giving the number of cubic feet to make one ton (2000 lb.) of wet pulp, as well as the ratio of solids to solution, and the percentage of dry slime. This was the first table published in which values were given for more than one specific gravity of dry slime. Later, in 1912, Stevens[11] published a straight-line diagram which was an elaboration of that given by McLain. This showed percentages of solids and ratio of solution to solids for various specific gravities of wet pulp and for a specific gravity of dry slime of 2.65.

Preparation of Detailed Tables

The range and general form of the accompanying tables were outlined in 1911, and shortly thereafter the computations were begun. Due to the large amount of work involved, which had to be done at intervals during the performance of other duties, the tables were only recently completed. Four-place logarithmic tables were employed in computing the various tables, with the exception of the table of dilutions, on account of the greater rapidity with which they could be used. The table of dilutions is intended for use in making rough conversions, and as it is not involved in the computation of the other tables, sufficiently accurate results may be obtained by the use of a slide rule. [illegible] tables the use of the [illegible] place logarithmic tables [illegible] without the use of [illegible] values to [illegible]

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†Instructor.

‡Mining engineer, Nikolaievsk-on-Amur, East Siberia.

[1] "The Solution of Gold in Accumulations [illegible] Slimes," Proc. Chem. and Met. Soc. S. A., Vol. [illegible] pulp formulas, ibid., p. 837.

[2] "Rapid Estimation of Pulp in Circular Tanks," "Eng. and Min. Journ.," Vol. 89, p. 160.

[3] "Measurement of Pulp and Tailing," [illegible] Vol. 1, pp. 226-230, pp. 297-305, Vol. 2, pp. [illegible]

[4] "The Capacity of Circular V[illegible]," Journ. Chem., Met. and Min. Soc. S. A., Vol. [illegible]

[5] The term "dry slime" does not seem to be [illegible] factory. "Dry ore" might [illegible] a very serious difficulty [illegible] as slime and part as sand. [illegible] the lack of a better term [illegible] out this article.

[6] "Specific Gravity Estimation [illegible]," [illegible] Vol. 9, p. 417.

[illegible]

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ing the tonnage of a number of slime charges, several different values occurring in this table will be brought into use. The error introduced through this source would, therefore, be largely compensating as regards the total monthly or yearly tonnage of a slime plant. In any event, the error introduced through the use of the tables would be much less than the inherent error in the methods of ascertaining certain of the data used in applying the tables. With individual charges, when extreme accuracy is desired, the results can be calculated by the more accurate methods previously mentioned, but it must be borne in mind that if any benefit is to be derived through greater refinement in making the computations, the same degree of accuracy must be maintained in ascertaining the data upon which these computations are based.

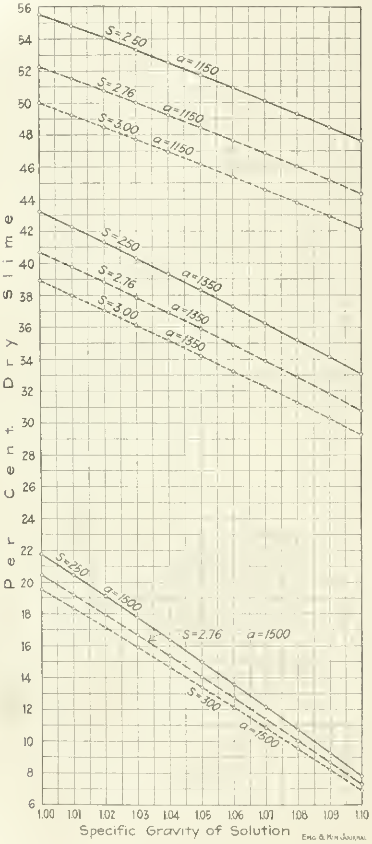

FIG. 1. EFFECT OF SPECIFIC GRAVITY OF SOLUTION ON PERCENTAGE OF DRY SLIME IN PULP

The following formula[12], with the exception of Hyder's work, has generally heretofore formed the basis of the computations for the constants of slime pulps:

$$P = \frac{100\,S\,(a - 1)}{a\,(S - 1)}$$

P = Percentage of dry slime in wet pulp;

S = Specific gravity of dry slime;

a = Specific gravity of wet pulp;

1 = Specific gravity of solution.

It will be noted that in this formula the specific gravity of the solution is taken as 1, while in reality it is always somewhat greater than 1. Mr. Turner has investigated the specific gravity of a number of cyanide-mill solutions. Some of the results are given in the accompanying table:

SPECIFIC GRAVITY OF WORKING CYANIDE SOLUTIONS

Solution		Specific Gravity
Fresh solution..................	......	1.00170
Butters plant, Virginia City, Nev...	Heads	1.00281
Butters plant, Virginia City, Nev...	Tails	1.00279
Belmont plant, Tonopah, Nev......	Heads	1.00881
Belmont plant, Tonopah, Nev........	Tails	1.00873
Montana-Tonopah, Tonopah, Nev.....	Heads	1.00314
Empire, Grass Valley, Calif.........	Heads	1.00142
[13]Portland, Colorado Springs, Colo...	Heads	1.01060
[14]South Africa, average............	......	1.00210
Pittsburgh-Silver Peak, Blair, Nev..	Heads	1.00309

We have derived the above formula, assigning a general value d for the specific gravity of the solution. The principal steps in the derivation are given below.

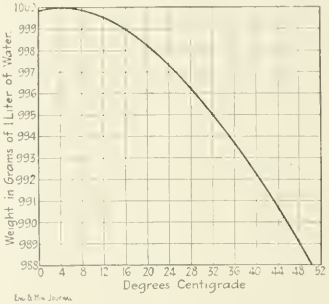

FIG. 2. WATER WEIGHT AND TEMPERATURE

Let

a = Specific gravity of wet pulp;

S = Specific gravity of dry slime;

V = Total volume of wet pulp;

m = Total weight of dry slime in wet pulp;

c = Volume of solution in wet pulp;

d = Specific gravity of solution;

P = Percentage of dry slime in wet pulp:

$$a = \frac{m + cd}{V} \qquad S = \frac{m}{(V - c)}$$

Solving for c, equating values, simplifying and solving for m:

$$m = \frac{SV\,(a - d)}{(S - d)}$$

P is obtained by multiplying the above value of m by 100 and dividing by the weight of the wet pulp, Va:

$$P = \frac{100\,S\,(a - d)}{a\,(S - d)}$$

It has been generally supposed that the difference between the specific gravity of the average mill solution and that of water was so slight that the error introduced through this source would be negligible. The results previously given for the specific gravity of mill solutions indicate that there is considerable variation. This variation in many cases bears no fixed relationship to the cyanide strength and alkalinity of the solution. The specific gravity is governed to no small extent by other salts which accumulate in solution and in certain cases to foreign salts which are added to perform special functions. Hyder's[15] article is a notable exception to this, as he derives the formula taking a general value for the specific gravity of the solutions, and calls particular attention to the error introduced when the specific gravity of the solution is assumed to be 1. Unfortunately most operators do not appear to be familiar with his work. Stadler[16] states that the specific gravity of South African solution is not high enough to cause an important error in estimating the tonnage of dry slime. Sharwood[17] has called attention to the fact that with excessively thin mixtures, such as the overflow of dams or clarifying tanks, the dissolved salts in the water may have an important influence upon the determination of the solids in suspension.

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[12] "The Cyanide Handbook," J. E. Clennell, New York, 1910, pp. 479-480.

[13] Determination by J. M. Tippett. Personal communication.

[14] Determination by M. T. Murray, "Practical Applications of the Specific Gravity or Moisture Flask." "Journ." Chem., Met. and Min. Soc. of S. A., Vol. 12, p. 170.

Variation Due to Specific Gravity of Solution

In order to show the importance of making a correction for the specific gravity of the solution, we give two cases which could readily occur in cyanide practice.

Taking the specific gravity of the dry slime as 2.66 and the weight of one liter of the wet pulp equal to 1260 grams (specific gravity 1.260).

(a) Taking the specific gravity of the solution at 1.000, $P = 33.07\%$.

(b) Taking the specific gravity of the solution as 1.008, $P = 32.20\%$.

The percentage of difference would be 2.63.

Again, taking the specific gravity of the dry slime as 2.66 and the weight of one liter of the wet pulp equal to 1100 grams (specific gravity 1.100).

(a) Taking the specific gravity of the solution as 1.000, $P = 14.56\%$.

(b) Taking the specific gravity of the solution as 1.008, $P = 13.47\%$.

The percentage of difference in this case would be 7.49.

It will be noted that as the percentage of solids in the pulp decreases the percentage of error from this source increases.

In the hydrometallurgy of copper, which is [illegible] of rapidly increasing importance, solutions having a comparatively high specific gravity are frequently used. In order to show more fully the effect of the specific gravity of the solution upon the percentage of dry slime in wet pulps, and particularly for pulps in which the specific gravity of the solution is higher than that met with in cyanide practice, we have calculated the values given under P and P' in Table A.

The values given under P have been calculated by substituting in the formula and solving by the use of a five-place logarithmic table.

The values given under P' have been calculated by taking the value for P when d is 1 and deducting from it a correction arrived at by taking as a constant, the difference between the value for P when d is 1 and when d is 1.010, and multiplying by the number of hundredths, taken as a whole number, by which d is greater than 1. Comparison of the values given for P and P' in Table A as well as the curves given for both values in Fig. 1, will show the degree of error which would be introduced at various parts of the table by the use of this constant for values of d above 1.

It will be noted that the percentages given under P as the specific gravity of the solution increases do not form a straight line; therefore a constant cannot be given for applying this correction which is accurate throughout the whole range shown by the curves. But we have found that covering the range of the present tables, which have been more particularly calculated for use with the cyanide process, i.e., for values of d up to 1.010, this portion of the curve is so nearly a straight line that to show any curvature of the line between these two points it is necessary to make the computation by considerably more refined methods than those used in calculating the values given in the tables to which this correction is applied. Therefore, to keep the tables within reasonable bounds, we have given a constant [illegible] been calculated by assuming that between these limits the percentage line is straight. In each case the value of P has been calculated, taking d as 1 and also as 1.010. The difference between these two results, divided by 10, gives the constant used. The method of deriving this correction is explained more in detail in connection with each table.

Effect of Temperature

Variations in temperature cause a change in the volume of wet pulp which may give rise to [illegible] error, the magnitude of which depends upon the [illegible]

TABLE A. SHOWING THE EFFECT OF THE SPECIFIC GRAVITY OF THE SOLUTION UPON THE PERCENTAGE OF DRY SLIME IN WET PULP

Sp. G. of Solution	Sp. G. of Dry Slime = 2 50						Sp. G. of Dry Slime = 2 76						Sp. G. of Dry Slime = 3 00					
	Weight of 1 liter of Pulp						Weight of 1 liter of Pulp						Weight of 1 liter of Pulp					
	1150		1350		1500		1150		1350		1500		1150		1350		1500	
	P	P′	P	P′	P	P′	P	P′	P	P′	P	P′	P	P′	P	P′	P	P′
1 000	21 739	21 739	43.211	43 211	55 555	55 555	20 455	20 455	40.657	40 657	52 273	52 273	19 565	19 565	38 889	38 889	50 000	50 000
1 010	20.426	20.426	42.257	42 257	54.810	54 810	19 200	19 200	39 721	39 721	51 520	51 520	18 253	18 253	37 968	37 968	49 246	[illegible]
1 020	19 095	19 113	41 292	41 303	54 054	54 065	17 931	17 945	38 774	38 785	50 759	50 769	17 127	17 141	37 037	37 047	48 484	[illegible]
1 030	17 746	17.800	40 313	40 349	53 288	53 320	16 647	16 690	37 817	37 849	49 989	50 017	15 890	15 929	36 097	36 120	[illegible]	[illegible]
1 040	16.379	15.487	39.321	39 395	52 512	52.575	15 349	15 435	36.847	36 913	49 210	49 265	14 640	14 717	35 147	35 205	[illegible]	[illegible]
1 050	14 992	14.174	38 314	38 441	51 724	51.830	14 035	14.180	35 867	35.977	48 421	48 523	13 378	13 505	34 188	34 284	46 154	[illegible]
1 060	13.587	13.861	37 295	37 487	50 925	51 085	12 706	12 925	34 876	35 041	47 623	47 761	12 102	[illegible]	33 218	[illegible]	[illegible]	[illegible]
1.070	12.162	12.548	36.260	36 533	50 116	50 340	11 361	11 670	33 872	34 105	46 816	46 999	10 813	11 081	32 240	[illegible]	[illegible]	[illegible]
1 080	10 716	11.235	35 211	35 579	49 295	49 595	10 000	10 415	32 857	33.169	46 000	46 257	9 511	9 863	31 250	[illegible]	[illegible]	[illegible]
1 090	9.251	9.922	34 148	34 625	48 463	48 850	8.622	8 170	31 829	32 233	45 173	15 505	8 195	8 657	[illegible]	30 600	[illegible]	[illegible]
1.100	7 764	8.509	33 069	33 671	47 619	48 105	7 229	7 905	30 790	31 297	44 337	14 753	6 865	7 445	29 240	29 679	[illegible]	[illegible]

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[15] "Specific Gravity Estimation of Pulp," Colo. Sci. Soc., Vol 9, p. 417.

[16] "Practical Applications of the Specific Gravity or Mixture Flask," "Journ." Chem., Met. and Min. Soc. S. A., Vol. 12, p. [illegible]

[17] "Measurement of Pulp and Tailings," [illegible] Vol [illegible] p. 298.

ture difference. In former articles upon the subject, the effect of temperature has been ignored. The range in temperature of pulps in cyanide practice may vary from slightly above freezing, in a cold climate, to about 50° C. (122° F.), in a tropical country, or where the solutions are heated. To illustrate the effect of temperature, we have plotted the accompanying curve which will show the decrease in the density of water[18] with increasing temperature (p. 1080).

After considerable investigation, we have concluded that the best method of providing for this correction is to make all calculations upon the basis of water at its greatest density (4° C.). If the specific gravity of the dry slime is determined using distilled water at 4° C. and the precaution is taken of weighing the liter of pulp at the same temperature, whatever that may be, of the large mass of pulp in the tank, in a liter flask which has been calibrated at 4° C., the effect of temperature is provided for with the exception of that due to the expansion of the flask and of the tank containing the pulp, with increasing temperature above 4° C. An ordinary glass flask[19] calibrated to contain 100 grams of water at 4° C. (39.2° F.), if used with pulps at 50° C. (122° F.) would expand about 1/8%. With average pulps this would amount to about 1½ grams per liter. The expansion of wooden tanks with increasing temperature is variable, depending upon the variety of wood[20] of which the tanks are constructed, as well as the limitation imposed by the steel hoops. The circumference of a steel tank[21] 50 ft. in diameter would be increased by about 1 in. by a rise of temperature from 4° C. to 50° C. The error due to the expansion of the liter flask is, therefore, largely compensated by the expansion of the tank containing the pulp; but even if this were not the case, this correction would be negligible.

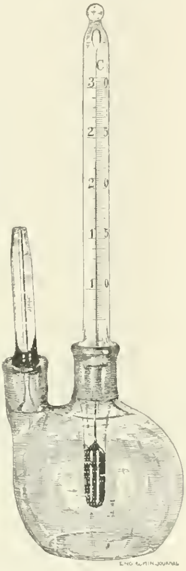

FIG. 3. PYCNOMETER

DETERMINATION OF THE SPECIFIC GRAVITY OF THE DRY SLIME

S (specific gravity of the dry slime) may be determined upon a sample of the dry slime by the well known pycnometer method. The pycnometer most generally used for this purpose is a small glass bottle, as shown in Fig. 3, having two necks. Into the central neck is introduced a small glass thermometer, through the medium of a ground joint, for the purpose of indicating the temperature. Similarly, into the other neck is fitted a glass stopper, having a capillary opening at the center.

Clean the pycnometer and fill with recently boiled distilled water at 4° C. so that the water just overflows the capillary opening in the glass stopper. Dry the outside and weigh accurately. Call this weight "D." Fill the pycnometer about half full of distilled water, then introduce five grams of the dry slime, which has been accurately weighed. Boil to remove air, cool on ice to 4° C., add water at 4° C. to fill the flask, and weigh. Call this weight C. Call the weight of the ore taken W. Specific gravity of the dry slime $= \frac{W}{D + W - C}$. By taking a greater weight of the dry slime, this determination can be made in the ordinary 1000-c.c. flask, and it is perhaps desirable to use the larger flask when an accurate analytical balance is not available.

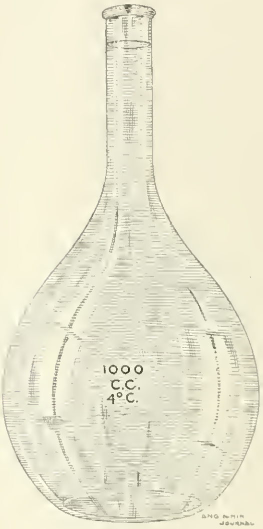

FIG. 4. 1000-C.C. FLASK FOR WEIGHING PULP

This is sometimes termed the specific gravity of the wet pulp, but the weight of a liter of the wet pulp, expressed in grams, appears to be a better term, therefore we have designated it in this manner throughout the tables. This is determined by weighing 1000 c.c. of the wet pulp at the temperature of the large mass of pulp. Sharwood[22] prefers a conical vessel made of tin plate for making this determination in mill work. Stadler[23] states that in practice he has found that a flask (presumably glass) having a large mouth ground true, the ground edge to be used as a mark of capacity, is more convenient than the usual flask with a mark below the mouth. Pooler[24] admits the convenience of the large neck flask as advocated by Stadler, but calls attention to the great error which may arise when it is used. For various reasons we favor for this purpose in both laboratory and mill work the use of the ordinary 1000-c.c. narrow-neck flask cut off about ½ in. above the mark, as shown in Fig. 4. The narrow neck projecting a short distance above the mark makes for greater accuracy and on account of the care necessary in handling a flask completely filled with solution or pulp is fully as convenient to use as the wide-neck flask which is filled level full. The frequent breaking of the glass flask, due to the rough handling which such apparatus receives in mill work, cannot be denied; but herein lies one of its strong points of advantage. A thin metal flask may soon become inaccurate through distortion and denting; but as long as it does not leak, the mill man is prone to continue its use. When such an accident happens to a glass flask, it is put entirely out of service. Another source of error in both glass and metal flasks is the coating of lime and slime which tends to build up upon the inside of the flask. A glass flask can be readily cleaned with acid, while a metal flask is not so readily cleaned.

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[18] Calculated from data given in "Physical and Chemical Constants," by Kaye and Saby, p. 22.

[19] Ibid., p. 53.

[20] Ibid., p. 53.

[21] Ibid., p. 53.

[22] "Measurement of Pulp and Tailing," "Min. Mag.," Vol. 1, p. 301.

[23] "Practical Applications of the Specific Gravity or Moisture Flask," "Journ." Chem., Met. and Min. Soc. S. A., Vol. 12, p. 167.

[24] "Discussion of Practical Application of the Specific Gravity or Moisture Flask," "Journ." Chem., Met. and Min. Soc. S. A., Vol. 12, p. 170.

The ordinary 1000-c.c. flask, as received from the dealer, should be calibrated by weighing in it exactly 1000 grams of distilled water at 4° C. Mark the level of the bottom of the meniscus by means of a file on the neck of the flask, and as has been previously mentioned, it is an advantage to cut off the neck about ½ in. above the mark. The flask should always be thoroughly cleaned before being used.

Care must be taken in obtaining the sample of pulp for this determination to insure that it is truly representative of the whole mass in the tank. The sample is perhaps best taken as suggested by Caldecott[25] by using a vessel having a small opening, so that the pulp can be taken at different depths in the tank. The pulp should be in violent agitation when the sample is taken. Thoroughly mix the pulp by stirring before filling the flask. After wiping out the inside of the neck of the flask above the pulp with a clean rag or piece of filter paper, weigh in grams upon a large pulp balance and deduct the weight of the flask. Example: If the net weight of 1000 c.c. of the pulp is 1235.6 grams, the specific gravity is 1.2356.

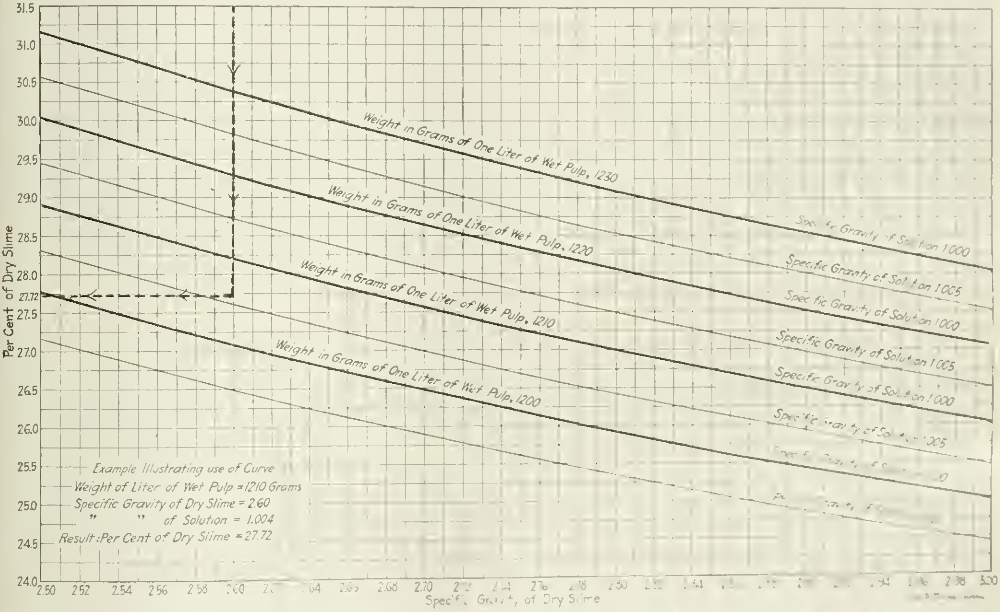
The weight of a liter of pulp expressed in grams is used in connection with the various tables; but if this value is substituted in formulas in which the specific gravity of the dry slime and of the solution appear, it must be expressed as specific gravity.

The hydrometer does not ordinarily give satisfactory results when used for determining the specific gravity of slime pulp, but there is a special type which I have not had the opportunity of investigating, which, with certain modifications, appears to be capable of giving good results.

Fill the 1000-c.c. flask (calibrated at 4° C.) with clear solution which has been cooled to 4°. Weigh the flask in grams and point off three places to give specific gravity. Example: If the net weight of the solution is 1008 grams, the specific gravity is 1.008.

ACCURACY OF SPECIFIC-GRAVITY METHOD OF DETERMINING TONNAGE

The accuracy of the specific-gravity method of determining tonnage when used over a sufficiently long period of time seems to be pretty well established. Slight errors in the determinations and calculations are largely compensating when a large number of slime charges are involved, for they do not occur in the same direction. However, there are other errors which apparently are unimportant because of the slight effect upon individual charges which become of importance when a large number of charges are involved, on account of occurring in one direction; thus changes in the specific gravity of the solution might in certain cases make an important effect upon a year's tonnage. Stadler[26] states that at the Knight Gold Mining Co.'s cyanide plant the daily tonnage measurements of the mill pulp for several years have been regularly taken by the specific-gravity method, which after careful investigation was found to give most reliable results. Drummond[27] states that the tonnage treated at the Nipissing low-grade mill, as determined



CURVE 1B. PER CENT. OF DRY SLIME AND CORRECTION FOR SPECIFIC GRAVITY OF SOLUTION

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[25] "Slime Pulp Formulas," W. A. Caldecott, Proc. [illegible] Met. Soc. S. A., Vol. 2, p. 8[illegible]

[26] [illegible]

[27] [illegible]

TABLE 1. PER CENT. OF DRY SLIME AND CORRECTION FOR SPECIFIC GRAVITY OF SOLUTION

Formula: $P = \frac{100\,S\,(a - d)}{a\,(S - d)}$

Specific Gravity of Dry Slime

Weight in Grams of One Liter of Wet Pulp	2.50	Correction	2.52	Correction	2.54	Correction	2.56	Correction	2.58	Correction	2.60	Correction	2.62	Correction	2.64	Correction	2.66	Correction	2.68	Correction	2.70	Correction	2.72	Correction	2.74	Correction
1010	1.650	.1650	1.642	.1642	1.633	.1633	1.625	.1625	1.617	.1617	1.609	.1609	1.601	.1601	1.594	.1594	1.586	.1586	1.579	.1579	1.573	.1573	1.566	.1566	1.560	.1560
1020	3.268	.1623	3.251	.1615	3.234	.1607	3.217	.1598	3.201	.1590	3.186	.1583	3.171	.1575	3.156	.1568	3.142	.1561	3.128	.1555	3.115	.1548	3.101	.1541	3.088	.1535
1030	4.854	.1597	4.829	.1589	4.804	.1581	4.780	.1573	4.756	.1565	4.733	.1558	4.711	.1551	4.689	.1544	4.668	.1537	4.647	.1531	4.627	.1525	4.607	.1518	4.588	.1512
1040	6.411	.1571	6.378	.1564	6.345	.1556	6.312	.1548	6.281	.1541	6.252	.1534	6.222	.1527	6.192	.1520	6.163	.1513	6.136	.1507	6.110	.1501	6.084	.1495	6.059	.1489
1050	7.936	.1545	7.895	.1537	7.854	.1530	7.814	.1523	7.776	.1516	7.739	.1509	7.702	.1502	7.666	.1496	7.631	.1490	7.597	.1484	7.565	.1478	7.532	.1472	7.501	.1466
1060	9.435	.1521	9.386	.1514	9.337	.1506	9.290	.1499	9.244	.1492	9.200	.1486	9.156	.1479	9.114	.1473	9.072	.1467	9.031	.1461	8.992	.1455	8.954	.1449	8.916	.1443
1070	10.90	.149	10.85	.149	10.79	.148	10.73	.147	10.68	.146	10.63	.146	10.58	.145	10.53	.145	10.48	.144	10.44	.144	10.39	.143	10.35	.143	10.30	.142
1080	12.34	.147	12.28	.146	12.22	.146	12.16	.145	12.10	.145	12.04	.144	11.98	.143	11.92	.142	11.87	.142	11.82	.142	11.77	.141	11.72	.141	11.67	.140
1090	13.76	.145	13.69	.144	13.62	.144	13.55	.143	13.48	.142	13.42	.142	13.35	.140	13.29	.140	13.23	.140	13.17	.139	13.12	.139	13.06	.139	13.01	.138
1100	15.15	.143	15.07	.142	14.99	.141	14.91	.140	14.84	.140	14.77	.139	14.70	.139	14.63	.138	14.56	.137	14.50	.137	14.44	.137	14.38	.137	14.32	.136
1110	16.52	.140	16.43	.139	16.34	.138	16.26	.138	16.18	.138	16.11	.138	16.03	.137	15.95	.136	15.88	.136	15.81	.135	15.74	.135	15.67	.134	15.61	.134
1120	17.86	.138	17.76	.137	17.67	.136	17.58	.136	17.50	.136	17.41	.135	17.33	.135	17.25	.134	17.17	.134	17.09	.133	17.02	.133	16.95	.133	16.88	.132
1130	19.17	.136	19.07	.135	18.97	.134	18.87	.133	18.78	.133	18.69	.132	18.60	.132	18.52	.132	18.43	.131	18.35	.131	18.27	.130	18.19	.130	18.12	.130
1140	20.47	.134	20.36	.133	20.25	.132	20.15	.132	20.05	.131	19.95	.130	19.86	.130	19.77	.130	19.68	.130	19.59	.129	19.51	.129	19.42	.128	19.34	.128
1150	21.74	.132	21.62	.131	21.51	.130	21.40	.130	21.30	.130	21.20	.129	21.10	.128	21.00	.129	20.90	.128	20.81	.128	20.72	.127	20.63	.127	20.54	.126
1160	22.99	.130	22.87	.129	22.75	.129	22.63	.128	22.52	.127	22.41	.127	22.30	.126	22.20	.126	22.10	.126	22.00	.125	21.91	.125	21.81	.124	21.72	.124
1170	24.21	.127	24.08	.127	23.96	.126	23.84	.126	23.72	.125	23.61	.125	23.50	.125	23.39	.124	23.28	.124	23.18	.124	23.08	.123	22.98	.123	22.88	.122
1180	25.42	.125	25.29	.125	25.16	.125	25.03	.124	24.91	.124	24.79	.123	24.67	.123	24.56	.123	24.45	.123	24.34	.122	24.23	.122	24.12	.121	24.02	.120
1190	26.61	.123	26.47	.123	26.34	.123	26.21	.122	26.08	.122	25.95	.121	25.83	.121	25.71	.121	25.59	.120	25.48	.120	25.37	.120	25.26	.119	25.15	.118
1200	27.77	.121	27.63	.121	27.49	.121	27.35	.120	27.21	.119	27.08	.119	26.95	.118	26.83	.118	26.71	.118	26.59	.118	26.47	.117	26.36	.117	26.25	.117
1210	28.92	.119	28.77	.119	28.62	.119	28.48	.118	28.34	.118	28.20	.117	28.07	.117	27.94	.117	27.81	.117	27.69	.116	27.57	.116	27.45	.116	27.33	.115
1220	30.05	.118	29.89	.117	29.74	.117	29.59	.116	29.44	.116	29.30	.116	29.16	.115	29.03	.115	28.89	.114	28.76	.114	28.64	.114	28.52	.114	28.40	.114
1230	31.16	.115	31.00	.115	30.84	.115	30.68	.114	30.53	.114	30.39	.114	30.24	.113	30.10	.113	29.96	.113	29.83	.113	29.70	.112	29.57	.112	29.44	.112
1240	32.26	.114	32.09	.114	31.92	.113	31.76	.113	31.60	.112	31.45	.112	31.30	.112	31.16	.112	31.02	.112	30.88	.112	30.75	.111	30.62	.111	30.49	.111
1250	33.33	.112	33.16	.112	32.99	.112	32.82	.111	32.66	.111	32.50	.110	32.35	.110	32.20	.110	32.05	.110	31.90	.110	31.76	.109	31.63	.109	31.50	.109
1260	34.39	.111	34.21	.110	34.03	.110	33.86	.110	33.69	.109	33.53	.109	33.37	.109	33.22	.109	33.07	.109	32.92	.108	32.78	.108	32.64	.108	32.50	.108
1270	35.43	.109	35.25	.108	35.07	.108	34.89	.108	34.72	.108	34.55	.108	34.39	.107	34.23	.107	34.07	.106	33.92	.106	33.77	.106	33.62	.106	33.48	.105
1280	36.46	.107	36.27	.107	36.08	.106	35.90	.106	35.72	.106	35.55	.106	35.38	.105	35.22	.105	35.06	.105	34.90	.105	34.75	.105	34.60	.104	34.45	.104
1290	37.46	.105	37.27	.104	37.08	.104	36.89	.104	36.71	.104	36.53	.104	36.36	.103	36.19	.103	36.02	.103	35.86	.103	35.71	.103	35.56	.102	35.41	.102
1300	38.46	.103	38.26	.103	38.06	.102	37.87	.102	37.68	.102	37.50	.102	37.32	.102	37.15	.102	36.98	.102	36.82	.102	36.66	.102	36.50	.101	36.34	.101
1310	39.44	.102	39.23	.102	39.03	.101	38.83	.101	38.64	.101	38.45	.101	38.27	.101	38.09	.101	37.92	.100	37.75	.100	37.59	.100	37.43	.100	37.27	.100
1320	40.40	.100	40.19	.100	39.98	.099	39.78	.099	39.58	.099	39.39	.099	39.20	.099	39.02	.099	38.84	.098	38.67	.098	38.50	.098	38.33	.097	38.17	.097
1330	41.34	.098	41.13	.098	40.92	.098	40.71	.098	40.51	.098	40.32	.098	40.13	.098	39.94	.098	39.75	.097	39.57	.097	39.40	.097	39.23	.096	39.07	.096
1340	42.29	.096	42.07	.097	41.85	.097	41.64	.097	41.43	.097	41.23	.096	41.04	.096	40.85	.096	40.66	.096	40.48	.096	40.30	.096	40.13	.095	39.96	.095
1350	43.21	.095	42.99	.095	42.77	.095	42.55	.095	42.34	.095	42.14	.095	41.94	.095	41.74	.095	41.55	.095	41.37	.095	41.19	.095	41.01	.094	40.84	.094
1360	44.12	.094	43.89	.094	43.66	.093	43.44	.093	43.23	.093	43.02	.093	42.82	.093	42.62	.093	42.42	.093	42.23	.093	42.05	.093	41.87	.092	41.69	.092
1370	45.01	.092	44.78	.092	44.55	.092	44.32	.092	44.10	.092	43.89	.092	43.68	.092	43.48	.092	43.28	.092	43.09	.092	42.90	.092	42.72	.091	42.54	.091
1380	45.89	.091	45.65	.091	45.41	.091	45.18	.091	44.96	.091	44.75	.091	44.54	.091	44.33	.091	44.13	.091	43.93	.091	43.74	.091	43.55	.090	43.37	.090
1390	46.76	.089	46.52	.089	46.28	.089	46.05	.089	45.82	.089	45.60	.089	45.38	.089	45.17	.089	44.97	.089	44.77	.089	44.58	.089	44.39	.089	44.20	.089
1400	47.63	.088	47.38	.088	47.13	.088	46.89	.088	46.66	.088	46.44	.088	46.22	.088	46.00	.088	45.79	.088	45.59	.088	45.39	.088	45.20	.087	45.01	.087
1410	48.46	.086	48.21	.086	47.96	.086	47.72	.086	47.49	.086	47.26	.086	47.04	.086	46.82	.086	46.60	.086	46.39	.086	46.19	.086	45.99	.086	45.80	.086
1420	49.28	.084	49.03	.084	48.78	.084	48.53	.084	48.29	.084	48.06	.084	47.83	.084	47.61	.084	47.39	.084	47.18	.084	46.98	.084	46.78	.084	46.58	.084
1430	50.12	.083	49.86	.083	49.60	.083	49.35	.083	49.11	.083	48.87	.083	48.64	.083	48.41	.083	48.19	.083	47.97	.083	47.76	.083	47.56	.083	47.36	.083
1440	50.92	.082	50.66	.082	50.40	.082	50.14	.082	49.89	.082	49.65	.082	49.42	.082	49.19	.082	48.96	.082	48.74	.082	48.53	.082	48.32	.082	48.12	.082
1450	51.72	.080	51.45	.080	51.18	.080	50.92	.080	50.67	.080	50.43	.080	50.19	.080	49.96	.080	49.73	.080	49.51	.080	49.29	.080	49.08	.080	48.87	.080
1460	52.50	.079	52.23	.079	51.96	.079	51.70	.079	51.45	.079	51.20	.079	50.96	.079	50.72	.079	50.49	.079	50.26	.079	50.04	.079	49.83	.079	49.62	.079
1470	53.29	.078	53.01	.078	52.74	.078	52.47	.078	52.21	.078	51.96	.078	51.71	.078	51.47	.078	51.24	.078	51.01	.078	50.79	.078	50.57	.078	50.36	.078
1480	54.05	.077	53.76	.077	53.48	.077	53.21	.077	52.95	.077	52.69	.077	52.44	.077	52.20	.077	51.96	.077	51.73	.077	51.51	.077	51.29	.077	51.07	.077
1490	54.81	.076	54.52	.076	54.24	.076	53.97	.076	53.70	.076	53.44	.076	53.19	.076	52.94	.076	52.70	.076	52.46	.076	52.23	.076	52.01	.076	51.79	.076
1500	55.56	.075	55.26	.075	54.98	.075	54.70	.075	54.43	.075	54.17	.075	53.92	.075	53.67	.075	53.42	.075	53.18	.075	52.95	.075	52.72	.075	52.50	.075

TABLE IA. LOGARITHMS OF PER CENT. OF DRY SLIME AND CORRECTION FOR SPECIFIC GRAVITY OF SOLUTION

Specific Gravity of Dry Slime

Weight in Grams of One Liter of Wet Pulp	2.50	Correction	2.52	Correction	2.54	Correction	2.56	Correction	2.58	Correction	2.60	Correction	2.62	Correction	2.64	Correction	2.66	Correction	2.68	Correction	2.70	Correction	2.72	Correction	2.74	Correction
1010	.2175	.1650	.2154	.1642	.2130	.1633	.2109	.1625	.2087	.1617	.2066	.1609	.2044	.1601	.2025	.1594	.2003	.1586	.1984	.1579	.1967	.1573	.1948	.1566	.1931	.1560
1020	.5143	.1623	.5120	.1615	.5097	.1607	.5075	.1598	.5053	.1590	.5032	.1583	.5012	.1575	.4991	.1568	.4972	.1561	.4953	.1555	.4935	.1548	.4915	.1541	.4897	.1535
1030	.6861	.1597	.6839	.1589	.6816	.1581	.6794	.1573	.6772	.1565	.6751	.1555	.6731	.1551	.6711	.1544	.6691	.1537	.6672	.1531	.6653	.1525	.6634	.1518	.6616	.1512
1040	.8069	.1571	.8047	.1564	.8024	.1556	.8002	.1548	.7980	.1541	.7960	.1534	.7939	.1527	.7918	.1520	.7898	.1513	.7879	.1507	.7860	.1501	.7842	.1495	.7824	.1489
1050	.8996	.1545	.8974	.1537	.8951	.1530	.8929	.1523	.8908	.1516	.8887	.1509	.8866	.1502	.8846	.1496	.8826	.1490	.8806	.1484	.8788	.1478	.8769	.1472	.8751	.1466
1060	.9747	.1521	.9725	.1514	.9702	.1506	.9680	.1499	.9659	.1492	.9638	.1486	.9617	.1479	.9597	.1473	.9577	.1467	.9557	.1461	.9539	.1455	.9520	.1449	.9502	.1443
1070	.0374	.149	.0354	.149	.0330	.148	.0306	.147	.0286	.146	.0265	.146	.0245	.145	.0224	.145	.0204	.144	.0187	.144	.0166	.143	.0149	.143	.0128	.142
1080	.0913	.147	.0892	.146	.0871	.146	.0849	.145	.0828	.145	.0806	.144	.0785	.143	.0763	.142	.0745	.142	.0726	.142	.0708	.141	.0689	.141	.0671	.140
1090	.1386	.145	.1364	.144	.1342	.144	.1319	.143	.1297	.142	.1278	.142	.1255	.140	.1235	.140	.1216	.140	.1196	.139	.1179	.139	.1159	.138	.1143	.138
1100	.1804	.143	.1781	.142	.1758	.141	.1735	.140	.1714	.140	.1694	.139	.1673	.139	.1652	.138	.1632	.137	.1614	.137	.1596	.137	.1578	.137	.1559	.136
1110	.2180	.140	.2156	.139	.2133	.138	.2111	.138	.2090	.138	.2071	.138	.2049	.137	.2028	.136	.2009	.136	.1989	.135	.1970	.135	.1951	.134	.1934	.134
1120	.2519	.138	.2494	.137	.2472	.137	.2450	.136	.2430	.136	.2408	.135	.2388	.135	.2368	.134	.2348	.134	.2327	.133	.2310	.133	.2292	.133	.2274	.132
1130	.2826	.135	.2804	.135	.2781	.134	.2758	.133	.2737	.133	.2716	.132	.2695	.132	.2676	.132	.2655	.131	.2636	.131	.2617	.130	.2598	.130	.2582	.130
1140	.3111	.134	.3088	.133	.3064	.132	.3043	.132	.3021	.131	.2999	.130	.2980	.130	.2960	.130	.2940	.130	.2920	.129	.2903	.129	.2882	.128	.2865	.128
1150	.3373	.132	.3349	.131	.3326	.130	.3304	.130	.3284	.130	.3263	.130	.3243	.129	.3222	.129	.3201	.128	.3183	.128	.3164	.127	.3145	.127	.3126	.126
1160	.3615	.130	.3593	.129	.3570	.129	.3547	.128	.3526	.127	.3504	.127	.3483	.126	.3464	.126	.3444	.126	.3424	.125	.3406	.125	.3387	.124	.3369	.124
1170	.3840	.127	.3817	.126	.3795	.126	.3773	.126	.3751	.125	.3731	.125	.3711	.125	.3690	.124	.3670	.124	.3651	.124	.3632	.123	.3614	.123	.3595	.122
1180	.4052	.125	.4030	.125	.4007	.125	.3985	.124	.3964	.124	.3943	.123	.3922	.123	.3902	.123	.3883	.123	.3863	.122	.3844	.122	.3824	.121	.3806	.120
1190	.4250	.123	.4228	.123	.4206	.123	.4185	.122	.4163	.122	.4141	.121	.4121	.121	.4101	.121	.4081	.120	.4062	.120	.4043	.120	.4024	.119	.4005	.118
1200	.4436	.121	.4414	.121	.4392	.121	.4370	.120	.4347	.119	.4326	.119	.4306	.118	.4286	.118	.4267	.118	.4247	.118	.4228	.117	.4209	.117	.4191	.117
1210	.4612	.119	.4589	.119	.4567	.119	.4545	.118	.4524	.118	.4502	.117	.4482	.117	.4462	.117	.4442	.117	.4423	.117	.4404	.116	.4385	.116	.4366	.115
1220	.4778	.118	.4755	.117	.4733	.117	.4711	.116	.4689	.116	.4669	.116	.4648	.115	.4628	.115	.4608	.114	.4588	.114	.4570	.114	.4551	.114	.4533	.114
1230	.4936	.115	.4914	.115	.4891	.115	.4869	.114	.4847	.114	.4827	.114	.4806	.113	.4786	.113	.4766	.113	.4747	.113	.4729	.112	.4709	.112	.4690	.111
1240	.5087	.114	.5064	.114	.5041	.113	.5019	.113	.4997	.112	.4976	.112	.4955	.112	.4936	.112	.4916	.112	.4897	.112	.4878	.112	.4860	.111	.4842	.111
1250	.5228	.112	.5206	.112	.5184	.112	.5161	.111	.5140	.111	.5119	.110	.5099	.110	.5079	.110	.5058	.110	.5038	.109	.5019	.109	.5001	.109	.4983	.109
1260	.5364	.111	.5342	.111	.5319	.110	.5297	.110	.5275	.109	.5254	.109	.5234	.109	.5214	.109	.5194	.109	.5175	.109	.5156	.108	.5138	.108	.5119	.108
1270	.5494	.108	.5472	.108	.5449	.108	.5427	.108	.5406	.108	.5384	.108	.5364	.107	.5344	.107	.5324	.106	.5305	.106	.5285	.106	.5266	.106	.5248	.105
1280	.5618	.107	.5595	.107	.5573	.106	.5551	.106	.5529	.106	.5508	.105	.5488	.105	.5468	.105	.5448	.105	.5428	.105	.5410	.105	.5391	.104	.5372	.104
1290	.5736	.104	.5714	.104	.5691	.104	.5669	.104	.5648	.104	.5626	.104	.5606	.103	.5586	.103	.5566	.103	.5546	.103	.5528	.103	.5510	.102	.5491	.102
1300	.5850	.103	.5827	.103	.5805	.102	.5783	.102	.5761	.102	.5740	.102	.5719	.102	.5700	.102	.5680	.102	.5661	.102	.5642	.102	.5623	.101	.5604	.101
1310	.5959	.102	.5936	.102	.5914	.101	.5892	.101	.5870	.101	.5849	.101	.5829	.101	.5808	.101	.5789	.100	.5769	.100	.5751	.100	.5732	.100	.5714	.100
1320	.6064	.100	.6041	.100	.6018	.099	.5997	.099	.5975	.099	.5954	.098	.5933	.098	.5913	.098	.5893	.098	.5874	.098	.5855	.098	.5835	.097	.5817	.097
1330	.6164	.098	.6142	.098	.6119	.098	.6097	.098	.6076	.098	.6055	.098	.6035	.098	.6014	.098	.5993	.097	.5974	.097	.5955	.097	.5936	.096	.5918	.096
1340	.6262	.098	.6240	.098	.6217	.097	.6195	.097	.6173	.097	.6152	.096	.6132	.096	.6112	.096	.6092	.096	.6072	.096	.6053	.096	.6035	.095	.6016	.095
1350	.6356	.095	.6334	.095	.6311	.095	.6289	.095	.6268	.095	.6247	.095	.6226	.095	.6206	.095	.6186	.095	.6167	.095	.6148	.095	.6129	.094	.6111	.094
1360	.6446	.094	.6424	.094	.6401	.094	.6379	.093	.6358	.093	.6337	.093	.6316	.093	.6296	.093	.6276	.093	.6256	.093	.6238	.093	.6219	.092	.6200	.092
1370	.6533	.092	.6511	.092	.6488	.092	.6466	.092	.6444	.092	.6424	.092	.6403	.092	.6383	.092	.3363	.092	.6344	.092	.6325	.092	.6306	.091	.6288	.091
1380	.6617	.091	.6594	.091	.6572	.091	.6549	.091	.6528	.091	.6508	.091	.6488	.091	.6467	.091	.6447	.091	.6428	.091	.6409	.091	.6390	.091	.6372	.091
1390	.6699	.089	.6676	.089	.6651	.089	.6632	.089	.6611	.089	.6590	.089	.6569	.089	.6548	.089	.6529	.089	.6510	.089	.6491	.089	.6473	.089	.6454	.089
1400	.6779	.089	.6756	.089	.6733	.088	.6711	.088	.6689	.088	.6669	.088	.6648	.088	.6628	.088	.6608	.088	.6589	.088	.6570	.088	.6551	.087	.6533	.087
1410	.6854	.086	.6831	.086	.6809	.086	.6787	.086	.6766	.086	.6745	.086	.6725	.086	.6704	.086	.6684	.086	.6664	.086	.6645	.086	.6627	.086	.6609	.086
1420	.6927	.084	.6905	.084	.6882	.084	.6860	.084	.6839	.084	.6818	.084	.6797	.084	.6777	.084	.6757	.084	.6738	.084	.6719	.084	.6701	.084	.6682	.084
1430	.7000	.084	.6978	.084	.6955	.084	.6933	.084	.6912	.084	.6890	.084	.6870	.084	.6849	.084	.6830	.084	.6810	.084	.6791	.084	.6772	.084	.6754	.084
1440	.7069	.082	.7047	.082	.7024	.082	.7002	.082	.6980	.082	.6959	.082	.6939	.082	.6919	.082	.6898	.082	.6879	.082	.6860	.082	.6841	.082	.6823	.082
1450	.7137	.081	.7114	.081	.7091	.080	.7069	.080	.7048	.080	.7027	.080	.7006	.080	.6986	.080	.6966	.080	.6947	.080	.6928	.080	.6909	.080	.6890	.080
1460	.7202	.080	.7179	.080	.7157	.080	.7135	.080	.7114	.080	.7093	.080	.7072	.080	.7052	.080	.7032	.080	.7012	.080	.6993	.080	.6975	.080	.6957	.080
1470	.7266	.078	.7244	.078	.7221	.078	.7199	.078	.7177	.078	.7157	.078	.7136	.078	.7116	.078	.7096	.078	.7077	.078	.7058	.078	.7039	.078	.7021	.078
1480	.7327	.077	.7305	.077	.7282	.077	.7260	.077	.7239	.077	.7217	.077	.7197	.077	.7177	.077	.7157	.077	.7137	.077	.7119	.077	.7100	.077	.7082	.077
1490	.7388	.076	.7366	.076	.7343	.076	.7321	.077	.7300	.077	.7279	.077	.7258	.077	.7238	.077	.7218	.077	.7198	.077	.7179	.077	.7161	.077	.7142	.077
1500	.7447	.075	.7424	.075	.7402	.075	.7380	.075	.7358	.075	.7338	.075	.7317	.076	.7297	.076	.7277	.076	.7257	.076	.7239	.076	.7220	.076	.7202	.076

Note—The natural values are given for the corrections on account of the manner in which they are applied.

By weighing with a Fairbanks registering scale, making proper allowance for moisture, checks the tonnage as determined in the cyanide plant by the specific-gravity method within one-eighth of one per cent., the specific-gravity method giving the higher result.

NOTE—The characteristics of the logarithms in Table 1A are not given. They are 0, for all values up to 1070 of "weight in grams of one liter of wet pulp," and for the last few columns of 1070. For all values above 1070 and most of 1070 the value is 1. The point of change of the characteristic from zero to unity can be seen by the change of the mantissa from .009+ to .000–. It can also be determined by looking up the antilogarithm in Table 1, and determining as usual in such work the characteristic of the logarithm of that number.

TABLE 1. PER CENT. OF DRY SLIME AND CORRECTION FOR SPECIFIC GRAVITY OF SOLUTION—Continued

Formula: $P = \frac{100\,S\,(a-d)}{a\,(S-d)}$

Specific Gravity of Dry Slime

2.76	Correction	2.78	Correction	2.80	Correction	2.82	Correction	2.84	Correction	2.86	Correction	2.88	Correction	2.90	Correction	2.92	Correction	2.94	Correction	2.96	Correction	2.98	Correction	3.00	Correction	Weight in Grams of One Liter of Wet Pulp
1.553	.1553	1.546	.1546	1.540	.1540	1.534	.1534	1.528	.1528	1.523	.1523	1.517	.1517	1.511	.1511	1.506	.1506	1.500	.1500	1.495	.1495	1.490	.1490	1.485	[illegible]	1010
3.075	.1529	3.062	.1522	3.050	.1516	3.038	.1510	3.026	.1505	3.015	.1499	3.003	.1493	2.992	.1488	2.982	.1483	2.971	.1478	2.961	.1473	2.951	.1468	2.941	[illegible]	[illegible]
4.568	.1505	4.549	.1499	4.531	.1494	4.513	.1488	4.496	.1483	4.479	.1477	4.462	.1471	4.446	.1466	4.430	.1461	4.414	.1456	4.398	.1451	4.383	.1446	4.369	[illegible]	[illegible]
6.033	.1483	6.008	.1477	5.984	.1472	5.960	.1466	5.937	.1460	5.915	.1455	5.893	.1450	5.871	.1445	5.850	.1440	5.829	.1435	5.809	.1430	5.789	.1426	5.770	.1422	1040
7.468	.1460	7.437	.1454	7.408	.1448	7.378	.1443	7.350	.1438	7.323	.1433	7.295	.1427	7.268	.1422	7.243	[illegible]	7.216	[illegible]	7.191	[illegible]	7.166	.1404	7.143	.1400	1050
8.878	.1437	8.841	.1432	8.806	.1427	8.771	.1423	8.738	.1418	8.705	.1412	8.672	.1406	8.640	.1401	8.610	.1397	8.578	.1395	8.549	[illegible]	8.519	.1384	8.491	[illegible]	1060
10.26	.142	10.22	.141	10.18	.141	10.14	.140	10.10	.140	10.06	.139	10.02	.138	9.984	.1380	9.948	.1375	9.913	.1371	9.879	.1367	9.845	.1363	9.812	[illegible]	1070
11.62	.140	11.57	.139	11.52	.138	11.48	.138	11.44	.138	11.39	.138	11.35	.137	11.31	.137	11.27	.136	11.23	.136	11.19	[illegible]	11.15	.135	11.11	[illegible]	1080
12.95	.137	12.90	.137	12.84	.136	12.79	.136	12.74	.135	12.70	.135	12.65	.134	12.60	.134	12.55	.133	12.51	.133	12.47	.133	12.43	[illegible]	[illegible]	[illegible]	1090
14.26	.136	14.20	.135	14.14	.134	14.08	.134	14.03	.134	13.98	.133	13.93	.133	13.88	.133	13.83	.132	13.78	.132	13.73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1100
15.54	.133	15.48	.133	15.42	.133	15.36	.133	15.30	.132	15.24	.131	15.18	.130	15.12	.130	15.07	.130	15.02	.130	14.97	[illegible]	[illegible]	[illegible]	[illegible]	.129	1110
16.80	.131	16.73	.131	16.67	.131	16.60	.130	16.54	.130	16.48	.129	16.41	.128	16.35	.128	16.30	.128	16.24	.128	16.18	.127	[illegible]	[illegible]	16.08	.127	1120
18.04	.129	17.96	.128	17.89	.128	17.82	.128	17.75	.127	17.69	.127	17.62	.126	17.56	.126	17.49	.126	17.43	.125	17.37	.125	17.31	[illegible]	17.25	.124	[illegible]
19.26	.128	19.18	.127	19.10	.126	19.02	.126	18.95	.126	18.88	.125	18.81	.125	18.74	.125	18.68	.125	18.61	.124	18.54	.123	18.48	[illegible]	[illegible]	.123	1140
20.45	.125	20.37	.125	20.29	.125	20.21	.125	20.13	.124	20.06	.124	19.98	.123	19.91	.123	19.84	.123	19.77	.123	19.76	.122	[illegible]	.122	[illegible]	[illegible]	[illegible]
21.63	.124	21.54	.123	21.45	.123	21.37	.123	21.29	.123	21.21	.122	21.13	.121	21.05	.121	20.97	.120	20.90	.120	20.83	.120	20.75	.119	[illegible]	.119	[illegible]
22.78	.121	22.69	.121	22.60	.121	22.51	.121	22.42	.121	22.34	.120	22.25	.119	22.17	.119	22.10	.119	22.02	.119	21.94	.118	21.80	.118	21.79	.118	1170
23.92	.120	23.82	.120	23.73	.120	23.64	.120	23.55	.119	23.46	.119	23.37	.118	23.28	.118	23.20	.118	23.12	.118	23.04	.117	22.96	.117	[illegible]	.117	[illegible]
25.04	.118	24.94	.118	24.84	.118	24.74	.117	24.65	.117	24.55	.117	24.46	.116	24.37	.116	24.29	.116	24.20	.116	24.11	.115	24.03	.115	[illegible]	.115	1190
26.14	.117	26.03	.116	25.92	.115	25.82	.115	25.72	.115	25.63	.115	25.53	.115	25.44	.115	25.34	.114	25.25	.113	25.16	.113	25.08	.113	25.00	.113	[illegible]
27.21	.115	27.10	.114	26.99	.114	26.89	.114	26.79	.114	26.69	.113	26.59	.113	26.49	.113	26.39	.112	26.30	.112	26.21	.112	26.12	.112	[illegible]	.112	[illegible]
28.28	.113	28.16	.113	28.05	.113	27.94	.113	27.83	.112	27.72	.111	27.62	.111	27.52	.111	27.42	.111	27.32	.111	27.23	.111	27.14	.111	27.05	.111	[illegible]
29.32	.111	29.20	.111	29.09	.111	28.97	.111	28.86	.111	28.75	.110	28.64	.109	28.54	.109	28.44	.109	28.31	.109	28.24	.109	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30.36	.110	30.23	.110	30.11	.110	29.99	.110	29.87	.109	29.76	.109	29.65	.108	29.54	.108	29.43	.107	29.33	.107	29.23	.107	[illegible]	.107	[illegible]	.107	[illegible]
31.37	.109	31.24	.109	31.11	.108	30.99	.108	30.87	.108	30.75	.107	30.63	.106	30.52	.106	30.41	.106	30.30	.106	30.20	.106	30.10	.106	[illegible]	[illegible]	[illegible]
32.36	108	32.23	.107	32.10	.107	31.97	.107	31.85	.107	31.73	.106	31.61	.105	31.49	.105	31.38	.105	31.27	.105	31.16	.105	31.05	.104	[illegible]	[illegible]	[illegible]
33.34	.105	33.20	.105	33.07	.105	32.94	.105	32.81	.105	32.69	.104	32.57	.104	32.45	.104	32.33	.104	32.22	.104	32.11	.104	32.00	.103	[illegible]	[illegible]	[illegible]
34.31	.104	34.17	.103	34.03	.103	33.89	.103	33.76	.103	33.63	.102	33.51	.102	33.39	.102	33.27	.102	33.15	.102	33.04	.102	[illegible]	.102	[illegible]	[illegible]	[illegible]
35.26	.102	35.11	.102	34.97	.102	34.83	.102	34 70	.101	34.57	.101	34.44	.101	34.31	.101	34.19	.100	34.07	.100	33.95	.100	[illegible]	.100	[illegible]	[illegible]	[illegible]
36.19	.101	36.04	.100	35.90	.100	35.76	.100	35.62	.099	35.48	.099	35.35	.099	35.22	.099	35.09	.098	34.97	.098	34.85	.098	[illegible]	.098	[illegible]	[illegible]	[illegible]
37.11	.100	36.96	.099	36.81	.099	36.67	.099	36.53	.098	36.39	.098	36.25	.098	36.12	.098	35.99	.097	35.86	.097	35.74	.097	35.62	[illegible]	[illegible]	[illegible]	[illegible]
38.01	.097	37.85	.097	37.70	.097	37.55	.097	37.41	.097	37.27	.096	37.13	.096	36.99	.096	36.86	.096	36.73	.096	36.60	.096	36.48	[illegible]	[illegible]	[illegible]	[illegible]
38.91	.096	38.75	.096	38.59	.096	38.44	.096	38.29	.096	38.15	.095	38.01	.095	37.87	.095	37.73	.095	37.59	.095	37.46	.095	37.34	.095	[illegible]	[illegible]	[illegible]
39.79	095	39.63	.095	39.47	.095	39.31	.095	39.16	.094	39.01	.094	38.87	.094	38.73	.094	38.59	.094	38.45	.094	38.32	.094	[illegible]	[illegible]	[illegible]	[illegible]	1340
40.67	.094	40.50	.094	40.34	.094	40.18	.094	40.02	.093	39.87	.093	39.72	.093	39.57	.093	39.43	.093	39.29	.093	39.16	.093	39.03	.093	[illegible]	[illegible]	[illegible]
41.51	.092	41.34	.092	41.18	.092	41.02	.092	40.86	.092	40.71	.092	40.56	.092	40.41	.091	40.26	.091	40.12	.091	39.98	.091	39.84	.091	[illegible]	[illegible]	[illegible]
42.36	.091	42.18	.091	42.01	.091	41.84	.091	41.68	.090	41.52	.090	41.37	.090	41.22	.090	41.07	.090	40.93	.090	40.79	.090	40.65	.090	[illegible]	[illegible]	[illegible]
43.19	.090	43.01	.089	42.83	.089	42.66	.089	42.50	.089	42.34	.089	42.18	.089	42.03	.089	41.88	.089	41.73	.089	41.58	.089	41.44	[illegible]	[illegible]	[illegible]	[illegible]
44.01	089	43.83	.088	43.65	.088	43.48	.088	43.31	.088	43.15	.088	42.99	.088	42.83	.087	42.67	.087	42.52	.087	42.37	.087	42.23	.087	[illegible]	[illegible]	[illegible]
44.82	.087	44.63	.087	44.45	.087	44.27	.087	44.10	.087	43.93	.087	43.77	.086	43.61	.086	43.45	.086	43.30	.086	43.15	.086	43.00	.086	[illegible]	[illegible]	[illegible]
45.61	.086	45.42	.086	45.24	.086	45.06	.086	44.89	.086	44.72	.086	44.55	.085	44.38	.085	44.22	.085	44.06	.085	43.91	.085	43.76	[illegible]	[illegible]	[illegible]	[illegible]
46.38	.084	46.19	.084	46.00	.084	45.82	.084	45.64	.084	45.47	.085	45.30	.084	45.14	.084	44.97	.084	44.81	.084	44.66	.084	44.51	[illegible]	[illegible]	[illegible]	[illegible]
47.16	.083	46.97	.083	46.78	.083	46.59	.083	46.41	.083	46.24	.083	46.07	.083	45.90	.083	45.74	.083	45.58	.083	45.42	.083	45.26	[illegible]	45.11	[illegible]	[illegible]
47.92	.082	47.72	.082	47.53	.082	47.34	.082	47.16	.082	46.98	.082	46.81	.082	46.64	.082	40.47	.082	46.20	.082	46.14	.082	45.98	[illegible]	45.83	.082	1440
48.66	.080	48.46	.080	48.26	.080	48.08	.080	47.90	.080	47.72	.080	47.54	.080	47.36	.080	47.19	.080	47.02	.080	46.86	.080	[illegible]	[illegible]	46.55	[illegible]	[illegible]
49.41	.079	49.21	.079	49.01	.079	48.82	.079	48.63	.079	48.45	.079	48.27	.079	48.09	.079	47.91	.079	47.74	.079	47.57	.079	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
50.15	.078	49.94	.078	49.74	.078	49.54	.078	49.35	.078	49.16	.078	48.98	.078	48.80	.078	48.62	.078	48.45	.078	48.28	.078	48.12	[illegible]	[illegible]	.078	[illegible]
50.85	.077	50.64	.077	50.45	.077	50.24	.077	50.05	.077	49.86	.077	49.68	.077	49.50	.077	49.32	.077	49.14	.077	48.97	.077	48.80	.077	48.64	.077	[illegible]
51.57	.076	51.36	.076	51.16	076	50.95	.076	50.76	.076	50.57	.076	50.38	076	50.19	.076	50.01	076	[illegible]	.076	49.66	.076	49.49	[illegible]	49.33	.076	[illegible]
52.28	.075	52.06	.075	51.85	.075	51.65	.075	51.45	.075	51.26	.075	51 07	075	50.88	075	50.69	075	50.51	.075	50.34	.075	50.17	075	50.00	075	[illegible]

TABLE IA. LOGARITHMS OF PER CENT. OF DRY SLIME AND CORRECTION FOR SPECIFIC GRAVITY OF SOLUTION—Continued

Specific Gravity of Dry Slime

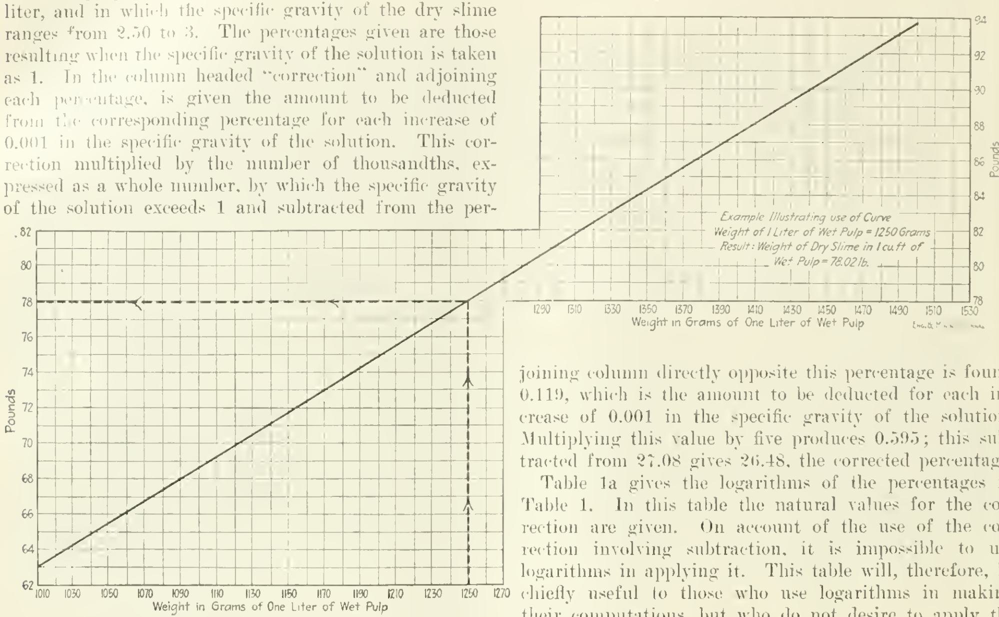
2.76	Correction	2.78	Correction	2.80	Correction	2.82	Correction	2.84	Correction	2.86	Correction	2.88	Correction	2.90	Correction	2.92	Correction	2.94	Correction	2.96	Correction	2.98	Correction	3.00	Correction	Weight in Grams of One Liter of Wet Pulp
.1912	.1553	.1892	.1546	.1875	.1540	.1858	.1534	.1841	.1528	.1827	.1523	.1810	.1517	.1793	.1511	.1778	.1506	1761	.1500	.1716	.1495	.1732	.1490	.1717	[illegible]	1010
.4878	.1529	.4860	.1522	.4843	.1516	.4826	.1510	.4809	.1505	.4793	.1499	.4776	.1493	.4760	.1488	.4745	.1483	4729	.1478	.4714	.1473	4700	.1468	[illegible]	[illegible]	[illegible]
.6597	.1505	.6579	.1499	.6562	.1494	.6545	.1488	.6528	.1483	.6512	.1477	.6495	.1471	.6480	.1466	.6464	.1461	.6448	.1456	.6433	.1451	.6418	.1446	6404	[illegible]	[illegible]
.7805	.1483	.7787	.1477	.7770	.1472	.7752	.1466	.7736	.1460	.7720	.1455	7703	.1450	.7687	.1445	.7672	.1440	7656	.1435	7641	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.8732	.1460	.8714	.1454	.8697	.1448	.8679	.1443	.8663	.1438	.8647	.1433	.8630	.1427	.8614	.1422	.8599	.1413	[illegible]	.1413	.8568	.1408	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.9483	.1437	.9465	.1432	.9448	.1427	.9430	.1423	.9414	.1418	.9398	.1412	.9381	.1406	.9365	.1401	.9350	.1397	.9334	[illegible]	.9319	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.0111	.142	.0094	.141	.0077	.141	.0060	.140	.0043	.140	.0026	.139	.0009	.138	.9993	.1380	.9977	.1375	.9962	[illegible]	9947	.1367	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.0652	.140	.0633	.139	.0615	.138	.0599	.138	.0584	.138	.0565	.138	.0549	.137	.0535	[illegible]	.0519	.136	0504	[illegible]	.0488	.135	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1123	.137	.1106	.137	.1086	.136	.1069	.136	.1052	.135	.1038	.135	.1021	.134	.1004	[illegible]	.0987	[illegible]	.0973	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1541	.136	.1523	.135	.1504	.134	.1486	.134	.1471	.134	.1455	.133	.1439	.133	.1424	[illegible]	.1408	.132	[illegible]	[illegible]	[illegible]	.131	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1915	.133	.1898	.133	.1881	.133	.1864	.133	.1847	.132	.1830	.131	.1813	.130	.1796	.130	.1781	.130	1767	.130	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.2253	.131	.2235	.131	.2219	.131	.2201	.130	.2185	.130	.2170	.129	.2151	.128	.2135	.128	.2122	.128	[illegible]	.128	[illegible]	.127	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.2562	.129	.2543	.128	.2526	.128	.2509	.128	.2492	.127	.2477	.127	.2460	.126	.2445	.126	.2428	.125	[illegible]	.125	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.2847	.128	.2828	.127	.2810	.126	.2792	.126	.2776	.126	.2760	.125	.2744	.125	.2728	.125	[illegible]	.125	[illegible]	.124	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3107	.125	.3090	.125	.3073	.125	.3056	.125	.3038	.124	.3023	.124	.3006	.123	.2991	.123	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3351	.124	.3332	.123	.3314	.123	.3298	.123	.3282	.123	.3265	.122	.3249	.121	3233	.121	[illegible]	.120	[illegible]	.120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3576	.121	.3558	.121	.3541	.121	.3524	.121	.3506	.120	.3491	.120	.3473	.119	.3458	.119	[illegible]	.119	.3428	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3788	.120	.3769	.120	.3753	.120	.3736	.120	.3720	.120	.3703	.119	.3687	.118	.3670	.118	[illegible]	.118	[illegible]	.118	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3986	.118	.3969	.118	.3952	.118	.3934	.117	.3918	.117	.3901	.116	.3885	.116	.3869	.116	3851	.116	[illegible]	.116	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4173	.117	.4155	.116	.4136	.115	.4120	.115	4103	.115	.4087	.115	.4071	.115	.4055	[illegible]	4038	.114	.4023	.113	4007	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4347	.114	.4330	.114	.4312	.114	.4296	.114	.4280	.114	.4263	.114	.4247	113	4231	.113	4211	.112	[illegible]	.112	[illegible]	.112	[illegible]	.112	[illegible]	[illegible]	[illegible]
.4515	.113	.4496	.113	.4479	.113	.4462	.113	4445	.112	.4428	.111	.4412	111	4396	.111	[illegible]	[illegible]	[illegible]	.111	[illegible]	[illegible]	[illegible]	.111	[illegible]	[illegible]	[illegible]
.4672	.111	.4654	.111	.4637	.111	.4619	.111	.4603	.111	.4586	.110	.4570	.109	4554	.109	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4823	.111	.4804	.110	.4787	.110	.4770	.110	.4752	.109	.4736	.109	.4720	.108	.4704	.108	4688	.107	[illegible]	.107	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4965	.109	.4947	.109	.4929	.108	.4912	.108	.4895	.108	.4878	.107	.4861	106	4846	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5100	.108	.5083	.108	.5065	.108	.5047	.107	.5031	.107	.5015	.106	[illegible]	.106	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5230	.105	.5211	.105	.5194	.105	.5177	.105	5160	.105	.5141	.104	.5128	.104	[illegible]	[illegible]	[illegible]	.104	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5354	.104	.5336	.103	.5319	.103	.5301	103	.5284	.103	.5267	.102	.5252	.102	5236	.102	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5473	.102	.5454	.102	.5437	.102	.5420	.102	5403	.101	.5387	.101	5371	101	.5354	.100	[illegible]	.100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5586	.101	.5568	.100	.5551	.100	.5534	.100	5517	.099	.5500	.099	.5481	[illegible]	.5468	.098	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5695	.100	.5677	.099	.5660	.099	5643	.099	.5626	.099	.5610	.099	.5593	099	.5577	.098	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5799	.097	.5781	.096	.5763	.096	.5746	.096	5730	.096	.5714	.096	.5697	096	5681	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5901	.096	.5883	.096	.5865	.096	.5848	.096	.5831	.096	.5815	.096	.5799	.096	.5783	.095	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5998	.095	.5980	.095	.5963	.095	.5945	.095	5928	.094	.5912	.094	.5896	.094	5880	.094	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6093	.094	.6075	.094	.6057	.094	.6040	.094	.6023	.093	.6007	.093	5990	.093	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6182	.092	.6164	.092	.6147	.092	.6130	.092	.6113	.092	.6097	.092	.6081	.092	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6270	.091	.6251	.091	.6234	.091	.6216	.091	6199	.090	.6183	.090	.6167	.090	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6354	.090	.6336	.089	.6317	.089	6300	.089	6281	.089	.6268	.089	6251	.089	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6436	.089	.6418	.088	.6400	.088	6383	.088	6366	.088	.6350	.088	.6334	.088	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6515	.087	.6496	.087	.6479	.087	6461	087	6444	.087	.6428	.086	6412	.086	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6591	.086	.6572	.086	.6555	.086	6538	.086	.6521	.086	.6505	.086	.6488	.086	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6663	.084	.6645	.084	.6628	.084	6611	.084	6593	.084	.6577	.084	.6561	.084	[illegible]	.084	[illegible]	.084	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6736	.084	.6718	.084	.6701	.084	6683	.084	6666	.084	6650	.084	.6634	.084	[illegible]	.084	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6805	.082	.6787	.082	.6770	.082	6752	.082	6736	.082	6719	.082	6703	082	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6872	.080	.6854	.080	.6836	.080	.6820	.080	6803	.080	6787	.080	.6771	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6938	.080	.6920	.080	.6903	.080	.6886	.080	.6869	.080	6853	080	6837	080	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7003	.078	.6984	.078	.6967	.078	.6950	.078	6933	.078	6916	.078	6900	078	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7063	.077	.7045	.077	.7028	.077	.7010	.077	6994	.077	6978	077	6962	077	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7124	.077	.7106	.077	.7088	.077	.7071	.077	7055	077	[illegible]	077	7023	077	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7183	.076	.7165	.076	.7147	.076	7131	.076	7114	.076	7098	076	7082	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

USE OF THE TABLES

The specific gravity of the dry slime, the specific gravity of the solution and the weight of 1000 c.c. of the pulp having been determined by the methods just described, the necessary data for the use of the first five tables are at hand. The specific gravity of the dry slime may be determined accurately once and need not be again determined unless there is a change in the character of the [illegible]

In most cases the specific gravity of the solution will [illegible] lished. It is necessary to determine the weight of 1000 c.c. of the pulp for each individual slime charge.

Table 1 gives the percentage by weight of the dry slime in pulps weighing from 1010 to 1500 grams per liter, and in which the specific gravity of the dry slime ranges from 2.50 to 3. The percentages given are those resulting when the specific gravity of the solution is taken as 1. In the column headed "correction" and adjoining each percentage, is given the amount to be deducted from the corresponding percentage for each increase of 0.001 in the specific gravity of the solution. This correction multiplied by the number of thousandths, expressed as a whole number, by which the specific gravity of the solution exceeds 1 and subtracted from the percentage given in the table, will give the corrected percentage.



CURVE IIB. WEIGHT OF ONE CUBIC FOOT OF WET PULP

This table is generally useful in all plants where wet pulps are handled. It might be mentioned that it would be particularly useful in connection with the control of classifiers. The following example will illustrate the method of using this table:

Given a slime pulp weighing 1200 grams per liter, the specific gravity of the dry slime being 2.60, and the specific gravity of the solution 1.005. At the intersection of the horizontal column headed 1200 (weight of one liter of the wet pulp) and the vertical column headed 2.60 (specific gravity of the dry slime) will be found 27.08, which is the percentage of dry slime in the pulp if the specific gravity of the solution is 1. In the adjoining column directly opposite this percentage is found 0.119, which is the amount to be deducted for each increase of 0.001 in the specific gravity of the solution. Multiplying this value by five produces 0.595; this subtracted from 27.08 gives 26.48, the corrected percentage.

Table 1a gives the logarithms of the percentages in Table 1. In this table the natural values for the correction are given. On account of the use of the correction involving subtraction, it is impossible to use logarithms in applying it. This table will, therefore, be chiefly useful to those who use logarithms in making their computations, but who do not desire to apply the correction for the specific gravity of the solution.

Table 2 gives the weight of one cubic foot of pulp for pulps weighing from 1010 to 1500 grams per liter. Neither the specific gravity of the dry slime nor of the solution need be considered in using this table. This table is chiefly useful in connection with calculating the foundations for tanks which are to contain pulp. Table 2a gives the logarithms of the values contained in Table 2. Curve 2b shows graphically some of the values of Table 3.

Table 3 gives the pounds of dry slime in one cubic foot of pulp for pulps weighing from 1010 to 1500 grams per

TABLE II WEIGHT IN POUNDS OF ONE CUBIC FOOT OF WET PULP
Formula: 62.42 a
Weight of One Liter of Wet Pulp

Wt. of One Liter of Wet Pulp	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190	1200	1210	1220	1230	1240	1250
Wt. of 1 Cu.Ft. of Wet Pulp	63.04	63.66	64.28	64.91	65.51	66.16	66.79	67.41	68.03	68.66	69.28	69.90	70.53	71.16	71.78	72.41	73.03	73.65	74.27	74.90	75.53	76.15	76.77	77.39	78.02

TABLE II WEIGHT IN POUNDS OF ONE CUBIC FOOT OF WET PULP—Continued

Wt. of One Liter of Wet Pulp	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500
Wt. of 1 Cu.Ft. of Wet Pulp	78.65	79.27	79.89	80.52	81.14	81.77	82.39	83.02	83.64	84.26	84.88	85.51	86.14	86.76	87.38	88.00	88.63	89.25	89.88	90.51	91.13	91.35	92.38	93.00	93.63

TABLE IIA. LOGARITHMS OF WEIGHT OF ONE CUBIC FOOT OF WET PULP
The Characteristic of All Logarithms in This Table is 1

Wt. of One Liter of Wet Pulp	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190	1200	1210	1220	1230	1240	1550
Logs. of Wt. of One Cu.Ft. Wet Pulp	7996	.8039	8081	8123	8165	8206	8247	8287	8327	8367	8406	8445	8484	8522	8560	8598	8635	8672	8708	8743	8781	8817	8852	8887	8922

TABLE IIA. LOGARITHMS OF WEIGHT OF ONE CUBIC FOOT OF WET PULP—Continued

Wt. of One Liter of Wet Pulp	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500
Logs. of Wt. of One Cu.Ft. Wet Pulp	.8957	8991	.9025	9059	9092	9126	9159	9192	9224	9256	9288	9320	9352	9383	9414	9445	9476	9506	9537	9567	9597	9626	9656	9685	9714

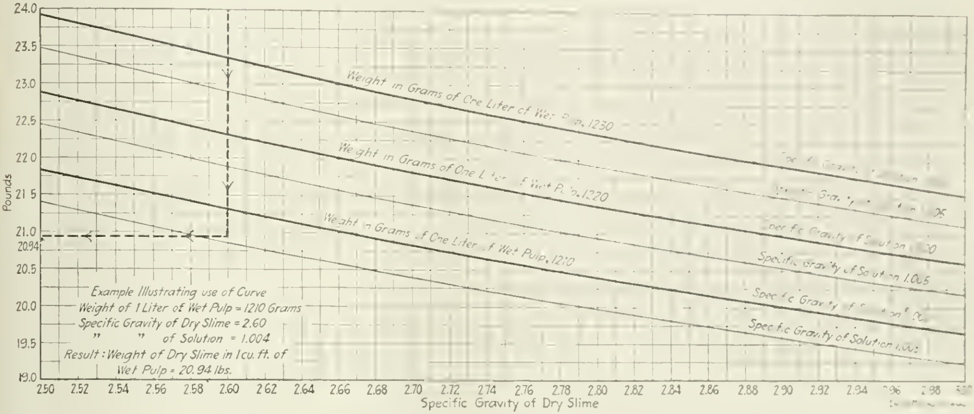
liter, and in which the specific gravity of the dry slime ranges from 2.50 to 3. The correction for the specific gravity of the solution is applied in the same manner as in Table 1.

Table 3a gives the logarithms of the values given in Table 3. Natural values are given for the corrections for the reason explained in connection with Table 1a.

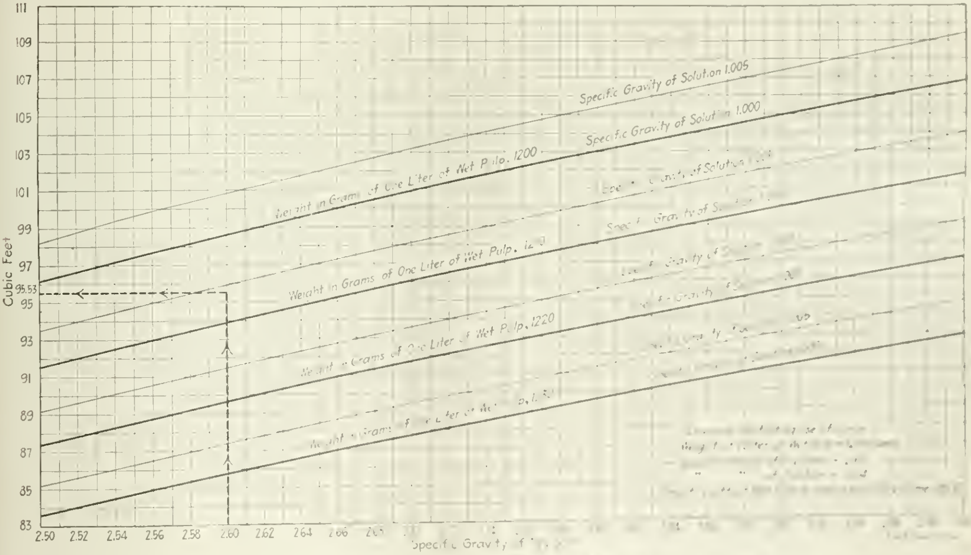
Table 4 gives the number of cubic feet of pulp to make one ton of dry slime for pulps weighing from 1010 to 1500 grams per liter, and for specific gravities of dry slime from 2.5 to 3. By reference to the formula from which the values in this table are derived, it will be seen that the correction for the specific gravity of the solution should be added to the values given in the table instead of being subtracted as in Tables 1 and 3.

Table 4a gives the logarithms of the values given in Table 1. Natural values are given for the corrections for the same reason as in Table 1.

Table 5 gives the dilution (ratio of solution to dry slime) for pulps weighing from 1010 to 1500 grams per liter, and for specific gravities of dry slime from 2.5 to 3. This table is useful in plants where a record is kept of the dilution of each charge.



Curve IIIb. Weights, in Pounds, of Dry Slime in One Cubic Foot of Wet Pulp



Curve IVb. Cubic Feet of Pulp to One Ton of Dry Slime

Table 6 gives the number of cubic feet per foot of depth of circular tanks from 10 to 100 ft. in diameter by steps of one-half inch. Each vertical column in the table is headed by a diameter, given in even feet, which increases by steps [illegible] the right of the table. Directly beneath each diameter are given the number of cubic feet of capacity [illegible]

TABLE III. POUNDS OF DRY SLIME IN ONE CUBIC FOOT OF WET PULP

Formula: $62.42\,a\,\frac{P}{100}$

Specific Gravity of Dry Slime

Weight in Grams of One Liter of Wet Pulp	2.50	Correction	2.52	Correction	2.54	Correction	2.56	Correction	2.58	Correction	2.60	Correction	2.62	Correction	2.64	Correction	2.66	Correction	2.68	Correction	2.70	Correction	2.72	Correction	2.74	Correction
1010	1.040		1.035		1.029		1.024		1.019		1.014		1.009		1.005		1.000		.9957		.9915		.9872		.9831	
1020	2.080	.1033	2.070	.1028	2.059	.1023	2.048	.1017	2.038	.1012	2.029	.1008	2.019	.1003	2.010	.0999	2.000	.0994	1.991	.0989	1.983	.0985	1.974	.0981	1.966	.0977
1030	3.120	.1026	3.104	.1021	3.088	.1016	3.072	.1011	3.057	.1006	3.043	.1001	3.028	.0996	3.014	.0992	3.000	.0988	2.987	.0984	2.974	.0979	2.961	.0975	2.949	.0971
1040	4.161	.1020	4.140	.1015	4.118	.1010	4.097	.1005	4.077	.1000	4.058	.0996	4.039	.0992	4.020	.0987	4.001	.0982	3.983	.0978	3.966	.0974	3.949	.0970	3.933	.0966
1050	5.201	.1012	5.175	.1007	5.148	.1003	5.122	.0998	5.097	.0994	5.072	.0989	5.048	.0984	5.025	.0980	5.002	.0976	4.979	.0972	4.957	.0968	4.936	.0964	4.916	.0960
1060	6.242	.1006	6.210	.1001	6.177	.0996	6.146	.0991	6.116	.0987	6.087	.0983	6.058	.0979	6.030	.0974	6.002	.0970	5.975	.0967	5.950	.0963	5.924	.0959	5.899	.0955
1070	7.281	.0998	7.244	.0994	7.207	.0990	7.170	.0985	7.134	.0980	7.100	.0975	7.066	.0971	7.034	.0968	7.002	.0964	6.971	.0961	6.941	.0957	6.911	.0953	6.882	.0948
1080	8.321	.0991	8.279	.0987	8.236	.0983	8.194	.0978	8.154	.0974	8.115	.0969	8.076	.0965	8.039	.0961	8.002	.0958	7.966	.0955	7.932	.0951	7.898	.0948	7.865	.0944
1090	9.360	.0983	9.312	.0979	9.265	.0975	9.217	.0970	9.171	.0966	9.128	.0962	9.085	.0959	9.043	.0955	9.001	.0951	8.960	.0947	8.923	.0944	8.884	.0940	8.847	.0936
1100	10.40	.098	10.35	.098	10.29	.097	10.24	.097	10.19	.096	10.14	.096	10.09	.095	10.05	.095	10.00	.095	9.957	.0944	9.915	.0941	9.873	.0938	9.831	.0934
1110	11.44	.097	11.38	.096	11.32	.096	11.27	.096	11.21	.095	11.16	.095	11.11	.094	11.05	.094	11.00	.094	10.95	.093	10.91	.093	10.86	.093	10.81	.092
1120	12.48	.096	12.42	.096	12.35	.095	12.29	.095	12.23	.095	12.17	.094	12.11	.094	12.06	.093	12.00	.093	11.95	.093	11.90	.093	11.85	.093	11.80	.092
1130	13.52	.095	13.45	.095	13.38	.095	13.31	.094	13.25	.094	13.19	.093	13.12	.093	13.06	.092	13.00	.092	12.94	.092	12.89	.092	12.83	.092	12.78	.091
1140	14.56	.095	14.49	.095	14.41	.094	14.34	.094	14.27	.094	14.20	.093	14.13	.093	14.07	.092	14.00	.092	13.94	.092	13.88	.091	13.82	.091	13.76	.091
1150	15.60	.094	15.52	.094	15.44	.094	15.36	.093	15.29	.093	15.22	.092	15.14	.092	15.07	.091	15.00	.091	14.93	.091	14.87	.091	14.81	.091	14.75	.090
1160	16.64	.093	16.56	.093	16.47	.093	16.39	.092	16.30	.092	16.22	.091	16.15	.091	16.08	.091	16.00	.091	15.93	.091	15.86	.090	15.79	.089	15.73	.089
1170	17.68	.093	17.59	.092	17.50	.092	17.41	.092	17.32	.091	17.24	.091	17.16	.091	17.08	.090	17.00	.090	16.92	.090	16.85	.090	16.78	.089	16.71	.089
1180	18.72	.092	18.63	.092	18.53	.092	18.44	.092	18.34	.091	18.25	.091	18.17	.091	18.09	.090	18.01	.090	17.93	.090	17.85	.090	17.77	.089	17.70	.089
1190	19.77	.092	19.67	.092	19.56	.091	19.46	.091	19.36	.090	19.27	.090	19.18	.090	19.09	.090	19.01	.090	18.92	.089	18.84	.089	18.76	.089	18.68	.089
1200	20.80	.090	20.70	.090	20.59	.090	20.48	.090	20.38	.089	20.29	.089	20.19	.089	20.10	.088	20.00	.088	19.91	.088	19.83	.088	19.74	.087	19.66	.087
1210	21.84	.090	21.73	.090	21.62	.090	21.51	.090	21.40	.089	21.30	.089	21.20	.089	21.10	.088	21.00	.088	20.91	.088	20.82	.087	20.73	.087	20.64	.087
1220	22.88	.089	22.77	.089	22.65	.089	22.53	.089	22.42	.088	22.32	.088	22.21	.088	22.11	.087	22.00	.087	21.90	.087	21.81	.087	21.72	.087	21.63	.087
1230	23.92	.089	23.80	.089	23.68	.089	23.56	.088	23.44	.088	23.33	.087	23.22	.087	23.11	.087	23.00	.086	22.90	.086	22.80	.086	22.70	.086	22.61	.086
1240	24.96	.088	24.84	.088	24.71	.088	24.58	.087	24.46	.087	24.34	.087	24.23	.087	24.12	.086	24.00	.086	23.89	.086	23.79	.086	23.69	.086	23.59	.085
1250	26.00	.087	25.87	.087	25.73	.087	25.60	.087	25.47	.086	25.35	.086	25.24	.086	25.12	.086	25.00	.085	24.89	.085	24.79	.085	24.68	.085	24.58	.085
1260	27.05	.087	26.91	.087	26.77	.087	26.63	.086	26.50	.086	26.38	.086	26.25	.086	26.13	.086	26.01	.085	25.89	.085	25.78	.085	25.67	.085	25.56	.084
1270	28.09	.086	27.94	.086	27.80	.086	27.66	.086	27.52	.085	27.39	.085	27.26	.085	27.13	.085	27.01	.085	26.89	.084	26.77	.084	26.66	.084	26.55	.084
1280	29.13	.085	28.98	.085	28.83	.085	28.68	.084	28.54	.084	28.41	.084	28.27	.084	28.14	.084	28.01	.084	27.88	.083	27.76	.083	27.64	.083	27.53	.083
1290	30.16	.084	30.01	.084	29.85	.084	29.70	.084	29.56	.083	29.42	.084	29.28	.083	29.15	.083	29.01	.083	28.88	.083	28.75	.083	28.63	.083	28.51	.082
1300	31.20	.084	31.04	.084	30.88	.084	30.72	.083	30.57	.083	30.43	.083	30.28	.082	30.14	.082	30.00	.082	29.87	.082	29.74	.082	29.61	.082	29.49	.082
1310	32.25	.083	32.08	.083	31.92	.083	31.76	.083	31.60	.083	31.45	.083	31.30	.082	31.15	.082	31.01	.082	30.87	.082	30.74	.082	30.61	.082	30.48	.082
1320	33.28	.082	33.11	.082	32.94	.082	32.77	.082	32.61	.082	32.46	.082	32.30	.081	32.15	.081	32.00	.081	31.86	.081	31.72	.081	31.59	.081	31.46	.080
1330	34.32	.082	34.15	.082	33.97	.082	33.80	.081	33.63	.082	33.47	.081	33.31	.081	33.16	.081	33.01	.081	32.86	.081	32.72	.081	32.58	.081	32.44	.080
1340	35.37	.082	35.19	.082	35.00	.082	34.82	.081	34.65	.081	34.49	.081	34.33	.081	34.17	.081	34.01	.081	33.86	.081	33.71	.080	33.57	.080	33.43	.080
1350	36.41	.081	36.22	.081	36.03	.081	35.85	.080	35.67	.080	35.50	.080	35.33	.080	35.17	.080	35.01	.080	34.86	.080	34.71	.080	34.56	.080	34.41	.079
1360	37.45	.080	37.26	.080	37.06	.080	36.87	.079	36.69	.079	36.52	.079	36.34	.079	36.17	.079	36.01	.079	35.85	.079	35.69	.079	35.54	.079	35.39	.078
1370	38.49	.079	38.29	.079	38.09	.079	37.90	.079	37.71	.079	37.53	.079	37.35	.079	37.18	.079	37.01	.079	36.85	.079	36.69	.079	36.53	.079	36.37	.078
1380	39.53	.079	39.33	.079	39.12	.079	38.92	.078	38.73	.078	38.55	.078	38.37	.078	38.19	.078	38.01	.078	37.84	.078	37.68	.078	37.52	.078	37.36	.078
1390	40.57	.078	40.36	.078	40.15	.078	39.95	.078	39.75	.078	39.56	.078	39.37	.077	39.19	.077	39.01	.077	38.84	.077	38.67	.077	38.50	.077	38.34	.077
1400	41.61	.077	41.40	.077	41.18	.077	40.97	.077	40.77	.077	40.58	.077	40.39	.077	40.20	.077	40.01	.077	39.83	.076	39.66	.076	39.49	.076	39.33	.076
1410	42.65	.076	42.43	.076	42.21	.076	42.00	.076	41.79	.076	41.59	.076	41.39	.076	41.20	.076	41.01	.076	40.83	.076	40.65	.076	40.48	.076	40.31	.076
1420	43.69	.076	43.46	.076	43.23	.076	43.01	.076	42.80	.076	42.60	.075	42.40	.075	42.20	.075	42.01	.075	41.82	.075	41.64	.075	41.46	.075	41.28	.075
1430	44.73	.076	44.50	.076	44.27	.076	44.05	.075	43.83	.075	43.62	.075	43.41	.075	43.21	.075	43.01	.075	42.82	.075	42.63	.075	42.45	.075	42.27	.074
1440	45.78	.075	45.54	.075	45.30	.075	45.07	.074	44.85	.074	44.63	.074	44.42	.074	44.22	.074	44.02	.074	43.82	.074	43.63	.074	43.44	.074	43.25	.073
1450	46.81	.074	46.57	.073	46.32	.073	46.09	.073	45.86	.073	45.64	.073	45.43	.073	45.22	.073	45.01	.073	44.81	.073	44.62	.073	44.43	.073	44.24	.073
1460	47.86	.073	47.61	.073	47.36	.073	47.12	.073	46.89	.073	46.66	.073	46.44	.073	46.22	.073	46.01	.073	45.81	.073	45.61	.073	45.41	.073	45.22	.073
1470	48.89	.072	48.64	.072	48.39	.072	48.14	.072	47.90	.072	47.67	.072	47.45	.072	47.23	.072	47.01	.072	46.80	.072	46.60	.072	46.40	.072	46.20	.071
1480	49.93	.071	49.67	.071	49.41	.071	49.16	.071	48.92	.071	48.68	.071	48.45	.071	48.23	.071	48.01	.071	47.79	.071	47.58	.071	47.38	.071	47.18	.071
1490	50.97	.071	50.71	.071	50.45	.071	50.19	.071	49.94	.071	49.70	.071	49.47	.071	49.24	.071	49.01	.071	48.79	.071	48.58	.071	48.37	.071	48.17	.071
1500	52.02	.071	51.75	.071	51.48	.071	51.22	.071	50.97	.071	50.72	.071	50.48	.071	50.25	.071	50.02	.071	49.79	.071	49.57	.071	49.36	.071	49.15	.071

TABLE IIIA. LOGARITHMS OF POUNDS OF DRY SLIME IN ONE CUBIC FOOT OF WET PULP

Specific Gravity of Dry Slime

Weight in Grams of One Liter of Wet Pulp	2.50	Correction	2.52	Correction	2.54	Correction	2.56	Correction	2.58	Correction	2.60	Correction	2.62	Correction	2.64	Correction	2.66	Correction	2.68	Correction	2.70	Correction	2.72	Correction	2.74	Correction
1010	.0170		.0149		.0124		.0103		.0081		.0060		.0039		.0022		.0000		.9981		.9963		.9944		.9926	
1020	.3181	.1033	.3160	.1028	.3137	.1023	.3113	.1017	.3092	.1012	.3073	.1008	.3051	.1003	.3032	.0999	.3010	.0994	.2991	.0989	.2973	.0985	.2953	.0981	.2936	.0977
1030	.4942	.1026	.4919	.1021	.4897	.1016	.4874	.1011	.4853	.1006	.4833	.1091	.4812	.0996	.4791	.0992	.4771	.0988	.4752	.0984	.4733	.0979	.4714	.0975	.4697	.0971
1040	.6192	.1020	.6170	.1015	.6147	.1010	.6125	.1005	.6103	.1000	.6083	.0996	.6063	.0992	.6042	.0987	.6022	.0982	.6002	.0978	.5984	.0974	.5965	.0970	.5947	.0966
1050	.7161	.1012	.7139	.1007	.7116	.1003	.7094	.0998	.7073	.0994	.7052	.0989	.7031	.0984	.7011	.0980	.6991	.0976	.6971	.0972	.6952	.0968	.6934	.0964	.6916	.0960
1060	.7953	.1006	.7931	.1001	.7908	.0996	.7886	.0991	.7865	.0967	.7844	.0983	.7823	.0979	.7803	.0974	.7783	.0970	.7763	.0967	.7745	.0963	.7726	.0959	.7708	.0955
1070	.8622	.0998	.8600	.0994	.8578	.0990	.8553	.0985	.8533	.0980	.8513	.0975	.8492	.0971	.8472	.0968	.8452	.0964	.8433	.0961	.8414	.0957	.8395	.0953	.8377	.0948
1080	.9202	.0991	.9180	.0987	.9157	.0983	.9135	.0978	.9114	.0974	.9093	.0969	.0972	.0965	.9052	.0961	.9032	.0958	.9012	.0955	.8994	.0951	.8975	.0948	.8957	.0944
1090	.9713	.0983	.9690	.0979	.9669	.0978	.9646	.0970	.9624	.0966	.9604	.0962	.9583	.0959	.9563	.0955	.9543	.0951	.9523	.0947	.9505	.0944	.9486	.0940	.9468	.0936
1100	.0170	.098	.0149	.098	.0124	.097	.0103	.097	.0081	.096	.0060	.096	.0039	.095	.0022	.095	.0000	.095	.9981	.0944	.9963	.0941	.9944	.0938	.9926	.0934
1110	.0584	.097	.0561	.096	.0539	.096	.0519	.096	.0496	.095	.0477	.095	.0457	.094	.0434	.094	.0414	.094	.0394	.093	.0378	.093	.0358	.093	.0338	.092
1120	.0962	.096	.0941	.096	.0917	.095	.0896	.095	.0874	.095	.0853	.094	.0831	.094	.0813	.093	.0792	.093	.0774	.093	.0755	.093	.0737	.093	.0719	.092
1130	.1310	.095	.1287	.095	.1265	.095	.1242	.094	.1222	.094	.1202	.093	.1179	.093	.1159	.092	.1139	.092	.1119	.092	.1103	.092	.1082	.092	.1065	.091
1140	.1632	.095	.1611	.095	.1587	.094	.1565	.094	.1544	.094	.1523	.093	.1504	.093	.1483	.092	.1461	.092	.1443	.092	.1424	.091	.1405	.091	.1386	.091
1150	.1931	.094	.1909	.094	.1886	.094	.1864	.093	.1844	.093	.1824	.092	.1801	.092	.1781	.091	.1761	.091	.1741	.091	.1723	.091	.1706	.091	.1688	.090
1160	.2212	.093	.2191	.093	.2167	.093	.2146	.092	.2122	.092	.2101	.091	.2082	.091	.2063	.091	.2041	.091	.2022	.091	.2003	.090	.1984	.089	.1967	.089
1170	.2475	.093	.2453	.092	.2430	.092	.2408	.092	.2386	.091	.2365	.091	.2345	.091	.2325	.090	.2304	.090	.2284	.089	.2266	.089	.2248	.089	.2230	.089
1180	.2723	.092	.2702	.092	.2679	.092	.2658	.092	.2634	.091	.2613	.091	.2594	.091	.2574	.091	.2555	.090	.2536	.090	.2516	.090	.2497	.089	.2480	.089
1190	.2960	.092	.2938	.092	.2914	.091	.2891	.091	.2869	.090	.2849	.090	.2829	.090	.2808	.090	.2790	.090	.2769	.089	.2751	.089	.2732	.089	.2774	.089
1200	.3181	.090	.3160	.090	.3137	.090	.3113	.090	.3092	.089	.3073	.089	.3051	.089	.3032	.088	.3010	.088	.2991	.088	.2973	.088	.2953	.087	.2936	.087
1210	.3393	.090	.3371	.090	.3349	.090	.3326	.090	.3304	.089	.3284	.089	.3263	.089	.3243	.088	.3222	.088	.3204	.088	.3185	.087	.3166	.087	.3147	.087
1220	.3595	.089	.3574	.089	.3551	.089	.3528	.089	.3506	.088	.3487	.088	.3465	.088	.3446	.087	.3424	.087	.3404	.087	.3387	.087	.3369	.087	.3351	.087
1230	.3788	.089	.3766	.089	.3744	.089	.3722	.088	.3700	.088	.3679	.087	.3659	.087	.3638	.087	.3617	.086	.3598	.086	.3579	.086	.3560	.086	.3543	.086
1240	.3972	.088	.3952	.088	.3929	.088	.3906	.087	.3885	.087	.3863	.087	.3845	.087	.3824	.086	.3802	.086	.3782	.086	.3764	.086	.3746	.086	.3727	.085
1250	.4150	.087	.4128	.087	.4104	.087	.4082	.086	.4060	.086	.4040	.086	.4021	.086	.4000	.085	.3979	.085	.3960	.085	.3943	.085	.3923	.085	.3906	.084
1260	.4322	.087	.4299	.087	.4276	.087	.4254	.087	.4232	.086	.4213	.086	.4191	.086	.4171	.086	.4151	.086	.4131	.085	.4113	.085	.4094	.085	.4076	.085
1270	.4486	.086	.4462	.086	.4440	.086	.4419	.086	.4396	.085	.4376	.085	.4355	.085	.4334	.085	.4315	.085	.4296	.084	.4276	.084	.4259	.084	.4241	.084
1280	.4643	.085	.4621	.085	.4598	.085	.4576	.084	.4555	.084	.4535	.084	.4513	.084	.4495	.084	.4473	.084	.4453	.083	.4434	.083	.4415	.083	.4398	.083
1290	.4794	.084	.4773	.084	.4749	.084	.4728	.083	.4707	.083	.4686	.083	.4666	.083	.4646	.083	.4625	.083	.4606	.083	.4586	.083	.4568	.083	.4550	.082
1300	.4942	.083	.4919	.083	.4897	.084	.4874	.083	.4853	.083	.4833	.083	.4812	.082	.4791	.082	.4771	.082	.4752	.082	.4733	.082	.4714	.082	.4697	.082
1310	.5085	.084	.5062	.084	.5041	.083	.5019	.084	.4997	.083	.4976	.084	.4955	.083	.4935	.083	.4915	.083	.4895	.082	.4877	.082	.4859	.082	.4840	.082
1320	.5222	.082	.5200	.082	.5177	.082	.5155	.081	.5134	.081	.5113	.081	.5092	.081	.5072	.081	.5051	.081	.5032	.081	.5013	.081	.4995	.081	.4978	.080
1330	.5355	.082	.5334	.082	.5311	.082	.5289	.082	.5267	.082	.5247	.082	.5226	.081	.5206	.081	.5186	.081	.5167	.081	.5148	.081	.5130	.081	.5111	.080
1340	.5486	.082	.5464	.082	.5441	.082	.5418	.081	.5397	.081	.5377	.081	.5357	.081	.5336	.081	.5316	.081	.5297	.081	.5278	.080	.5260	.080	.5241	.080
1350	.5612	.081	.5590	.081	.5567	.081	.5545	.080	.5523	.080	.5502	.080	.5481	.080	.5462	.080	.5442	.080	.5423	.080	.5404	.080	.5386	.080	.5367	.079
1360	.5734	.080	.5712	.080	.5689	.080	.5667	.079	.5645	.079	.5625	.079	.5604	.079	.5583	.079	.5564	.079	.5545	.079	.5525	.079	.5507	.079	.5489	.078
1370	.5853	.079	.5831	.079	.5808	.079	.5786	.079	.5765	.079	.5744	.079	.5723	.079	.5703	.079	.5683	.079	.5661	.079	.5645	.079	.5626	.079	.5607	.078
1380	.5969	.079	.5947	.079	.5924	.079	.5902	.078	.5880	.078	.5860	.078	.5840	.078	.5819	.078	.5799	.078	.5780	.078	.5761	.078	.5742	.078	.5724	.078
1390	.6082	.078	.6060	.078	.6037	.078	.6015	.078	.5993	.078	.5973	.078	.5952	.077	.5932	.077	.5912	.077	.5893	.077	.5874	.077	.5855	.077	.5837	.077
1400	.6192	.077	.6170	.077	.6147	.077	.6125	.077	.6103	.077	.6083	.077	.6063	.077	.6042	.077	.6022	.077	.6002	.076	.5984	.076	.5965	.076	.5947	.076
1410	.6299	.076	.6277	.076	.6254	.076	.6232	.076	.6211	.076	.6190	.076	.6169	.076	.6149	.076	.6129	.076	.6110	.076	.6091	.076	.6072	.076	.6054	.076
1420	.6404	.076	.6381	.076	.6358	.076	.6336	.075	.6314	.075	.6294	.075	.6274	.075	.6253	.075	.6231	.075	.6214	.075	.6195	.075	.6176	.075	.6157	.074
1430	.6506	.076	.6484	.076	.6461	.076	.6439	.076	.6418	.076	.6397	.076	.6376	.075	.6356	.075	.6336	.075	.6316	.075	.6297	.075	.6279	.075	.6260	.075
1440	.6607	.075	.6584	.075	.6561	.075	.6539	.074	.6518	.074	.6496	.074	.6476	.074	.6456	.074	.6436	.074	.6417	.074	.6398	.074	.6379	.071	.6360	.073
1450	.6703	.073	.6681	.073	.6658	.073	.6636	.073	.6614	.073	.6593	.073	.6573	.073	.6553	.073	.6533	.073	.6514	.073	.6495	.073	.6477	.073	.6458	.073
1460	.6800	.074	.6777	.073	.6754	.073	.6732	.073	.6711	.073	.6689	.073	.6663	.073	.6648	.073	.6628	.073	.6610	.073	.6591	.073	.6572	.073	.6553	.073
1470	.6892	.072	.6870	.072	.6848	.072	.6825	.072	.6803	.072	.6782	.072	.6762	.072	.6742	.072	.6722	.072	.6702	.072	.6684	.072	.6665	.072	.6646	.071
1480	.6984	.071	.6961	.071	.6938	.071	.6916	.071	.6895	.071	.6874	.071	.6853	.071	.6833	.071	.6813	.071	.6793	.071	.6774	.071	.6757	.071	.6738	.071
1490	.7073	.071	.7050	.071	.7029	.071	.7006	.071	.6984	.071	.6964	.071	.6943	.071	.6923	.071	.6903	.071	.6883	.071	.6865	.071	.6846	.071	.6828	.071
1500	.7162	.071	.7139	.071	.7116	.071	.7084	.071	.7073	.071	.7052	.071	.7031	.071	.7011	.071	.6991	.071	.6971	.071	.6952	.071	[illegible]	.071	.6916	.071

Note—The natural values are given for the corrections on account of the manner in which they are applied

of depth for a circular tank of this particular diameter. Reading downward in the table, capacities in cubic feet per foot of depth are given for each increase of ½ in. in diameter. Cubic feet of capacity for one foot of depth, multiplied by the depth of the pulp in the tank, will give the number of cubic feet of content.

MEASUREMENTS AND EXAMPLE OF USE OF TABLES

Sharwood[25] calls attention to the variations which may exist in the diameter of wooden tanks. Differences of 6

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[25] "Measurement of Pulp and Tailing," "Min. Mag.," Vol. 1, p. 228.

NOTE—The characteristics of the logarithms in the above table can be determined as was done in Table 1. They are all either 0 or 1. See footnote on p. 1084.

TABLE III. POUNDS OF DRY SLIME IN ONE CUBIC FOOT OF WET PULP—Continued

Formula: $62.42\,a\,\frac{P}{100}$

Specific Gravity of Dry Slime

2.76	Correction	2.78	Correction	2.80	Correction	2.82	Correction	2.84	Correction	2.86	Correction	2.88	Correction	2.90	Correction	2.92	Correction	2.94	Correction	2.96	Correction	2.98	Correction	3.00	Correction	Weight in Grams of One Liter of Wet Pulp
9789		.9748		9709		.9670		9633		9598		9561		.9526		9493		9458		.9425		9393		9363		1010
1.958	.0973	1.950	.0970	1.942	.0966	1.934	.0962	1.927	.0958	1.920	.0955	1.912	.0951	1.905	.0947	[illegible]	.0944	1.891	.0940	[illegible]	.0937	1.878	.0934	1.872	.0931	1020
2.936	.0967	2.924	.0963	2.913	.0960	2.901	.0957	2.890	.0953	2.879	.0949	2.868	.0946	2.858	.0943	2.848	.0959	2.837	.0936	2.827	.0933	2.818	.0930	2.809	.0927	1030
3.916	.0963	3.900	.0959	3.884	.0955	3.869	.0952	3.854	.0949	3.840	.0945	3.825	.0941	3.811	.0938	3.797	.0935	3.784	.0932	3.771	.0929	3.758	.0926	3.745	.0923	1040
4.895	.0956	4.874	.0952	4.854	.0948	4.835	.0945	4.817	.0942	4.799	.0939	4.781	.0935	4.763	.0932	4.746	.0929	4.729	.0926	4.713	.0923	4.697	.0920	4.682	.0918	1050
5.873	.0951	5.849	.0947	5.826	.0944	5.803	.0941	5.781	.0938	5.759	.0934	5.737	.0931	5.716	.0928	5.696	.0925	5.676	.0922	5.656	.0919	5.637	.0916	5.618	.0914	1060
6.852	.0944	6.823	.0940	6.796	.0937	6.769	.0934	6.744	.0931	6.719	.0928	6.693	.0925	6.668	.0922	6.644	.0919	6.621	.0916	6.598	.0913	6.575	.0910	6.554	.0908	1070
7.831	.0940	7.798	.0936	7.767	.0933	7.736	.0930	7.707	.0927	7.678	.0923	7.649	.0920	7.621	.0918	7.594	.0915	7.567	.0913	7.541	.0910	7.515	.0907	7.490	.0904	1080
8.808	.0932	8.772	.0929	8.738	.0927	8.702	.0924	8.669	.0921	8.637	.0917	8.604	.0914	8.572	.0911	8.542	.0909	8.512	.0906	8.482	.0903	8.453	.0901	8.428	.0899	1090
9.789	.0930	9.748	.0926	9.709	.0923	9.670	.0920	9.633	.0917	9.597	.0913	9.561	.0910	9.526	.0908	9.492	.0905	9.458	.0903	9.425	.0900	9.393	.0898	9.363	.0896	1100
10.77	.092	10.72	.092	10.68	.092	10.64	.092	10.60	.091	10.56	.091	10.52	.091	10.48	.090	10.44	.090	10.40	.089	10.37	.089	10.33	.089	10.30	[illegible]	1110
11.75	.092	11.70	.091	11.65	.091	11.60	.091	11.56	.091	11.52	.091	11.47	.090	11.43	.090	11.39	.090	11.35	.089	11.31	.089	11.27	.089	11.24	.089	1120
12.72	.091	12.67	.091	12.62	.090	12.57	.090	12.52	.090	12.48	.090	12.43	.089	12.38	.089	12.34	.089	12.29	.088	12.25	.088	12.21	.088	12.17	.088	1130
13.70	.090	13.65	.090	13.59	.090	13.54	.090	13.49	.090	13.44	.090	13.39	.089	13.34	.089	13.29	.089	13.24	.088	13.20	.088	13.15	.088	13.11	.088	1140
14.68	.090	14.62	.090	14.56	.089	14.50	.089	14.45	.089	14.40	.089	14.34	.088	14.29	.088	14.24	.088	14.19	.088	14.14	.087	[illegible]	.087	14.04	.087	1150
15.66	.089	15.60	.088	15.53	.088	15.47	.088	15.41	.088	15.36	.088	15.30	.088	15.24	.088	15.19	.087	15.13	.087	15.08	.087	15.03	.087	14.98	.087	1160
16.64	.089	16.57	.088	16.50	.088	16.44	.088	16.38	.088	16.31	.087	16.25	.087	16.19	.087	16.14	.087	16.08	.087	16.02	.086	15.97	.086	15.91	.086	1170
17.62	.089	17.55	.088	17.48	.088	17.41	.088	17.34	.088	17.28	.087	17.21	.087	17.15	.087	17.09	.087	17.03	.087	16.97	.086	16.91	.086	16.85	.086	1180
18.60	.088	18.52	.088	18.45	.088	18.38	.088	18.31	.088	18.24	.087	18.17	.087	18.10	.086	18.04	.086	17.97	.086	17.91	.086	17.85	.086	17.79	[illegible]	1190
19.58	.087	19.50	.087	19.42	.087	19.34	.087	19.27	.087	19.20	.086	19.12	.086	19.05	.085	18.98	.085	18.91	.085	18.85	.084	18.78	.084	18.72	.084	1200
20.55	.086	20.47	.086	20.39	.086	20.31	.086	20.23	.086	20.16	.086	20.08	.085	20.00	.085	19.93	.085	19.86	.085	19.79	.084	19.72	.084	19.66	[illegible]	1210
21.53	.086	21.44	.086	21.36	.086	21.27	.086	21.19	.086	21.12	.086	21.04	.085	20.96	.085	20.88	.085	20.81	.085	20.73	.084	20.66	.084	20.60	.084	1220
22.51	.085	22.42	.085	22.33	.085	22.24	.085	22.16	.085	22.08	.085	21.99	.084	21.91	.084	21.83	.084	21.75	.084	21.68	.083	21.60	.083	21.53	[illegible]	1230
23.49	.085	23.39	.085	23.30	.085	23.21	.085	23.12	.085	23.04	.085	22.95	.084	22.86	.084	22.78	.084	22.70	.084	22.62	.083	22.54	.083	22.47	[illegible]	1240
24.47	.084	24.37	.084	24.27	.084	24.17	.084	24.08	.084	23.99	.084	23.90	.083	23.81	.083	23.73	.083	23.64	.083	23.56	.082	23.48	.082	23.40	[illegible]	1250
25.45	.084	25.35	.084	25.25	.084	25.15	.084	25.05	.084	24.96	.084	24.86	.083	24.77	.083	24.68	.083	24.60	.083	24.51	.082	24.42	.082	24.34	[illegible]	1260
26.43	.084	26.32	.083	26.22	.083	26.11	.083	26.01	.083	25.92	.083	25.82	.083	25.72	.082	25.63	.082	25.54	.082	25.45	.082	25.36	.082	25.28	[illegible]	1270
27.41	.083	27.30	.083	27.19	.083	27.08	.083	26.98	.083	26.88	.082	26.77	.082	26.67	.082	26.58	.081	26.49	.081	26.39	.081	26.30	.081	26.22	[illegible]	1280
28.39	.082	28.27	.082	28.16	.082	28.05	.082	27.94	.082	27.84	.082	27.73	.082	27.63	.082	27.53	.081	27.43	.081	27.33	.081	27.24	.080	27.15	.080	1290
29.36	.082	29.24	.082	29.13	.082	29.01	.082	28.90	.082	28.79	.081	28.68	.081	28.58	.081	28.48	.080	28.37	.080	28.27	.080	28.18	.080	28.09	[illegible]	1300
30.35	.082	30.22	.082	30.10	.081	29.98	.081	29.87	.081	29.76	.081	29.64	.081	29.53	.081	29.43	.080	29.32	.080	29.22	.080	29.12	.080	29.03	[illegible]	1310
31.32	.080	31.19	.080	31.07	.080	30.94	.080	30.82	.080	30.71	.080	30.59	.080	30.48	.080	30.37	.079	30.26	.079	30.16	.079	30.06	.079	29.96	[illegible]	1320
32.30	.080	32.17	.080	32.04	.080	31.91	.080	31.79	.080	31.67	.080	31.55	.080	31.43	.080	31.32	.079	31.21	.079	31.10	.079	31.00	.079	30.90	[illegible]	1330
33.28	.080	33.14	.080	33.01	.079	32.88	.079	32.76	.079	32.63	.079	32.51	.079	32.39	.079	32.28	.079	32.16	.079	32.05	.079	31.94	.079	31.83	[illegible]	1340
34.26	.079	34.12	.079	33.99	.079	33.85	.079	33.72	.079	33.60	.079	33.47	.079	33.35	.079	33.23	.078	33.11	.078	32.99	.078	32.88	.078	32.77	[illegible]	1350
35.24	.078	35.09	.078	34.95	.078	34.81	.078	34.68	.078	34.55	.077	34.42	.077	34.29	.077	34.17	.077	34.05	.077	33.93	.077	33.81	.077	33.70	.077	1360
36.22	.078	36.07	.078	35.92	.077	35.78	.077	35.64	.077	35.51	.077	35.38	.077	35.25	.077	35.12	.077	34.99	.077	34.87	.077	34.75	.076	34.64	[illegible]	1370
37.20	.078	37.05	.078	36.90	.077	36.75	.077	36.61	.077	36.47	.077	36.33	.077	36.20	.077	36.07	.077	35.94	.077	35.82	.077	35.70	.076	35.58	.076	1380
38.18	.077	38.02	.077	37.87	.077	37.72	.077	37.58	.077	37.44	.077	37.29	.077	37.15	.077	37.02	.076	36.89	.076	36.76	.076	36.64	.076	36.52	.076	1390
39.16	.076	39.00	.076	38.84	.076	38.69	.076	38.54	.076	38.40	.076	38.25	.076	38.11	.076	37.97	.075	37.84	.075	37.71	.075	37.58	.075	37.45	.075	1400
40.14	.076	39.97	.076	39.81	.075	39.65	.075	39.50	.075	39.35	.075	39.20	.075	39.06	.075	38.92	.075	38.78	.075	38.65	.075	38.52	.075	38.39	.075	1410
41.11	.075	40.94	.075	40.78	.074	40.62	.074	40.46	.074	40.30	.075	40.15	.075	40.00	.075	39.86	.074	39.72	.074	39.58	.074	39.45	.074	39.32	.074	1420
42.09	.075	41.92	.075	41.75	.074	41.58	.074	41.43	.074	41.28	.075	41.12	.075	40.97	.075	40.82	.074	40.67	.074	40.53	.074	40.39	.074	40.26	.074	1430
43.07	.073	42.89	.073	42.72	.073	42.55	.073	42.39	.073	42.23	.073	42.07	.073	41.92	.073	41.77	.073	41.62	.073	41.47	.073	41.33	.073	[illegible]	[illegible]	1440
44.05	.073	43.87	.073	43.69	.073	43.52	.073	43.35	.073	43.19	.073	43.03	.072	42.87	.072	42.71	.072	42.56	.072	42.41	.072	42.37	.072	42.13	[illegible]	1450
45.03	.073	44.84	.073	44.66	.073	44.49	.073	44.32	.073	44.15	.073	43.99	.072	43.83	.072	43.67	.072	43.51	.072	43.36	.072	43.21	.072	43.07	[illegible]	1460
46.00	.071	45.81	.071	45.63	.071	45.45	.071	45.28	.071	45.11	.071	44.94	.071	44.78	.071	44.62	.071	44.46	.071	44.30	.071	44.15	.071	44.00	[illegible]	1470
46.98	.071	46.79	.071	46.60	.071	46.42	.071	46.24	.071	46.06	.071	45.89	.071	45.72	.071	45.56	.071	45.40	.071	45.24	.071	45.08	.071	44.93	[illegible]	1480
47.96	.071	47.76	.071	47.57	.071	47.39	.071	47.21	.071	47.03	.071	46.85	.071	46.68	.071	46.51	.071	46.35	.071	46.19	.071	46.03	.071	45.88	[illegible]	1490
48.95	.071	48.74	.071	48.54	.071	48.35	.071	48.17	.071	47.99	.071	47.81	.071	47.63	.071	47.46	.071	47.29	.071	47.13	.071	46.97	.071	46.81	[illegible]	1500

TABLE III-A. LOGARITHMS OF POUNDS OF DRY SLIME IN ONE CUBIC FOOT OF WET PULP—Continued

Specific Gravity of Dry Slime

2.76	Correction	2.78	Correction	2.80	Correction	2.82	Correction	2.84	Correction	2.86	Correction	2.88	Correction	2.90	Correction	2.92	Correction	2.94	Correction	2.96	Correction	2.98	Correction	3.00	Correction	Weight in Grams of One Liter of Wet Pulp
.9907		.9889		.9872		.9854		.9838		9822		.9805		9789		9774		.9758		9743		9728		9714		1010
.2918	.0973	.2900	.0970	.2882	.0966	.2865	.0962	.2849	.0958	2833	.0955	.2815	.0951	2799	.0947	2783	.0944	.2767	.0940	2753	.0937	2737	.0934	2723	[illegible]	1020
.4678	.0967	.4660	.0963	.4643	.0960	.4625	.0957	.4609	.0953	.4592	.0949	.4576	.0946	.4561	.0943	4545	.0939	.4529	.0936	4513	.0933	[illegible]	[illegible]	4486	[illegible]	[illegible]
.5928	.0963	.5911	.0959	.5893	.0955	.5876	.0952	.5859	.0949	.5813	.0945	.5826	.0941	3810	.0938	5794	.0935	.5780	.0932	5765	.0929	5750	[illegible]	[illegible]	[illegible]	[illegible]
.6898	.6956	.6879	.0952	.6861	.0948	.6844	.0945	.6828	.0942	.6812	.0939	.6795	.0935	6779	.0932	6763	.0929	.6748	.0926	6733	.0923	6718	[illegible]	6704	[illegible]	[illegible]
.7689	.0951	.7671	.0947	.7654	.0944	.7637	.0941	.7620	.0938	.7604	.0934	.7587	.0931	7671	.0928	7556	.0925	.7540	[illegible]	7525	[illegible]	7510	[illegible]	[illegible]	.0914	[illegible]
.8354	.0944	.8340	.0940	.8323	.0937	.8305	.0934	.8289	.0931	.8273	.0928	.8256	.0925	8240	.0922	8224	.0919	.8209	.0916	.8191	[illegible]	8173	.0910	[illegible]	[illegible]	[illegible]
.8938	.0940	.8920	.0936	.8903	.0933	.8885	.0930	.8869	.0927	.8852	.0923	.8836	.0920	.8820	.0918	.8805	.0915	.8789	[illegible]	8774	.0910	[illegible]	[illegible]	8745	[illegible]	[illegible]
.9449	.0932	.9431	.0929	.9414	.0927	.9396	.0924	.9380	.0921	.9364	.0917	.9347	.0914	.9031	.0911	.9316	.0909	.9300	.0906	9285	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.9907	.0930	.9889	.0926	.9872	.0923	.9854	.0920	.9838	.0917	.9821	.0913	.9805	.0910	.9789	.0908	9774	.0905	.9758	[illegible]	9743	[illegible]	9728	[illegible]	[illegible]	[illegible]	[illegible]
.0322	.092	.0302	.092	.0286	.092	.0269	.092	.0253	.091	.0237	.091	.0220	.091	0204	.090	.0187	.089	.0170	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.0700	.092	.0682	.091	.0663	.091	.0645	.092	.0630	.091	.0614	.091	.0596	.090	0580	.090	0565	.090	.0545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1045	.091	.1028	.091	.1017	.090	.0993	.090	.0976	.090	.0962	.090	.0945	.089	.0927	.089	.0913	[illegible]	.0896	.088	0881	.088	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1367	.090	.1351	.090	.1332	.090	.1316	.090	.1300	.090	.1281	.090	.1268	.090	.1252	.089	.1235	.089	.1219	.088	1206	.088	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1667	.090	.1649	.090	.1632	.089	.1614	.089	.1599	.089	.1524	.089	.1566	.088	.1550	.088	.1535	.088	.1520	.088	1504	.087	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1948	.089	.1931	.088	.1912	.088	.1895	.088	.1878	.088	.1864	.088	.1847	.088	.1830	.088	1816	.087	.1798	.087	[illegible]	[illegible]	1770	[illegible]	[illegible]	[illegible]	[illegible]
.2212	.089	.2193	.088	.2175	.088	.2159	.088	.2143	.088	.2125	.087	.2109	.087	.2092	.087	.2079	.087	.2063	.087	2047	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.2460	.089	.2443	.088	.2425	.088	.2408	.088	.2391	.088	.2375	.088	.2358	.087	.2343	.087	2327	[illegible]	.2312	.087	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.2695	.088	.2676	.088	.2660	.088	.2643	.088	.2627	.088	.2610	.087	.2594	.087	2577	.086	2562	.086	.2545	[illegible]	[illegible]	.086	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.2918	.087	.2908	.087	.2882	.087	.2865	.087	.2849	.087	.2833	.086	.2815	.086	2799	.085	2783	.085	.2767	[illegible]	2753	.084	[illegible]	.084	[illegible]	.084	[illegible]
.3128	.086	.3111	.086	.3094	.086	.3077	.086	.3060	.086	.3045	.086	.3028	.085	3010	.085	2995	[illegible]	[illegible]	[illegible]	[illegible]	.084	[illegible]	.084	[illegible]	.084	[illegible]
.3330	.086	.3312	.086	.3296	.086	.3278	.086	.3261	.086	.3247	.086	.3239	.085	.3234	.085	3197	.085	[illegible]	[illegible]	3166	.084	[illegible]	.084	[illegible]	.084	[illegible]
.3924	.085	.3506	.085	.3489	.085	.3478	.085	.3456	.085	.3440	.085	.3422	.084	.3416	.084	3391	.084	[illegible]	.084	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3709	.085	.3693	.085	.3574	.085	.3657	.085	.3640	[illegible]	.3625	.085	.3608	.084	.3591	.084	3576	.084	[illegible]	.084	3545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3886	.084	.3869	.084	.3851	.084	.3833	.084	.3817	.084	.3800	.083	.3784	.083	.3780	.083	3753	.083	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4057	.085	.4040	.085	.4023	.084	.4005	.084	.3988	.084	.3972	.084	.3955	.083	.3959	.083	[illegible]	.083	.3909	[illegible]	[illegible]	.082	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4221	.084	.4203	.083	.4186	.083	.4168	.083	.4151	.083	.4136	.083	.4120	.083	.4108	.082	4087	.082	[illegible]	[illegible]	4057	.082	[illegible]	.082	[illegible]	[illegible]	[illegible]
.4379	.083	.4362	.083	.4344	.083	.4326	.083	.4310	[illegible]	.4294	.082	.4276	.082	.4280	.082	[illegible]	.081	4231	.081	4214	[illegible]	[illegible]	.081	[illegible]	[illegible]	[illegible]
.4532	.082	.4513	.082	.4496	.082	.4479	.082	.4462	.082	.4447	.082	.4429	.082	.4414	.082	[illegible]	.081	[illegible]	.081	[illegible]	[illegible]	[illegible]	.080	[illegible]	[illegible]	[illegible]
.4678	.082	.4660	.082	.4643	.082	.4625	.082	.4609	.082	.4592	.081	.4576	.081	.4581	.081	4545	.080	4529	[illegible]	[illegible]	.080	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4822	.082	.4803	.082	.4786	.081	.4768	.081	.4752	.081	.4736	.081	.4719	.081	.4708	.081	4688	.080	4672	[illegible]	[illegible]	.080	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4958	.080	.4940	.080	.4923	.080	.4905	.080	.4888	.080	.4873	.079	.4856	.079	.4860	.079	[illegible]	.079	[illegible]	[illegible]	4794	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5092	.080	.5075	.080	.5057	.080	.5039	.080	.5023	.080	.5006	.080	.4990	.080	4983	.080	[illegible]	.079	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6222	.080	.5204	.080	.5186	.079	.5169	.079	.5153	.079	5136	.079	.5120	.079	.5104	.079	[illegible]	.079	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5348	.079	.5330	.079	.5313	.079	.5296	.079	.5279	.079	.5263	.079	.5247	.079	5231	.079	5215	.078	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5470	.078	.5452	.078	.5434	.078	.5417	.078	.5401	.078	.5384	.077	5368	.077	5352	.077	[illegible]	.077	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5589	.078	.5571	.078	.5553	.077	.5536	.077	.5519	.077	5504	.077	.5188	.077	5472	.077	[illegible]	.076	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5705	.078	.5688	.078	.5670	.078	.5653	.078	.5636	.078	5619	.077	5603	.077	5580	.077	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5818	.077	.5800	.077	.5783	.077	.5766	.077	.5750	.077	5733	.077	5716	.077	.5706	.077	[illegible]	.076	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5928	.076	.5911	.076	.5893	.076	.5876	.076	.5859	.076	5843	.076	5826	.076	.5811	.076	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6036	.076	.6017	.076	.6000	.075	.5982	.075	.5966	.075	5949	.075	5933	.075	5912	.075	[illegible]	.074	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6139	.074	.6121	.074	.6104	.074	.6087	.074	.6070	.074	.6053	.074	6037	.074	6028	.074	[illegible]	.074	[illegible]	.074	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6242	.075	.6224	.075	.6207	.075	.6189	.075	.6173	.075	.6157	.075	6140	[illegible]	6123	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6342	.073	.6324	.073	.6306	.073	.6289	.073	.6273	.073	.6256	.073	6240	.073	6221	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6439	.073	.6422	.073	.6404	.073	.6387	.073	.6370	.073	.6354	.073	6338	.072	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6535	.073	.6517	.073	.6499	.073	.6483	.073	.6466	.073	6449	.073	6434	[illegible]	6418	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6628	.071	.6610	.071	.6592	.071	.6575	.071	.6559	.071	6543	.071	6526	.071	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6719	.071	.6702	.071	.6684	.071	.6667	.071	.6650	.071	6633	.071	6617	.071	[illegible]	.071	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6809	.071	.6791	.071	.6773	.071	.6757	.071	.6740	.071	6724	.071	6707	.071	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6898	.071	.6879	.071	.6861	.071	.6844	.071	6828	.071	6812	.071	6795	.071	[illegible]	[illegible]	[illegible]	.071	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

in. or over may be found in tanks over 25 ft. in diameter, due to imperfect construction, unequal settling or unequal shrinkage of the staves. In order that an accurate diameter be obtained, it is necessary to make a number of measurements at different depths and preferably at equal angles and take the average of the results thus obtained as being the true diameter. The diameters of steel tanks are also subject to variation due to poor construction and unequal settling, therefore the [illegible] [illegible] is observed as in the case of [illegible] [illegible]. The measurement of [illegible] [illegible] [illegible]

TABLE IV. NUMBER OF CUBIC FEET OF WET PULP TO MAKE ONE TON OF DRY SLIME

Formula: $\frac{2000}{64.42\,a\,\frac{P}{100}}$

Specific Gravity of Dry Slime

Weight in Grams of One Liter of Wet Pulp

	2.50	Correction	2.52	Correction	2.54	Correction	2.56	Correction	2.58	Correction	2.60	Correction	2.62	Correction	2.64	Correction	2.66	Correction	2.68	Correction	2.70	Correction	2.72	Correction	2.74	Correction
1010	1923		1933		1943		1953		1963		1972		1981		1990		1999		2008		2017		2026		2034	
1020	961.4	94.9	966.3	95.4	971.4	95.9	976.4	96.4	981.2	96.9	985.8	97.3	990.6	97.8	995.2	98.3	999.8	98.8	1004	99.3	1009	99.7	1013	100.1	1017	100.5
1030	640.9	31.41	644.2	31.59	647.6	31.76	650.9	31.93	654.1	32.09	657.2	32.26	660.3	32.42	663.4	32.58	666.5	32.73	669.5	32.89	672.4	33.10	675.3	33.2	678.2	33.30
1040	[illegible]	15.60	483.1	15.69	485.6	15.78	488.1	15.87	490.5	15.95	492.9	16.03	495.2	16.11	497.5	16.19	499.8	16.27	502.1	16.35	504.3	16.43	506.4	16.50	508.5	16.58
1050	[illegible]	9.29	386.5	9.35	388.5	9.40	390.5	9.45	392.4	9.50	394.3	9.55	396.2	9.60	398.0	9.65	399.9	9.69	401.7	9.74	403.4	9.79	405.1	9.84	406.8	9.88
1060	[illegible]	6.15	322.0	6.19	323.7	6.23	325.4	6.26	327.0	6.29	328.5	6.33	330.1	6.36	331.7	6.40	333.2	6.43	334.7	6.46	336.1	6.49	337.6	6.52	339.0	6.55
1070	[illegible]	4.36	276.1	4.39	277.5	4.42	278.9	4.44	280.3	4.46	281.7	4.48	283.0	4.51	284.3	4.53	285.6	4.56	286.9	4.58	288.1	4.60	289.4	4.62	290.6	4.64
1080	[illegible]	3.25	241.5	3.28	242.8	3.30	244.1	3.32	245.3	3.33	246.4	3.35	247.6	3.37	248.8	3.39	249.9	3.40	251.0	3.42	252.1	3.44	253.2	3.45	254.3	3.47
1090	[illegible]	2.51	214.7	2.53	215.9	2.54	217.0	2.55	218.1	2.56	219.1	2.58	220.1	2.60	221.2	2.61	222.2	2.62	223.2	2.64	224.1	2.66	225.1	2.67	226.0	2.68
1100	192.3	1.99	193.3	2.00	194.3	2.02	195.3	2.03	196.2	2.05	197.2	2.06	198.1	2.07	199.0	2.08	199.9	2.10	200.8	2.11	201.7	2.11	202.6	2.12	203.4	2.13
1110	174.8	1.62	175.7	1.63	176.6	1.64	177.5	1.65	178.4	1.66	179.2	1.67	180.1	1.68	180.9	1.69	181.8	1.70	182.6	1.71	183.4	1.71	184.2	1.72	184.9	1.73
1120	160.2	1.34	161.0	1.35	161.9	1.36	162.7	1.37	163.5	1.38	164.3	1.38	165.1	1.39	165.8	1.40	166.6	1.41	167.4	1.41	168.1	1.42	168.8	1.43	169.5	1.43
1130	147.9	1.12	148.7	1.13	149.4	1.14	150.2	1.14	151.0	1.15	151.7	1.16	152.4	1.17	153.1	1.17	153.8	1.18	154.5	1.19	155.2	1.19	155.8	1.20	156.5	1.20
1140	137.3	.96	138.0	.96	138.8	.97	139.5	.97	140.2	.98	140.8	.99	141.5	1.00	142.2	1.00	142.8	1.01	143.5	1.01	144.1	1.02	144.7	1.03	145.3	1.03
1150	128.2	.82	128.8	.83	129.5	.84	130.2	.84	130.8	.85	131.4	.85	132.1	.85	132.7	.86	133.3	.87	133.9	.87	134.5	.88	135.0	.89	135.6	.89
1160	120.2	.71	120.8	.72	121.4	.73	122.0	.73	122.6	.74	123.2	.74	123.8	.75	124.4	.75	125.0	.75	125.5	.76	126.1	.76	126.6	.77	127.1	.77
1170	113.1	.63	113.7	.63	114.3	.63	114.9	.63	115.5	.64	116.0	.64	116.5	.65	117.1	.65	117.6	.66	118.2	.66	118.7	.66	119.2	.67	119.7	.67
1180	106.8	.56	107.4	.56	107.9	.57	108.5	.57	109.0	.57	109.5	.57	110.1	.57	110.6	.57	111.1	.58	111.6	.59	112.0	.59	112.5	.60	113.0	.60
1190	101.2	.49	101.7	.49	102.2	.50	102.8	.50	103.3	.50	103.8	.50	104.3	.51	104.7	.51	105.2	.52	105.7	.52	106.1	.52	106.6	.53	107.1	.53
1200	96.14	.44	96.63	.44	97.14	.45	97.64	.45	98.12	.45	98.58	.45	99.06	.45	99.52	46	99.98	.46	100.4	.47	100.9	.47	101.3	.47	101.7	.47
1210	91.56	.394	92.03	.398	92.51	.401	92.98	.404	93.44	.406	93.89	.409	94.34	411	94.78	.414	95.21	.417	95.64	.420	96.06	.420	96.47	.42	96.88	.42
1220	87.39	.356	87.85	.359	88.31	.361	88.76	.363	89.20	.365	89.63	.368	90.05	371	90.47	.374	90.89	.376	91.30	.378	91.70	.381	92.09	.383	92.48	.385
1230	83.59	.323	84.03	.325	84.47	.327	84.90	.329	85.32	.331	85.73	.333	86.14	336	86.54	.338	86.94	340	87.33	.343	87.71	.345	88.09	.347	88.46	.349
1240	80.11	.293	80.53	.296	80.95	.298	81.36	.300	81.76	.302	82.16	.304	82.55	306	82.93	.308	83.31	.311	83.69	.313	84.05	.31	84.41	.317	84.77	.318
1250	76.91	.266	77.31	.269	77.71	.272	78.11	.274	78.50	.275	78.88	.277	79.25	279	79.62	.281	79.99	.283	80.35	.285	80.70	.287	81.04	.289	81.38	.290
1260	73.94	.246	74.32	.248	74.71	.250	75.09	.252	75.47	.253	75.83	.255	76.19	257	76.54	.259	76.90	.261	77.24	.263	77.58	.264	77.91	.266	78.24	.267
1270	71.20	.225	71.57	.227	71.94	.229	72.31	.231	72.67	.232	73.02	.234	73.37	235	73.71	.237	74.05	.239	74.38	.241	74.70	.242	75.02	.244	75.34	.245
1280	68.66	.207	69.01	.209	69.37	.211	69.73	.212	70.08	.214	70.41	.216	70.74	.217	71.07	.219	71.40	.221	71.72	.222	72.03	.223	72.34	.225	72.64	.226
1290	66.30	.190	66.64	.192	66.99	.194	67.33	.195	67.67	.197	67.99	.198	68.31	200	68.63	.202	68.95	.203	69.26	.204	69.55	.206	69.85	.207	70.15	.208
1300	64.09	.177	64.42	.179	64.76	.180	65.09	.181	65.41	.183	65.72	.184	66.03	.186	66.34	.188	66.65	.189	66.95	.190	67.24	.191	67.53	.192	67.81	.193
1310	62.02	.165	62.33	.167	62.66	.168	62.98	.169	63.30	.171	63.60	.172	63.90	.173	64.19	.175	64.49	.177	64.78	.178	65.06	.179	65.34	.180	65.62	.181
1320	60.09	.151	60.40	.153	60.71	.154	61.02	.155	61.33	.157	61.63	.158	61.92	.159	62.20	.161	62.49	.162	62.77	.163	63.04	.164	63.31	.165	63.58	.166
1330	58.26	.143	58.56	.144	58.87	.145	59.17	.146	59.47	.148	59.75	.149	60.03	.150	60.31	.151	60.59	.152	60.87	.153	61.13	.154	61.39	.155	61.65	.156
1340	56.54	.134	56.83	.135	57.13	.136	57.42	.137	57.71	.138	57.99	.139	58.26	.140	58.53	.141	58.80	.142	59.07	.143	59.32	.144	59.58	.145	59.83	.146
1350	54.93	.124	55.21	.125	55.50	.126	55.78	.127	56.06	.128	56.33	.129	56.60	.130	56.86	.131	57.13	132	57.39	.133	57.63	.134	57.88	.135	58.12	.136
1360	53.41	.116	53.68	.117	53.96	.118	54.24	.119	54.51	.120	54.77	.121	55.03	.122	55.28	.123	55.54	.124	55.79	.125	56.03	.125	56.27	.126	56.51	.127
1370	51.96	.109	52.23	.110	52.50	.111	52.77	.112	53.04	.113	53.29	.114	53.54	.115	53.79	.116	54.04	.117	54.28	.118	54.51	.119	54.75	.120	54.98	.121
1380	50.59	.103	50.85	.103	51.12	.104	51.38	.105	51.64	.106	51.88	.107	52.13	.108	52.37	.108	52.62	.109	52.86	.110	53.09	.111	53.31	.112	53.53	.113
1390	49.29	.097	49.55	.098	49.81	.099	50.06	.099	50.31	.100	50.55	.101	50.79	.102	51.03	.103	51.26	.104	51.49	.105	51.71	.106	51.93	.107	52.15	.107
1400	48.06	.091	48.31	.092	48.56	.093	48.81	.093	49.05	.094	49.29	095	49.52	.096	49.75	.096	49.98	.097	50.21	.098	50.42	.099	50.64	.100	50.85	.101
1410	46.89	.086	47.13	087	47.38	.088	47.62	.088	47.86	.089	48.09	.090	48.32	.090	48.54	.091	48.77	.092	48.99	.092	49.20	.093	49.41	.094	49.62	.094
1420	45.78	.081	46.02	.082	46.26	.083	46.49	.083	46.72	.084	46.95	.085	47.17	.085	47.39	.086	47.61	.087	47.83	.087	48.03	.088	48.24	.089	48.44	.089
1430	44.71	.077	44.94	.078	45.17	.079	45.40	.079	45.63	.080	45.85	.081	46.07	.081	46.28	.082	46.50	.083	46.71	.083	46.91	.084	47.11	.085	47.31	.085
1440	43.69	.072	43.92	.073	44.15	.074	44.37	.074	44.59	.075	44.81	.076	45.02	.076	45.23	.077	45.44	.078	45.64	.078	45.84	.079	46.04	.080	46.23	.080
1450	42.73	.068	42.95	.069	43.17	.069	43.39	.070	43.61	.070	43.82	.071	44.03	.071	44.23	.072	44.44	.072	44.64	.073	44.83	.073	45.02	.074	45.21	.075
1460	41.79	.065	42.01	.066	42.23	.066	42.44	.067	42.65	.067	42.86	.068	43.06	.069	43.26	.070	43.46	.071	43.66	.071	43.85	.072	44.03	.073	44.22	.073
1470	40.91	.061	41.12	.061	41.33	.062	41.54	.063	41.75	.064	41.95	.065	42.15	.065	42.35	.066	42.54	.066	42.73	.067	42.92	.067	43.10	.068	43.28	.068
1480	40.06	.058	40.26	.058	40.48	059	40.68	.060	40.89	.060	41.08	.061	41.28	.061	41.47	.062	41.66	.063	41.85	.063	42.02	.064	42.20	.065	42.38	.065
1490	39.24	.055	32.44	.056	39.65	057	39.85	.057	40.05	.058	40.23	.059	40.43	.059	40.62	.060	40.80	.061	40.99	.061	41.16	.062	41.34	.063	41.51	.063
1500	38.45	.053	38.65	.053	38.85	.054	39.05	.054	39.25	055	39.43	.056	39.62	.056	39.80	.057	39.99	.058	40.17	.058	40.34	.059	40.51	.059	40.68	.060

TABLE IV-A. LOGARITHMS OF NUMBER OF CUBIC FEET OF WET PULP TO MAKE ONE TON OF DRY SLIME

Specific Gravity of Dry Slime

Weight in Grams of One Liter of Wet Pulp

	2.50	Correction	2.52	Correction	2.54	Correction	2.56	Correction	2.58	Correction	2.60	Correction	2.62	Correction	2.64	Correction	2.66	Correction	2.68	Correction	2.70	Correction	2.72	Correction	2.74	Correction
1010	.2840		.2862		.2885		.2907		.2929		.2949		.2969		.2989		.3008		.3028		.3047		3066		.3084	
1020	.9829	94.9	.9851	95.4	.9874	95.9	.9896	96.4	.9918	96.9	.9938	97.3	.9959	97.8	.9979	98.3	.9990	98.8	.0017	99.3	.0039	99.7	.0056	100.1	.0073	100.5
1030	.8068	31.41	.8090	31.59	.8113	31.76	.8135	31.93	.8156	32.09	.8177	32.26	.8197	32.42	.8218	32.58	.8238	32.73	.8258	32.89	.8276	33.1	.8295	33.2	.8314	33.3
1040	6818	15.60	.6840	15.69	.6863	15.78	.6885	15.87	.6906	15.95	.6928	16.03	.6948	16.11	.6968	16.19	.6988	16.27	.7008	16.35	.7027	16.43	7045	16.50	7063	16.58
1050	.5849	9.29	.5871	9.35	.5894	9.40	.5916	9.45	.5936	9.50	.5958	9.55	.5979	9.60	.5999	9.65	.6020	9.69	.6039	9.74	.6057	9.79	.6076	9.84	.6094	9.88
1060	5057	6.15	5079	6.19	.5101	6.23	.5124	6.26	5145	6.29	.5165	6.33	5186	6.36	5207	6.40	.5227	6.43	.5247	6.46	5265	6.49	5284	6.52	.5302	6.55
1070	.4389	4.36	.4411	4.39	.4433	4.42	.4454	4.44	4476	4.46	.4498	4.48	4518	4.51	4538	4.53	.4558	4.56	.4577	4.58	4595	4.60	4615	4.62	.4633	4.64
1080	.3808	3.25	.3829	3.28	.3852	3.30	.3876	3.32	3897	3.33	.3916	3.35	3938	3.37	3959	3.39	.3978	3.40	.3997	3.42	.4016	3.44	4035	3.45	.4053	3.47
1090	.3296	2.51	.3318	2.53	.3342	2.54	.3365	2.55	.3387	2.56	.3406	2.58	.3426	2.60	3448	2.61	.3467	2.62	.3487	2.64	.3504	2.66	.3524	2.67	.3541	2.68
1100	2840	1.99	.2862	2.00	2885	2.02	.2907	2.03	.2927	2.05	.2949	2.06	.2969	2.07	.2989	2.08	.3008	2.10	.3028	2.11	3047	2.11	.3066	2.12	.3084	2.13
1110	.2425	1.62	.2448	1.63	.2470	1.64	.2492	1.65	.2514	1.66	.2534	1.67	2555	1.68	.2574	1.69	.2596	1.70	.2615	1.71	2634	1.71	2653	1.72	.2669	1.73
1120	.2047	1.34	.2068	1.35	.2092	1.36	.2114	1.37	.2135	1.38	.2156	1.38	.2177	1.39	.2196	1.40	.2218	1.41	.2238	1.41	.2256	1.42	.2274	1.43	.2292	1.43
1130	.1700	1.12	.1723	1.13	.1745	1.14	.1767	1.14	.1790	1.15	.1810	1.16	1830	1.17	1850	1.17	.1870	1.18	.1889	1.19	.1909	1.19	.1926	1.20	.1945	1.20
1140	.1377	.96	.1400	.96	.1424	.97	.1446	.97	.1467	.98	.1486	.99	.1508	1.00	1529	1.00	.1547	1.01	.1569	1.01	.1587	1.02	1605	1.03	1623	1.03
1150	.1079	.82	.1099	.83	1123	.84	.1146	.84	.1166	.85	.1186	.85	1209	.85	1229	.86	.1248	.87	.1268	.87	.1287	.88	.1303	89	1323	.89
1160	.0799	.71	.0821	.72	.0842	.73	.0864	.73	.0885	.71	.0906	.74	.0927	75	0948	.75	.0969	.75	.0986	.76	.1007	.76	.1024	.77	.1041	.77
1170	.0535	.63	.0558	.63	.0580	.63	.0603	.63	.0626	.64	.0643	.61	.0663	65	.0686	.65	.0704	.66	.0726	.66	0745	.66	.0763	.67	.0781	.67
1180	0286	.56	.0310	.56	.0330	.57	.0354	.57	.0374	57	.0394	.57	0418	57	.0438	.57	.0457	.58	.0477	.59	.0492	.59	.0512	.60	.0531	.60
1190	.0052	.49	.0073	.49	.0095	.50	0120	.50	.0141	.50	.0162	.50	0183	51	.0199	.51	.0220	.52	.0241	.52	.0257	.52	.0278	.53	.0298	.53
1200	9829	.44	9851	.41	.9874	.45	.9896	.45	9918	45	9938	45	9959	45	9979	.46	.9999	.46	.0017	.47	.0039	.47	.0056	.47	.0073	.47
1210	9617	.394	.9639	398	.9662	.401	9684	.404	.9705	406	.9726	.409	.9747	411	9767	.414	.9787	.417	.9806	.420	.9825	.42	.9844	.42	.9862	.42
1220	9415	.356	9437	.359	.9460	.361	.9482	.363	.9504	.365	9525	.368	9545	.371	9565	.374	.9585	.376	.9605	.378	.9624	.381	.9642	.383	9660	.385
1230	.9222	.323	9244	.325	.9267	.327	.9289	.329	.9311	.331	9331	.333	.9357	336	9372	.338	.9392	.340	.9412	.343	9430	.345	9449	.347	.9467	.345
1240	.9037	.293	9060	.296	.9082	.298	.9104	.300	.9125	.302	9147	.304	.9167	306	9187	.308	.9207	.311	.9227	.313	.9245	.315	9264	.317	.9282	.318
1250	8860	.266	8882	.269	.8905	.272	.8927	.274	.8949	.275	.8970	.277	.8990	.279	9010	.281	.9030	.283	9050	.285	.9069	.287	9087	.289	.9105	.290
1260	.8689	.246	.8711	.248	.8734	.250	.8756	.252	.8778	.253	8798	255	.8819	257	8839	.259	.8859	.261	.8878	.263	.8897	.264	8916	.266	.8934	.267
1270	8525	.225	.8547	227	.8570	.229	8592	.231	.8614	.232	8634	.231	8655	235	8675	.237	.8695	.239	[illegible]	.241	.8733	.242	8752	.244	.8770	.245
1280	8367	.207	.8389	.209	.8412	.211	.8434	.212	.8456	211	8476	.216	8497	217	8517	.219	.8537	.221	.8556	.222	.8575	.223	8594	.225	.8612	.229
1290	8215	.190	8237	.192	8260	.194	.8282	.195	.8304	.197	8324	.198	.8345	.200	8365	.202	.8385	.203	.8405	.204	8423	.206	8442	.207	.8460	.208
1300	8068	.177	8090	.179	.8113	.180	.8135	.181	.8156	.183	.8177	.184	8197	186	8218	.188	8238	.189	.8258	.190	8276	.191	8295	.192	8313	.193
1310	7925	.165	7947	.167	.7970	.168	7992	.169	.8014	.171	8035	.172	8055	173	8075	.175	8095	.177	8114	.178	.8133	.179	8152	.180	.8178	.181
1320	7788	.151	7810	.153	.7833	.154	7855	.155	.7877	.157	.7898	.158	7918	159	7938	161	.7958	162	.7978	.163	.7996	.164	.8075	.165	.8033	.169
1330	.7651	.143	7676	.144	.7699	.145	7721	.146	.7743	.148	7763	.149	7784	150	7804	151	.7824	.152	7844	.153	.7862	.154	7881	.155	.7899	.156
1340	.7524	.134	7546	.135	.7569	.136	7591	.137	.7612	138	.7634	139	7654	140	7674	.141	7694	142	7714	.143	.7732	.144	7751	.145	.7769	.146
1350	.7398	.124	.7420	.125	7443	.126	7465	.127	7487	128	7507	129	7528	130	7548	131	.7569	.132	7588	.133	7606	.134	7625	.135	.7643	.136
1360	7276	.116	7298	117	.7321	.118	.7343	.119	7365	.120	.7385	121	7406	[illegible]	7426	123	.7446	.124	7466	.125	7484	.125	7503	.126	7521	.127
1370	.7157	.109	7179	.110	.7202	.111	7224	.112	7246	113	7266	.111	7287	[illegible]	7307	116	7327	.117	7346	.118	.7365	.119	7384	.120	7402	.120
1380	7041	.103	7063	103	7086	.104	.7108	.105	7130	.106	7150	.107	7171	108	7191	108	7212	.109	7231	110	7250	.111	7268	.112	.7286	.113
1390	6928	.097	.6950	.098	6973	.099	.6995	.099	.7017	100	7037	.101	7058	102	7078	103	7098	104	7117	105	7136	106	7154	.107	7172	.107
1400	.6818	.091	.6840	.092	.6863	093	6885	.093	6906	094	6928	095	6948	096	6968	096	6988	097	7008	098	7026	.099	7045	.100	.7063	.101
1410	.6711	086	.6733	.087	6756	.088	.6778	.088	.6800	.089	.6820	.090	.6841	090	.6861	091	.6882	.092	.6901	092	6920	.093	.6938	.094	6956	.094
1420	6607	.081	.6629	.082	.6652	.083	6674	.083	.6695	.064	6716	.085	6737	085	.6757	086	.6777	.067	6797	.087	6815	.088	6834	.089	6852	.089
1430	.6504	.077	6526	.078	.6549	.079	.6571	.079	6592	.080	.6613	.081	6634	081	6654	082	6674	083	6694	083	6713	084	6731	.085	6750	.085
1440	.6404	.072	6427	.073	.6449	074	.6471	.074	6492	075	6514	766	6534	076	[illegible]	.077	6574	078	6594	078	6612	079	6631	.080	6649	.080
1450	6307	.068	6330	069	6352	069	.6374	.070	.6396	.070	.6417	.071	6437	071	6457	072	6478	072	6497	073	6516	073	6534	.074	6552	075
1460	6211	065	6234	066	6256	.066	.6278	.067	.6299	.067	6320	.068	6341	069	[illegible]	070	6381	071	6401	071	6420	072	6437	.073	6456	073
1470	6118	.061	6140	061	.6163	.062	6185	.063	.6207	.064	6227	.065	6248	065	6268	066	6288	.066	6307	067	6327	067	6345	.068	6363	.068
1480	6027	058	6049	.058	.6072	.059	6094	.060	.6116	.060	6136	061	6157	061	.6177	062	6197	063	6217	063	6235	064	6253	065	6272	.065
1490	.5937	.055	.5959	.056	5982	.057	.6001	.057	6026	058	6046	059	6067	059	6087	060	.6107	061	6127	061	6145	.062	6164	.063	6182	.063
1500	5849	[illegible]	[illegible]	[illegible]	5891	.054	5916	054	5938	055	5958	056	5979	056	5999	057	6020	058	6039	058	6057	059	6076	059	6084	.060

Note—The natural values are given for the corrections on account of the manner in which they are applied.

tanks. Care must also be exercised in ascertaining the average depth of the pulp. A deduction must be made for the number of cubic feet occupied by various devices sub

NOTE—The characteristics of the logarithms in the above table can be found as was done in Table 1, but it is safer with this table to look up the natural number in Table 4 and from that calculate the characteristic, which may be either 3, 2 or 1.

TABLE IV NUMBER OF CUBIC FEET OF WET PULP TO MAKE ONE TON OF DRY SLIME—Continued

Formula $\frac{2000}{64.42 \times \frac{P}{100}}$

Specific Gravity of Dry Slime

2.76	Correction	2.78	Correction	2.80	Correction	2.82	Correction	2.84	Correction	2.86	Correction	2.88	Correction	2.90	Correction	2.92	Correction	2.94	Correction	2.96	Correction	2.98	Correction	3.00	Correction	Weight in Grams of One Liter of Wet Pulp
2043		2052		2060		2068		2076		2084		2092		2099		2107		2115		2122		2129		2136		1010
102.2	100.9	10.26	101.4	1030	101.8	1034	102.3	1038	102.7	1042	103.1	1046	103.5	1050	103.9	1053	104.3	1057	104.7	1061	105.0	1065	105.5	1068	105.8	1020
681.1	33.5	683.9	33.6	686.7	33.7	689.4	33.9	692.0	34.1	694.6	34.2	697.2	34.3	699.8	34.4	702.3	34.5	704.8	34.7	707.3	34.8	709.7	34.9	712.0	35.1	1030
510.7	16.65	512.8	16.72	514.9	16.79	516.9	16.87	518.9	16.94	520.9	17.00	522.9	17.07	524.8	17.14	526.7	17.21	528.6	17.27	530.4	17.33	532.2	17.40	534.0	17.46	1040
408.6	9.92	410.3	9.97	411.9	10.02	413.5	10.07	415.1	10.11	416.7	10.14	418.3	10.18	419.9	10.22	421.4	10.26	422.9	10.30	424.4	10.34	425.8	10.38	427.2	10.42	1050
340.5	6.58	341.9	6.61	343.2	6.64	344.6	6.67	345.9	6.70	347.2	6.73	348.6	6.75	349.9	6.77	351.1	6.80	352.4	6.83	353.6	6.86	354.8	6.88	356.0	6.91	1060
291.9	4.66	293.1	4.68	294.3	4.70	295.5	4.72	296.6	4.75	297.7	4.77	298.8	4.79	299.9	4.81	301.0	4.83	302.1	4.85	303.1	4.87	304.2	4.88	305.2	4.90	1070
255.4	3.48	256.4	3.50	257.5	3.51	258.5	3.53	259.5	3.55	260.5	3.56	261.5	3.58	262.4	3.59	263.3	3.61	264.2	3.62	265.2	3.64	266.1	3.65	267.0	3.67	1080
227.0	2.69	228.0	2.70	228.9	2.71	229.8	2.72	230.7	2.74	231.5	2.76	232.4	2.77	233.3	2.78	234.1	2.79	235.0	2.80	235.8	2.81	236.6	2.82	237.4	2.83	1090
204.3	2.14	205.2	2.15	206.0	2.16	206.8	2.17	207.6	2.18	208.4	2.19	209.2	2.20	209.9	2.21	210.7	2.22	211.4	2.23	212.2	2.24	212.9	2.25	213.6	2.26	1100
185.7	1.74	186.5	1.75	187.2	1.76	188.0	1.77	188.7	1.78	189.4	1.79	190.2	1.79	190.9	1.80	191.5	1.81	192.2	1.82	192.9	1.82	193.6	1.83	194.2	1.83	1110
170.3	1.44	171.0	1.45	171.6	1.46	172.3	1.47	172.9	1.48	173.6	1.48	174.3	1.48	174.9	1.49	175.6	1.49	176.2	1.50	176.8	1.51	177.4	1.52	178.0	1.52	1120
157.2	1.21	157.8	1.21	158.5	1.22	159.1	1.23	159.7	1.24	160.3	1.24	160.9	1.24	161.5	1.25	162.1	1.25	162.7	1.26	163.2	1.26	163.8	1.27	164.3	1.28	1130
145.9	1.04	146.5	1.04	147.1	1.05	147.7	1.05	148.3	1.06	148.8	1.06	149.4	1.06	150.0	1.07	150.5	1.07	151.0	1.08	151.6	1.08	152.1	1.09	152.6	1.09	1140
136.2	.89	136.7	.90	137.3	.90	137.9	.90	138.4	.91	138.9	.91	139.4	.92	139.9	.93	140.4	.93	140.9	.94	141.4	.94	141.9	.94	142.4	.94	1150
127.7	.77	128.2	.78	128.7	.79	129.2	.79	129.7	.80	130.2	.80	130.7	.80	131.2	.80	131.7	.80	132.1	.81	132.6	.81	133.1	.81	133.5	.82	1160
120.2	.68	120.7	.68	121.2	.68	121.7	.69	122.1	.69	122.6	.69	123.1	.70	123.5	.70	123.9	.70	124.4	.71	124.8	.71	125.3	.71	125.7	.72	1170
113.5	.60	114.0	.60	114.4	.61	114.9	.61	115.3	.62	115.7	.62	116.2	.62	116.6	.63	117.0	.63	117.5	.63	117.9	.63	118.3	.64	118.7	.64	1180
107.5	.54	108.0	.54	108.4	.54	108.8	.54	109.2	.55	109.6	.55	110.1	.55	110.5	.55	110.9	.55	111.3	.56	111.7	.56	112.0	.57	112.4	.57	1190
102.2	.47	102.6	.48	103.0	.48	103.4	.48	103.8	.49	104.2	.49	104.6	.49	105.0	.49	105.3	.49	105.7	.50	106.1	.50	106.5	.50	106.8	.51	1200
97.29	.43	97.70	.43	98.10	.43	98.49	.43	98.87	.44	99.24	.44	99.61	.44	99.98	.44	100.3	.44	100.7	.45	101.0	.45	101.4	.45	101.7	.46	1210
92.87	.387	93.26	.389	93.64	.391	94.01	.393	94.37	.395	94.73	.397	95.08	.399	95.43	.401	95.77	.403	96.11	.41	96.45	.41	96.78	.41	97.10	.41	1220
88.83	.351	89.20	.353	89.56	.355	89.92	.357	90.27	.359	90.61	.361	90.95	.363	91.28	.365	91.61	.367	91.94	.369	92.26	.371	92.57	.373	92.88	.375	1230
85.13	.320	85.48	.322	85.83	.324	86.17	.326	86.50	.328	86.82	.330	87.15	.332	87.47	.333	87.79	.335	88.10	.337	88.41	.339	88.71	.341	89.00	.343	1240
81.73	.291	82.07	.293	82.40	.295	82.73	.297	83.05	.299	83.36	.300	83.67	.302	83.98	.304	84.28	.306	84.58	.308	84.88	.309	85.17	.310	85.45	.312	1250
78.57	.269	78.90	.271	79.22	.273	79.54	.274	79.84	.276	80.13	.278	80.44	.279	80.74	.281	81.02	.282	81.32	.284	81.60	.285	81.88	.286	82.15	.287	1260
75.67	.247	75.98	.249	76.28	.251	76.58	.252	76.88	.254	77.16	.255	77.46	.256	77.75	.257	78.02	.259	78.30	.260	78.58	.261	78.85	.262	79.10	.263	1270
72.95	.228	73.26	.229	73.56	.230	73.85	.232	74.13	.233	74.41	.234	74.69	.236	74.96	.237	75.23	.238	75.50	.239	75.77	.241	76.03	.242	76.28	.243	1280
70.45	.210	70.74	.211	71.02	.213	71.31	.214	71.58	.215	71.85	.216	72.12	.217	72.38	.218	72.64	.219	72.91	.221	73.17	.222	73.42	.223	73.66	.224	1290
68.11	.195	68.39	.196	68.66	.197	68.94	.199	69.20	.200	69.46	.201	69.73	.202	69.98	.203	70.23	.204	70.48	.206	70.73	.207	70.97	.208	71.20	.209	1300
65.90	.182	66.17	.183	66.44	.184	66.71	.186	66.96	.187	67.21	.188	67.46	.189	67.71	.190	67.95	.191	68.20	.192	68.44	.193	68.67	.194	68.90	.195	1310
63.85	.167	64.12	.168	64.38	.169	64.64	.171	64.88	.172	65.12	.173	65.37	.174	65.61	.175	65.84	.176	66.08	.177	66.31	.178	66.54	.179	66.76	.180	1320
61.91	.158	62.17	.159	62.42	.160	62.67	.161	62.91	.162	63.14	.163	63.39	.164	63.62	.165	63.84	.166	64.08	.167	64.30	.168	64.52	.169	64.73	.170	1330
60.09	.147	60.34	.148	60.58	.149	60.83	.150	61.05	.151	61.28	.152	61.51	.152	61.74	.153	61.96	.154	62.19	.155	62.41	.156	62.62	.157	62.82	.158	1340
58.37	.137	58.61	.138	58.85	.139	59.09	.140	59.31	.141	59.53	.142	59.76	.142	59.98	.143	60.19	.144	60.41	.145	60.62	.146	60.82	.147	61.02	.148	1350
56.75	.128	56.99	.129	57.22	.130	57.45	.131	57.66	.132	57.88	.133	58.10	.133	58.31	.134	58.52	.135	58.73	.136	58.94	.137	59.14	.138	59.33	.139	1360
55.22	.122	55.45	.123	55.67	.123	55.89	.124	56.11	.125	56.31	.126	56.53	.127	56.73	.128	56.93	.128	57.14	.129	57.34	.129	57.54	.130	57.73	.130	1370
53.76	.114	53.99	.115	54.20	.116	54.42	.116	54.63	.117	54.83	.118	55.04	.119	55.24	.120	55.44	.120	55.64	.121	55.83	.122	56.02	.122	56.21	.123	1380
52.38	.108	52.60	.109	52.81	.109	53.02	.110	53.22	.111	53.42	.111	53.63	.112	53.83	.113	54.02	.113	54.21	.114	54.40	.114	54.59	.115	54.77	.115	1390
51.07	.102	51.29	.103	51.49	.103	51.70	.104	51.89	.105	52.08	.105	52.28	.106	52.48	.107	52.66	.107	52.86	.108	53.04	.108	53.22	.109	53.40	.109	1400
49.83	.095	50.04	.096	50.24	.096	50.44	.097	50.63	.098	50.82	.098	51.01	.099	51.20	.100	51.38	.100	51.57	.101	51.75	.101	51.93	.102	52.10	.102	1410
48.65	.090	48.85	.091	49.05	.091	49.25	.092	49.43	.093	49.61	.093	49.81	.094	49.99	.095	50.16	.095	50.34	.096	50.52	.096	50.70	.097	50.87	.097	1420
47.51	.086	47.71	.087	47.90	.087	48.10	.088	48.29	.089	48.46	.089	48.64	.090	48.82	.091	48.99	.091	49.17	.092	49.34	.092	49.51	.093	49.67	.093	1430
46.43	.081	46.62	.082	46.81	.082	47.00	.083	47.18	.084	47.35	.084	47.53	.085	47.70	.086	47.87	.086	48.05	.087	48.22	.087	48.38	.088	48.54	.088	1440
45.40	.075	45.59	.076	45.78	.077	45.96	.078	46.13	.079	46.30	.079	46.48	.080	46.65	.081	46.81	.081	46.98	.082	47.15	.082	47.31	.083	47.47	.083	1450
44.41	.074	44.59	.074	44.77	.075	44.95	.075	45.12	.076	45.29	.077	45.46	.077	45.63	.078	45.79	.078	45.96	.079	46.12	.079	46.28	.080	46.43	.080	1460
43.47	.069	43.65	.069	43.82	.070	44.00	.071	44.17	.071	44.33	.072	44.50	.072	44.66	.073	44.82	.073	44.98	.074	45.14	.074	45.30	.075	45.45	.075	1470
42.57	.066	42.75	.066	42.91	.067	43.09	.067	43.25	.068	43.41	.069	43.58	.069	43.74	.070	43.89	.070	44.06	.070	44.21	.071	44.36	.071	44.50	.071	1480
41.70	.064	41.87	.065	42.03	.065	42.21	.065	42.36	.066	42.52	.066	42.69	.066	42.84	.067	42.99	.067	43.15	.067	43.30	.068	43.45	.068	43.59	.068	1490
40.86	.060	41.03	.060	41.19	.061	41.36	.061	41.52	.062	41.67	.062	41.83	.062	41.99	.063	42.14	.063	42.29	.064	42.43	.064	42.58	.065	42.72	.066	1500

TABLE IV-A. LOGARITHMS OF NUMBER OF CUBIC FEET OF WET PULP TO MAKE ONE TON OF DRY SLIME—Continued

Specific Gravity of Dry Slime

2.76	Correction	2.78	Correction	2.80	Correction	2.82	Correction	2.84	Correction	2.86	Correction	2.88	Correction	2.90	Correction	2.92	Correction	2.94	Correction	2.96	Correction	2.98	Correction	3.00	Correction	Weight in Grams of One Liter of Wet Pulp
.3103		.3122		3139		.3156		3172		3189		.3206		3220		.3237		3253		3267		3282		[illegible]		[illegible]
.0094	100.9	.0111	101.4	.0128	101.8	0145	102.3	0162	102.7	.0179	103.1	0195	103.5	.0212	103.9	0221	104.3	0241	104.7	.0257	105.0	0273	105.4	[illegible]	[illegible]	[illegible]
.8332	33.5	.8350	33.6	8367	33.7	8385	33.9	8401	34.1	.8417	34.2	8434	34.3	8450	34.4	8465	34.5	8481	34.7	8496	34.8	8511	[illegible]	[illegible]	[illegible]	[illegible]
.7082	16.65	7100	16.72	7117	16.79	7134	16.87	7151	16.94	.7168	17.00	.7184	17.07	7200	17.14	7216	17.21	7231	17.27	7246	17.33	7261	[illegible]	[illegible]	[illegible]	[illegible]
.6113	9.92	.6131	9.97	.6148	10.02	6165	10.07	6182	10.11	.6198	10.14	6215	10.18	6231	10.22	6247	10.26	6262	[illegible]	6278	10.34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.5321	6.58	.5339	6.61	.5355	6.64	.5373	6.67	5390	6.70	.5406	6.73	5423	6.75	5439	6.77	5454	6.80	5470	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4652	4.66	4670	4.68	4688	4.70	4706	4.72	4722	4.75	.4738	4.77	4754	4.79	4770	4.81	4786	[illegible]	4802	[illegible]	[illegible]	4.87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.4072	3.48	4089	3.50	.4108	3.61	.4125	3.53	4141	3.55	.4158	3.56	4175	3.58	4190	3.59	4205	3.61	[illegible]	3.62	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3560	2.69	.3579	2.70	.3596	2.71	.3614	2.72	3630	2.74	3646	2.76	3662	2.77	3679	2.78	3694	[illegible]	3711	[illegible]	[illegible]	2.81	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.3103	2.14	3122	2.15	.3139	2.16	.3156	2.17	3172	2.18	3189	2.19	3306	2.20	3220	2.21	3237	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.2688	1.74	2707	1.75	.2723	1.76	.2742	1.77	2758	1.78	2774	1.79	2792	1.79	2808	1.80	2822	1.81	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.2312	1.44	.2330	1.45	2345	1.46	2363	1.47	2378	1.48	2395	1.48	2413	1.49	2428	1.49	2445	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1965	1.21	1981	1.21	2000	1.22	2017	1.23	2033	1.24	2049	1.24	2066	1.24	2082	1.25	[illegible]	[illegible]	2114	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1641	1.04	.1658	1.04	1676	1.05	1694	1.05	1711	1.06	1726	1.06	.1744	1.06	1761	1.07	1775	1.07	[illegible]	1.08	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1342	.89	.1358	.90	1377	.90	1396	.90	.1411	.91	1427	.91	.1443	.92	1458	.93	1474	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.1062	.77	.1079	.78	1096	.79	1113	.79	.1129	.80	1146	.80	.1163	.80	1179	.80	1196	.80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.0799	.68	0817	.68	0835	.68	0853	.69	0867	.69	.0885	.69	.0903	.70	0917	.70	0931	.70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.0550	.60	.0569	.60	0584	.61	.0603	.61	.0618	.62	.0633	.62	0652	.62	0667	.63	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.0314	.54	0334	.54	0350	.54	.0366	.54	0382	.55	0398	.55	0418	.55	0434	.55	0449	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.0095	.47	.0111	.48	0128	.48	.0145	.48	0162	.49	.0179	.49	.0195	.49	0212	.49	[illegible]	.49	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.9881	.43	.9899	.43	9917	.43	.9934	.43	9951	.44	9967	.44	.9983	.44	[illegible]	.44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.9670	.387	.9697	.389	9715	.391	.9732	.393	9748	.395	.9765	.397	.9781	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.9486	.351	.9504	.353	9521	.355	.9539	.357	9555	.359	9572	.361	9588	.363	9601	[illegible]	9619	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.9301	.320	.9319	.322	9336	.324	9354	.326	9370	.328	9386	.330	[illegible]	.332	9419	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.9124	.291	.9142	.293	9159	.295	9177	.297	9193	.299	9210	.300	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.8953	.269	.8971	.271	8988	.273	9006	.274	9022	.276	9038	.278	[illegible]	[illegible]	9071	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.8789	.247	8807	.249	.8824	.251	8841	.252	[illegible]	.254	8874	.255	8891	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.8630	.228	8649	.229	8666	.230	8681	.232	[illegible]	.233	[illegible]	.234	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.8479	.210	.8497	.211	8514	.213	[illegible]	.211	[illegible]	[illegible]	[illegible]	.216	8581	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.8332	.195	.8350	.196	8367	.197	[illegible]	.199	8401	.200	8417	[illegible]	8434	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.8189	.182	.8207	.183	8224	.184	8242	.186	[illegible]	[illegible]	8271	.188	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.8052	.167	.8070	.168	8088	.169	8105	.171	8121	.172	.8137	[illegible]	8154	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7919	.158	.7936	.159	7953	.160	7971	.161	7987	[illegible]	[illegible]	[illegible]	[illegible]	.163	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7788	.147	.7806	.148	7823	.149	7841	[illegible]	[illegible]	[illegible]	7873	[illegible]	7889	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7662	.137	.7680	.138	7697	.139	7715	[illegible]	7731	[illegible]	7747	[illegible]	7764	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7540	.128	7558	.129	.7575	.130	[illegible]	.131	7609	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7421	.122	.7439	.123	.7456	.123	7473	.124	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7305	.114	.7323	.115	.7340	.116	[illegible]	.116	7374	[illegible]	7390	[illegible]	7407	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7192	.108	.7210	.109	7227	.109	.7244	.110	7261	.111	[illegible]	.111	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.7082	.102	.7100	.103	7117	.103	[illegible]	.101	7151	[illegible]	[illegible]	.105	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6975	.095	.6993	.096	.7010	[illegible]	7028	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6871	.090	6889	.091	6906	.091	6924	.092	[illegible]	.093	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6768	.086	.6786	.087	6803	.087	6821	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6668	.081	6686	.082	6703	.082	6721	[illegible]	[illegible]	.084	[illegible]	.084	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6571	.075	.6589	.076	6607	.077	6624	.078	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6475	.074	6493	.071	6510	.075	[illegible]	.075	[illegible]	.076	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6382	.069	.6400	.069	6417	[illegible]	6434	.071	[illegible]	[illegible]	[illegible]	[illegible]	6484	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6291	.066	.6309	.066	6326	.067	[illegible]	.067	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6201	.064	6219	.065	6236	.065	[illegible]	.065	6270	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.6113	.060	.6131	.060	.6148	061	6166	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

merged in the [illegible] pipes, etc.

The following [illegible] 4 in connection with Table [illegible] of tons of dry slime in a [illegible] of pulp 10 ft. [illegible]

The specific gravity of the dry slime 2.66; the weight of one liter of pulp 1150 grams; the specific gravity of solution 1.005. Required: The number of tons of dry slime in the charge. In Table 4, at the intersection of the vertical column headed 2.66 and the horizontal column headed 1150, is found 133.3, the number of cubic feet of pulp to make one ton of dry slime when the headed 30 ft. and the horizontal column headed 6 in., is found 730.6, the number of cubic feet per foot of depth for a tank 30 ft. 6 in. in diameter; 730.6 × 10 = 7306, apparent total cubic feet of pulp in the tank. Suppose 5.5 cu.ft. are occupied in the tank by various devices below the pulp level; 7306 — 5.5 = 7300.5, actual cubic feet of pulp in the tank; 7300.5 ÷ 137.03 =

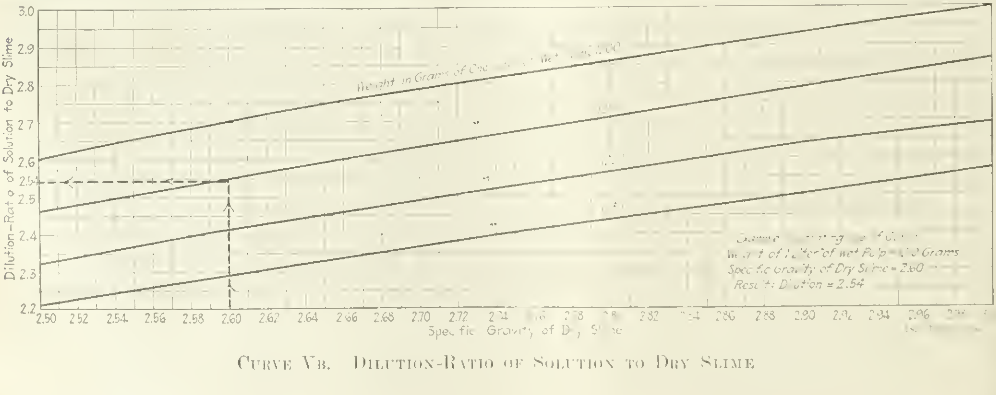
TABLE V. DILUTION—RATIO OF SOLUTION TO DRY SLIME

Formula: $$\frac{64.42\,a - 64.42\,a\,\frac{P}{100}}{64.42\,a\,\frac{P}{100}}$$

Specific Gravity of Dry Slime

Weight in Grams of One Liter of Wet Pulp	2.50	2.52	2.54	2.56	2.58	2.60	2.62	2.64	2.66	2.68	2.70	2.72	2.74	2.76	2.78	2.80	2.82	2.84	2.86	2.88	2.90	2.92	2.94	2.96	2.98	3.00
1010	59.6	60.0	60.3	60.6	60.9	61.2	61.5	61.8	62.0	62.3	62.6	62.9	63.2	63.5	63.7	63.9	64.2	65.4	64.7	65.0	65.3	65.5	65.7	66.0	66.2	66.4
1020	29.6	29.8	29.9	30.1	30.2	30.4	30.5	30.7	30.8	31.0	31.1	31.3	31.4	31.5	31.6	31.8	31.9	32.0	32.2	32.3	32.4	32.5	32.6	32.8	32.9	33.0
1030	19.6	19.7	19.8	19.9	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	21.0	21.0	21.1	21.2	21.3	21.4	21.5	21.5	21.6	21.7	21.8	21.9
1040	14.6	14.7	14.8	14.8	14.9	15.0	15.0	15.1	15.2	15.3	15.4	15.4	15.5	15.6	15.6	15.7	15.8	15.8	15.9	15.9	16.0	16.1	16.1	16.2	16.3	16.3
1050	11.6	11.7	11.8	11.8	11.9	11.9	12.0	12.0	12.1	12.1	12.2	12.3	12.3	12.4	12.4	12.5	12.6	12.6	12.7	12.7	12.8	12.8	12.9	12.9	13.0	13.0
1060	9.60	9.67	9.72	9.77	9.82	9.87	9.92	9.97	10.0	10.1	10.1	10.2	10.2	10.3	10.3	10.4	10.4	10.5	10.5	10.5	10.6	10.6	10.7	10.7	10.8	10.8
1070	8.18	8.23	8.27	8.32	8.37	8.41	8.45	8.50	8.54	8.58	8.62	8.66	8.71	8.75	8.79	8.83	8.87	8.90	8.94	8.98	9.01	9.05	9.08	9.12	9.16	9.19
1080	7.10	7.14	7.18	7.22	7.26	7.30	7.34	7.38	7.42	7.46	7.49	7.53	7.57	7.61	7.64	7.68	7.71	7.75	7.78	7.81	7.85	7.88	7.91	7.94	7.97	8.00
1090	6.27	6.31	6.34	6.38	6.42	6.45	6.49	6.53	6.56	6.60	6.63	6.66	6.69	6.73	6.76	6.79	6.82	6.85	6.88	6.91	6.94	6.97	7.00	7.03	7.05	7.08
1100	5.55	5.60	5.65	5.70	5.74	5.77	5.81	5.84	5.87	5.90	5.93	5.96	5.99	6.02	6.04	6.07	6.10	6.13	6.16	6.18	6.21	6.23	6.26	6.28	6.31	6.34
1110	5.05	5.09	5.12	5.16	5.19	5.22	5.25	5.28	5.30	5.33	5.36	5.38	5.41	5.44	5.47	5.49	5.52	5.54	5.57	5.60	5.62	5.64	5.66	5.68	5.70	5.72
1120	4.59	4.62	4.65	4.68	4.71	4.74	4.77	4.80	4.83	4.86	4.88	4.91	4.93	4.96	4.99	5.01	5.03	5.06	5.08	5.10	5.12	5.14	5.16	5.18	5.20	5.22
1130	4.22	4.25	4.28	4.30	4.33	4.35	4.38	4.40	4.43	4.45	4.47	4.49	4.52	4.55	4.57	4.59	4.61	4.63	4.65	4.67	4.70	4.72	4.74	4.76	4.78	4.80
1140	3.89	3.91	3.94	3.96	3.99	4.01	4.04	4.06	4.09	4.11	4.13	4.16	4.18	4.20	4.22	4.24	4.26	4.28	4.30	4.32	4.34	4.36	4.38	4.40	4.41	4.42
1150	3.60	3.63	3.66	3.68	3.70	3.72	3.74	3.76	3.79	3.81	3.83	3.85	3.87	3.89	3.91	3.93	3.95	3.97	3.99	4.01	4.02	4.04	4.05	4.07	4.09	4.11
1160	3.34	3.37	3.40	3.42	3.44	3.46	3.48	3.50	3.52	3.54	3.56	3.58	3.60	3.62	3.64	3.66	3.68	3.70	3.72	3.73	3.75	3.77	3.79	3.80	3.81	3.83
1170	3.13	3.15	3.18	3.20	3.22	3.24	3.26	3.28	3.30	3.32	3.33	3.35	3.37	3.39	3.40	3.42	3.44	3.46	3.48	3.49	3.51	3.53	3.54	3.56	3.58	3.59
1180	2.93	2.95	2.97	2.99	3.01	3.03	3.05	3.07	3.09	3.11	3.13	3.14	3.16	3.18	3.20	3.22	3.23	3.25	3.26	3.27	3.29	3.31	3.33	3.34	3.36	3.37
1190	2.75	2.77	2.79	2.81	2.83	2.85	2.87	2.89	2.91	2.93	2.94	2.96	2.98	3.00	3.01	3.03	3.04	3.06	3.07	3.08	3.10	3.11	3.13	3.14	3.16	3.17
1200	2.60	2.62	2.64	2.66	2.68	2.70	2.72	2.73	2.75	2.77	2.78	2.80	2.81	2.83	2.84	2.86	2.87	2.89	2.90	2.92	2.93	2.95	2.96	2.98	2.99	3.00
1210	2.46	2.48	2.50	2.51	2.53	2.54	2.56	2.58	2.60	2.61	2.63	2.64	2.66	2.67	2.69	2.70	2.72	2.73	2.75	2.76	2.78	2.80	2.81	2.83	2.85	2.86
1220	2.32	2.34	2.36	2.37	2.39	2.41	2.43	2.44	2.46	2.47	2.49	2.50	2.52	2.53	2.55	2.56	2.58	2.59	2.61	2.62	2.64	2.65	2.66	2.67	2.68	2.69
1230	2.21	2.23	2.24	2.26	2.27	2.29	2.30	2.32	2.33	2.35	2.37	2.38	2.39	2.41	2.42	2.43	2.45	2.46	2.47	2.49	2.50	2.51	2.53	2.54	2.55	2.57
1240	2.09	2.11	2.13	2.14	2.16	2.17	2.19	2.21	2.22	2.24	2.25	2.27	2.28	2.29	2.30	2.31	2.33	2.34	2.35	2.37	2.38	2.39	2.40	2.42	2.43	2.44
1250	2.00	2.01	2.03	2.05	2.06	2.08	2.09	2.11	2.12	2.14	2.15	2.17	2.18	2.20	2.21	2.22	2.23	2.24	2.25	2.26	2.27	2.29	2.30	2.31	2.32	2.33
1260	1.91	1.92	1.94	1.95	1.97	1.98	2.00	2.01	2.03	2.04	2.05	2.06	2.08	2.09	2.10	2.11	2.13	2.14	2.15	2.16	2.17	2.18	2.20	2.21	2.22	2.23
1270	1.83	1.84	1.86	1.87	1.88	1.89	1.91	1.92	1.94	1.95	1.96	1.97	1.99	2.00	2.01	2.02	2.03	2.05	2.06	2.07	2.08	2.09	2.10	2.11	2.12	2.13
1280	1.75	1.76	1.77	1.79	1.80	1.81	1.83	1.84	1.85	1.86	1.87	1.88	1.89	1.91	1.93	1.94	1.95	1.96	1.97	1.98	2.00	2.01	2.02	2.03	2.04	2.05
1290	1.68	1.69	1.70	1.71	1.72	1.74	1.75	1.76	1.78	1.79	1.80	1.81	1.82	1.84	1.85	1.86	1.87	1.88	1.89	1.90	1.91	1.92	1.94	1.95	1.96	1.97
1300	1.60	1.61	1.63	1.64	1.66	1.67	1.68	1.69	1.71	1.72	1.73	1.74	1.75	1.77	1.78	1.79	1.80	1.81	1.82	1.83	1.84	1.85	1.86	1.87	1.88	1.89
1310	1.54	1.55	1.56	1.57	1.59	1.60	1.61	1.63	1.64	1.65	1.66	1.67	1.68	1.69	1.70	1.72	1.73	1.74	1.75	1.76	1.77	1.78	1.79	1.80	1.81	1.82
1320	1.48	1.49	1.50	1.52	1.53	1.54	1.55	1.56	1.58	1.59	1.60	1.61	1.62	1.63	1.64	1.65	1.66	1.67	1.68	1.69	1.70	1.71	1.72	1.73	1.74	1.75
1330	1.42	1.43	1.45	1.46	1.47	1.48	1.49	1.50	1.52	1.53	1.54	1.55	1.56	1.57	1.58	1.59	1.60	1.61	1.62	1.63	1.64	1.65	1.66	1.67	1.68	1.69
1340	1.37	1.38	1.39	1.40	1.41	1.43	1.44	1.45	1.46	1.47	1.48	1.49	1.50	1.51	1.52	1.53	1.54	1.55	1.56	1.57	1.58	1.59	1.60	1.61	1.62	1.63
1350	1.31	1.33	1.34	1.35	1.36	1.38	1.39	1.40	1.41	1.42	1.43	1.44	1.45	1.46	1.47	1.48	1.49	1.50	1.51	1.52	1.53	1.54	1.55	1.55	1.56	1.57
1360	1.27	1.28	1.29	1.30	1.31	1.32	1.34	1.35	1.36	1.37	1.38	1.39	1.40	1.41	1.42	1.43	1.44	1.45	1.46	1.47	1.48	1.48	1.49	1.50	1.51	1.52
1370	1.22	1.23	1.24	1.25	1.26	1.28	1.29	1.30	1.31	1.32	1.33	1.34	1.35	1.36	1.37	1.38	1.39	1.40	1.41	1.42	1.43	1.43	1.44	1.45	1.46	1.47
1380	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25	1.26	1.27	1.28	1.29	1.30	1.31	1.32	1.33	1.34	1.35	1.36	1.37	1.38	1.39	1.40	1.41	1.41	1.42
1390	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25	1.26	1.27	1.28	1.29	1.30	1.31	1.32	1.33	1.34	1.34	1.35	1.36	1.37	1.38
1400	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25	1.26	1.27	1.27	1.28	1.29	1.30	1.31	1.32	1.32	1.33
1410	1.06	1.07	1.08	1.09	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25	1.25	1.26	1.27	1.28	1.28	1.29
1420	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.17	1.18	1.19	1.20	1.21	1.22	1.22	1.23	1.24	1.24	1.25
1430	0.99	1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.16	1.17	1.18	1.18	1.19	1.20	1.21	1.22
1440	.964	.974	.984	.994	1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.10	1.10	1.11	1.12	1.13	1.14	1.14	1.15	1.16	1.16	1.17	1.18
1450	.935	.945	.955	.964	.974	.983	.992	1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.07	1.08	1.09	1.09	1.10	1.11	1.12	1.13	1.13	1.14	1.15
1460	.906	.916	.925	.934	.914	.953	.962	.971	.980	.990	1.00	1.01	1.01	1.02	1.03	1.04	1.05	1.06	1.06	1.07	1.08	1.09	1.10	1.10	1.11	1.12
1470	.875	.885	.895	.905	.915	.924	.934	.943	.951	.960	.969	.977	.985	.993	1.00	1.01	1.02	1.03	1.03	1.04	1.05	1.05	1.06	1.07	1.08	1.08
1480	.851	.860	.869	.878	.887	.896	.905	.915	.924	.933	.941	.950	.958	.966	.974	.982	.990	.998	1.01	1.01	1.02	1.03	1.03	1.04	1.05	1.05
1490	.824	.834	.844	.853	.862	.871	.880	.889	.898	.906	.914	.922	.930	.939	.947	.956	.963	.970	.977	.984	.991	.998	1.01	1.01	1.02	1.02
1500	.799	.809	.819	.828	.837	.846	.855	.864	.872	.881	.890	.898	.905	.913	.921	.929	.937	.944	.952	.959	.966	.973	.980	9.87	.994	1.00

Note—This table is calculated taking the specific gravity of the solution as 1.



Curve Vb. Dilution-Ratio of Solution to Dry Slime

specific gravity of the solution is 1. In the adjoining column opposite 133.3 is found 0.87, the number of cubic feet to be added to 133.3 for each increase of 0.001 in the specific gravity of the solution; 0.87 × 5 = 4.35 (total correction) 133.3 + 4.35 = 137.65 cu.ft. of the pulp specified necessary to make one ton of dry slime. In Table 6 at the intersection of the vertical column 53.03, the number of tons of dry slime in the charge. In order to show the effect of not taking the specific gravity of the solution into account, we have calculated the number of tons of dry slime in the above charge, taking the specific gravity of the solution as 1, and find it to be 54.76, a difference of 1.73 tons.

Curves 1b, 3b, 4b and 5b illustrate how the operator

TABLE VI. NUMBER OF CUBIC FEET FOR EACH FOOT OF DEPTH OF CYLINDRICAL TANKS

Diameter, Feet.

Diameter, Inches	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	78.54	95.03	113.1	132.7	153.9	176.7	201.1	227.0	254.5	283.5	314.2	346.4	380.1	415.5	452.4	490.9	530.9	572.6	615.8	660.5	706.9	754.8
½	79.19	95.75	113.9	133.5	154.8	177.7	202.1	228.1	255.6	284.7	315.5	347.7	381.5	417.0	453.9	492.5	532.6	574.3	617.6	662.4	708.8	756.8
1	79.85	96.48	114.7	134.4	155.8	178.7	203.2	229.2	256.8	286.0	316.8	349.1	383.0	418.5	455.5	494.2	534.3	576.1	619.4	664.3	710.8	758.8
1½	80.51	97.20	115.5	135.3	156.7	179.7	204.2	230.3	258.0	287.2	318.1	350.5	384.4	420.0	457.1	495.8	536.0	577.8	621.2	666.2	712.7	760.8
2	81.18	97.93	116.3	136.2	157.6	180.7	205.3	231.5	259.2	288.5	319.4	351.9	385.9	421.5	458.7	497.4	537.8	579.6	623.1	668.1	714.7	762.9
2½	81.85	98.66	117.1	137.0	158.5	181.7	206.3	232.6	260.4	289.7	320.7	353.3	387.3	423.0	460.3	499.0	539.5	581.4	624.9	670.0	716.7	764
3	82.52	99.40	117.9	137.9	159.5	182.7	207.4	233.7	261.6	291.0	322.1	354.7	388.8	424.6	461.9	500.7	541.2	583.2	626.8	672.0	718.7	767.0
3½	83.19	100.1	118.7	138.7	160.4	183.7	208.4	234.8	262.8	292.3	323.4	356.0	390.2	426.1	463.4	502.4	542.9	585.0	628.6	673.9	720.7	769.0
4	83.86	100.9	119.5	139.6	161.4	184.7	209.5	236.0	264.0	293.6	324.7	357.4	391.7	427.6	465.0	504.1	544.6	586.8	630.5	675.8	722.7	771.1
4½	84.54	101.6	120.3	140.5	162.3	185.7	210.6	237.1	265.2	294.8	326.0	358.8	393.2	429.1	466.6	505.7	546.3	588.6	632.3	677.7	724.6	773.1
5	85.22	102.4	121.1	141.4	163.2	186.7	211.7	238.2	266.4	296.1	327.4	360.2	394.7	430.7	468.2	507.4	548.1	590.4	634.2	679.6	726.6	775.2
5½	85.90	103.1	121.9	142.2	164.1	187.7	212.7	239.3	267.6	297.3	328.7	361.6	396.1	432.2	469.8	509.0	549.8	592.2	636.0	681.5	728.6	777.2
6	86.59	103.9	122.7	143.1	165.1	188.7	213.8	240.5	268.8	298.6	330.1	363.1	397.6	433.7	471.4	510.7	551.5	594.0	637.9	683.5	730.6	779.3
6½	87.28	104.6	123.5	144.0	166.0	189.7	214.9	241.6	270.0	299.9	331.4	364.5	399.1	435.2	473.0	512.3	553.2	595.8	639.8	685.4	732.6	781.3
7	87.97	105.4	124.4	144.9	167.0	190.7	216.0	242.8	271.2	301.2	332.8	365.9	400.6	436.8	474.6	514.0	555.0	597.6	641.7	687.4	734.6	783.4
7½	88.66	106.1	125.2	145.8	167.9	191.7	217.1	243.9	272.4	302.5	334.1	367.3	402.0	438.3	476.2	515.7	556.7	599.4	643.5	689.3	736.6	785.5
8	89.36	106.9	126.0	146.7	168.9	192.8	218.2	245.1	273.7	303.8	335.5	368.7	403.5	439.9	477.9	517.4	558.5	601.2	645.4	691.2	738.6	787.6
8½	90.06	107.6	126.8	147.6	169.9	193.8	219.3	246.2	274.9	305.1	336.8	370.1	405.0	441.4	479.5	519.1	560.2	603.0	647.3	693.1	740.6	789.6
9	90.76	108.4	127.7	148.5	170.9	194.8	220.4	247.4	276.1	306.4	338.2	371.5	406.5	443.0	481.1	520.8	562.0	604.8	649.2	695.1	742.0	791.7
9½	91.47	109.2	128.5	149.4	171.8	195.8	221.5	248.6	277.3	307.6	339.5	372.9	408.0	444.5	482.7	522.4	563.7	606.6	651.0	697.0	744.6	793.8
10	92.18	110.0	129.4	150.3	172.8	196.9	222.6	249.8	278.6	308.9	340.9	374.4	409.5	446.1	484.4	524.1	565.6	608.4	652.9	699.0	746.7	795.9
10½	92.89	110.7	130.2	151.2	173.8	197.9	223.7	250.9	279.8	310.2	342.2	375.8	411.0	447.7	486.0	525.8	567.2	610.2	654.8	700.9	748.7	798.0
11	93.60	111.5	131.0	152.1	174.8	199.0	224.8	252.1	281.0	311.5	343.6	377.3	412.5	449.3	487.6	527.5	569.0	612.1	656.7	702.9	750.7	800.1
11½	94.31	112.3	131.8	153.0	175.7	200.0	225.9	253.3	282.2	312.8	345.0	378.7	414.0	450.8	489.2	529.2	570.8	613.9	658.6	704.9	752.7	802.1

Diameter, Inches	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
0	804.2	855.3	907.9	962.1	1018	1075	1134	1195	1257	1320	1385	1452	1521	1590	1662	1735	1810	1886	1963	2043	2124	2206	[illegible]
½	806.3	857.4	910.1	964.4	1020	1077	1136	1197	1259	1323	1388	1455	1523	1593	1665	1738	1813	1889	1966	2046	2127	2209	[illegible]
1	808.4	859.6	912.4	966.7	1023	1080	1139	1200	1262	1326	1391	1458	1526	1596	1668	1741	1816	1892	1970	2050	2131	2213	[illegible]
1½	810.5	861.8	914.6	969.0	1025	1082	1141	1202	1264	1328	1393	1460	1529	1599	1671	1744	1819	1895	1973	2053	2134	2216	[illegible]
2	812.6	864.0	916.8	971.3	1027	1085	1144	1205	1267	1331	1396	1463	1532	1602	1674	1747	1822	1899	1977	2056	2137	2220	2304
2½	814.7	866.1	919.0	973.6	1029	1087	1146	1207	1269	1333	1399	1466	1535	1605	1677	1750	1825	1902	1980	2059	2140	2223	2307
3	816.9	868.3	921.3	975.9	1032	1090	1149	1210	1272	1336	1402	1469	1538	1608	1680	1753	1828	1905	1983	2063	2144	2227	2311
3½	819.0	870.5	923.5	978.2	1034	1092	1151	1212	1275	1339	1405	1472	1541	1611	1683	1756	1831	1908	1986	2066	2147	2230	2315
4	821.1	872.7	925.8	980.5	1037	1095	1154	1215	1278	1342	1408	1475	1544	1614	1686	1760	1835	1911	1990	2070	2151	2234	2319
4½	823.2	874.8	928.0	982.8	1039	1097	1156	1217	1280	1344	1410	1477	1546	1617	1689	1763	1838	1914	1993	2073	2154	2237	2322
5	825.3	877.0	930.3	985.2	1042	1100	1159	1220	1283	1347	1413	1480	1549	1620	1692	1766	1841	1918	1996	2076	2158	2241	2326
5½	827.4	879.2	932.5	987.5	1044	1102	1161	1222	1285	1350	1416	1483	1552	1623	1695	1769	1844	1921	1999	2079	2161	2244	2329
6	829.6	881.4	934.8	989.8	1046	1104	1164	1225	1288	1353	1419	1486	1555	1626	1698	1772	1847	1924	2003	2083	2165	2248	2333
6½	831.7	883.6	937.0	992.1	1048	1106	1166	1228	1291	1355	1421	1489	1558	1629	1701	1775	1850	1927	2006	2086	2168	2251	2336
7	833.8	885.8	939.3	994.5	1051	1109	1169	1231	1294	1358	1424	1492	1561	1632	1704	1778	1854	1931	2010	2090	2172	2255	2340
7½	835.9	888.0	941.6	996.8	1053	1111	1171	1233	1296	1361	1427	1495	1564	1635	1707	1781	1857	1934	2013	2093	2175	2258	2343
8	838.1	890.2	943.9	999.1	1056	1114	1174	1236	1299	1364	1430	1498	1567	1638	1710	1785	1860	1937	2016	2097	2179	2262	2347
8½	840.2	892.4	946.1	1001	1058	1116	1176	1238	1301	1366	1432	1500	1570	1641	1713	1788	1863	1940	2019	2100	2182	2265	2351
9	842.4	894.6	948.4	1004	1061	1119	1179	1241	1304	1369	1435	1503	1573	1644	1717	1791	1867	1944	2023	2103	2185	2269	2354
9½	844.5	896.8	950.1	1006	1063	1121	1181	1243	1307	1371	1438	1506	1576	1647	1720	1794	1870	1947	2026	2106	2188	2273	2357
10	846.7	899.0	953.0	1008	1066	1124	1184	1246	1310	1374	1441	1509	1579	1650	1723	1797	1873	1950	2029	2110	2192	2276	2361
10½	848.8	901.2	955.2	1010	1068	1126	1186	1248	1312	1377	1444	1512	1582	1653	1726	1800	1876	1953	2032	2113	2195	2279	2365
11	851.0	903.5	957.5	1013	1070	1129	1189	1251	1315	1380	1447	1515	1585	1656	1729	1803	1879	1957	2036	2117	2199	2283	2369
11½	853.1	905.7	959.8	1015	1072	1131	1192	1254	1317	1382	1450	1518	1587	1659	1732	1806	1882	1960	2039	2120	2202	2286	2372

Diameter, Inches	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
0	2376	2463	2552	2642	2734	2827	2922	3019	3117	3217	3318	3421	3526	3632	3739	3848	3959	4072	4185	4301	4418	[illegible]
½	2379	2466	2555	2646	2738	2831	2926	3023	3121	3221	3322	3425	3530	3636	3743	3853	3963	4076	4190	4306	4423	4541
1	2383	2470	2559	2650	2742	2835	2930	3027	3125	3225	3327	3430	3534	3641	3748	3858	3968	4081	4195	4311	4428	4546
1½	2386	2474	2563	2653	2745	2839	2934	3031	3129	3229	3331	3434	3538	3645	3752	3862	3973	4085	4200	4315	4433	4551
2	2390	2478	2567	2657	2749	2843	2938	3035	3134	3234	3335	3438	3543	3650	3757	3867	3978	4090	4205	4320	4438	4556
2½	2393	2481	2570	2661	2753	2847	2942	3039	3138	3238	3339	3442	3547	3654	3761	3871	3982	4095	4209	4325	4442	4561
3	2397	2485	2574	2665	2757	2851	2946	3043	3142	3242	3344	3447	3552	3658	3766	3876	3987	4100	4214	4330	4447	4566
3½	2401	2488	2578	2669	2761	2855	2950	3047	3146	3246	3348	3451	3556	3662	3770	3880	3991	4104	4219	4335	4452	4571
4	2405	2492	2582	2673	2765	2859	2954	3652	3150	3251	3352	3456	3561	3667	3775	3885	3996	4109	4224	4340	4457	4576
4½	2408	2496	2585	2676	2769	2863	2958	3056	3154	3255	3356	3460	3565	3671	3780	3889	4001	4114	4228	4344	4462	4581
5	2412	2500	2589	2680	2773	2867	2963	3060	3159	3259	3361	3465	3570	3676	3785	3894	4006	4119	4233	4349	4467	4586
5½	2415	2503	2593	2684	2777	2871	2967	3064	3163	3263	3365	3469	3574	3680	3789	3899	4010	4123	4238	4354	4472	4591
6	2419	2507	2597	2688	2781	2875	2971	3068	3167	3267	3370	3473	3578	3685	3794	3904	4015	4128	4243	4359	4477	4596
6½	2422	2511	2600	2691	2784	2879	2975	3072	3171	3271	3374	3477	3582	3689	3798	3908	4020	4133	4248	4364	4482	4601
7	2426	2515	2604	2695	2788	2883	2979	3076	3175	3276	3378	3482	3587	3694	3803	3913	4025	4138	4253	4369	4487	4606
7½	2430	2518	2608	2699	2792	2887	2983	3080	3179	3280	3382	3486	3591	3698	3807	3917	4029	4142	4257	4374	4492	4611
8	2434	2522	2612	2703	2796	2891	2987	3084	3184	3284	3387	3491	3596	3703	3812	3922	4034	4147	4262	4379	4497	4616
8½	2437	2525	2615	2707	2800	2895	2991	3088	3188	3288	3391	3495	3600	3707	3816	3926	4038	4152	4267	[illegible]	4502	4621
9	2441	2529	2619	2711	2804	2899	2995	3093	3192	3293	3395	3499	3605	3712	3821	3931	4043	4157	4272	[illegible]	4507	[illegible]
9½	2444	2533	2623	2715	2808	2903	2999	3097	3196	3297	3399	3503	3609	3716	3825	3936	4048	4161	4276	[illegible]	4512	[illegible]
10	2448	2537	2627	2719	2812	2907	3003	3101	3200	3301	3404	3508	3614	3721	3830	3941	4053	4166	4281	[illegible]	4517	[illegible]
10½	2452	2540	2630	2722	2816	2910	3007	3105	3204	3305	3408	3512	3618	3725	3834	3945	4057	4171	4286	[illegible]	[illegible]	4641
11	2456	2544	2634	2726	2820	2914	3011	3109	3209	3310	3413	3517	3623	3730	3839	3950	[illegible]	4176	4291	[illegible]	[illegible]	4647
11½	2459	2548	2638	2730	2823	2918	3015	3113	3213	3314	3417	3521	3627	3734	3843	3954	[illegible]	4180	4296	[illegible]	[illegible]	[illegible]

Diameter, Inches	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	4657	4778	4902	5027	5153	5281	5411	5542	5675	5869	5945	6082	6221	6362	6504	6648	6793	6940	7088	7238	[illegible]	7543	[illegible]
½	4662	4783	4907	5032	5158	5286	5416	5547	5680	5814	5950	6088	6227	6368	6510	6654	6799	6946	7094	7244	[illegible]	7549	7704
1	4667	4789	4912	5037	5164	5292	5421	5553	5686	5820	5956	6094	6233	6374	6516	6660	6805	6952	7101	7251	7403	7556	7711
1½	4672	4794	4917	5042	5169	5297	5426	5558	5691	5825	5961	6099	6238	6379	6522	6666	6811	6958	7107	7257	7409	7562	7717
2	4677	4799	4922	5048	5174	5303	5432	5564	5697	5831	5967	6105	6244	6385	6528	6672	6817	6964	7113	[illegible]	7415	7569	7724
2½	4682	4804	4927	5053	5179	5308	5437	5569	5702	5837	5973	6111	6250	6391	6534	6678	6823	6970	7119	7269	7421	7575	7730
3	4687	4809	4933	5058	5185	5313	5443	5575	5708	5843	5979	6117	6256	6397	6540	6684	6829	6977	7126	7276	7428	7581	7737
3½	4692	4814	4938	5063	5190	5318	5448	5580	5713	5848	4984	6122	6262	6403	6546	6690	6835	6983	7132	7282	7434	7587	7743
4	4697	4819	4943	5069	5195	5324	5154	5586	5719	5854	5990	6128	6268	6409	6552	6696	6842	6989	7138	7288	7441	7594	7750
4½	4702	4824	4948	5074	5200	5329	5459	5591	5724	5859	5996	6134	6274	6415	6558	6702	6848	6995	7144	7295	7447	7600	7756
5	4707	4830	4954	5079	5206	5335	5465	5597	5730	5865	6002	6140	6280	6421	6564	6708	6854	7001	7151	7301	[illegible]	[illegible]	7763
5½	4712	4835	4959	5084	5211	5340	5470	5602	5735	5871	6007	6145	6285	6427	6570	6714	6860	7007	7157	[illegible]	[illegible]	7613	7769
6	4717	4840	4964	5090	5217	5346	5476	5608	5741	5877	6013	6151	6291	6433	6576	6720	6866	7014	7163	[illegible]	7466	7620	7776
6½	4722	4845	4969	5095	5222	5351	5481	5613	5747	5882	6019	6157	6297	6438	6582	6726	6872	7020	7169	[illegible]	7472	7626	7782
7	4727	4850	4974	5100	5227	5356	5487	5619	5753	5888	6025	6163	6303	6444	6588	6732	6878	7026	7176	[illegible]	7479	7633	7789
7½	4732	4855	4979	5105	5232	5361	5492	5624	5758	5893	6030	6169	6309	6450	6594	6738	6884	7032	7182	[illegible]	7485	7639	7795
8	4738	4860	4985	5111	5238	5367	5498	5630	5764	5899	6036	6175	6315	6456	6600	6744	6891	[illegible]	7188	[illegible]	7492	7646	[illegible]
8½	4743	4865	4990	5116	5243	5372	5503	5635	5769	5905	6042	6180	6320	6462	6606	6750	6897	7045	7194	[illegible]	[illegible]	7652	[illegible]
9	4748	4871	4995	5121	5249	5378	5509	5641	5775	5911	6048	6186	6326	6468	6612	6756	6903	7051	7201	[illegible]	[illegible]	[illegible]	[illegible]
9½	4753	4876	5000	5126	5254	5383	5514	5646	5780	5916	6054	6192	6332	6474	6618	6762	6909	7057	7207	[illegible]	[illegible]	7665	7821
10	4758	4881	5006	5132	5260	5389	5520	5652	5786	5922	6059	6198	6338	6480	6624	6769	6915	7063	7213	[illegible]	[illegible]	7672	[illegible]
10½	4763	4886	5011	5137	5265	5394	5525	5657	5792	5927	6065	6203	6344	6486	6630	6775	6921	[illegible]	7219	[illegible]	[illegible]	7678	[illegible]
11	4768	4891	5016	5142	5270	5400	5531	5663	5798	5933	6071	6209	6350	6492	6636	6781	6927	7076	[illegible]	[illegible]	[illegible]	[illegible]	7841
11½	4773	4896	5021	5147	5275	5405	5536	5669	5803	5939	6076	6215	6356	6498	6642	6787	[illegible]	7082	[illegible]	[illegible]	7536	[illegible]	7847

may use the data contained in any of the tables for plotting large-scale curves covering the particular work which he may have in hand.

Curve 1b shows graphically a few of the values given in Table 1. When the specific gravities of the dry slime and solution are constant, or nearly so, a single curve may be plotted, but when there is considerable variation in these factors, the uncorrected percentages for all specific gravities of dry slime and any particular weight of one liter of pulp may be indicated by heavy lines. Directly beneath each heavy line should be light lines giving the corrected percentages for pulps covering the range of the specific gravities of the solutions used. In using this curve, follow the vertical line representing the specific gravity of the dry slime to the point where it intersects the heavy line representing the weight of one liter of the pulp, drop below to the light line or intermediate point representing the specific gravity of the solution, then follow horizontally, either to the right or left, and read corrected percentage.

TABLE VIb. LOGARITHMS OF THE NUMBER OF CUBIC FEET FOR EACH FOOT OF DEPTH OF CYLINDRICAL TANKS

Diameter, Inches	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	.8951	.9779	.0535	.1229	.1872	.2472	.3034	.3560	.4057	.4526	.4972	.5396	.5799	.6186	.6555	.6910	.7250	.7579	.7894	.8199	.8494	.8778
½	.8987	.9811	.0565	.1255	.1898	.2497	.3056	.3581	.4076	.4544	.4990	.5412	.5815	.6201	.6570	.6924	.7264	.7591	.7907	.8211	.8505	.8790
1	.9023	.9844	.0596	.1284	.1926	.2521	.3079	.3602	.4096	.4564	.5008	.5429	.5832	.6217	.6585	.6939	.7278	.7605	.7920	.8224	.8517	.8801
1½	.9058	.9877	.0626	.1313	.1951	.2545	.3101	.3623	.4116	.4582	.5026	.5447	.5848	.6232	.6600	.6953	.7292	.7618	.7932	.8236	.8529	.8813
2	.9094	.9909	.0656	.1342	.1976	.2570	.3124	.3646	.4136	.4601	.5043	.5464	.5865	.6248	.6615	.6967	.7306	.7631	.7946	.8248	.8541	.8825
2½	.9130	.9941	.0686	.1367	.2000	.2594	.3145	.3666	.4156	.4619	.5061	.5481	.5880	.6263	.6630	.6981	.7320	.7645	.7958	.8261	.8553	.8836
3	.9166	.9974	.0715	.1396	.2028	.2617	.3168	.3687	.4176	.4639	.5080	.5499	.5897	.6280	.6645	.6996	.7334	.7658	.7971	.8274	.8565	.8848
3½	.9201	.0004	.0745	.1421	.2052	.2641	.3189	.3707	.4196	.4658	.5097	.5514	.5913	.6295	.6660	7010	.7347	.7672	.7984	8286	.8578	.8859
4	.9236	.0039	.0774	.1449	.2079	.2665	.3212	.3729	.4216	.4678	.5115	.5532	.5930	.6310	.6675	.7025	.7361	.7685	.7997	8298	.8590	.8871
4½	.9271	.0069	.0803	.1477	.2103	.2688	.3235	.3749	.4236	.4695	.5132	.5549	.5946	.6326	.6689	.7039	.7374	.7698	.8009	.8310	.8601	.8882
5	.9305	.0103	.0831	.1504	.2127	.2711	.3257	.3769	.4255	.4714	.5151	.5565	.5963	.6342	.6704	.7054	.7389	.7711	.8022	.8323	.8613	.8894
5½	.9340	.0133	.0860	.1529	.2151	.2735	.3278	.3789	.4275	.4732	.5168	.5582	.5978	6357	.6719	.7067	.7402	.7725	8035	.8335	.8625	.8905
6	.9375	.0166	.0888	.1556	.2177	.2758	.3300	.3811	.4294	.4751	.5186	.5600	.5994	.6372	.6734	.7082	.7415	.7738	.8048	.8347	.8637	.8917
6½	.9409	.0195	.0917	.1584	.2201	.2781	.3322	.3831	.4314	4770	.5204	.5617	.6011	.6387	.6749	.7095	.7429	.7751	8060	.8359	.8649	.8928
7	.9443	.0228	.0948	.1611	.2227	.2804	.3345	.3852	.4333	.4789	.5222	.5634	.6027	.6403	.6763	.7110	.7443	.7764	8073	.8372	.8661	.8940
7½	.9477	.0257	.0976	.1638	.2251	.2826	.3367	.3872	.4352	.4807	.5239	.5650	.6042	.6418	.6778	.7124	7456	.7777	8085	.8384	.8672	.8951
8	.9511	.0290	.1004	.1664	.2276	.2851	.3389	.3893	.4373	.4826	.5257	.5667	.6058	.6434	.6793	.7138	.7470	.7790	.8098	.8396	.8684	.8963
8½	.9545	.0318	.1031	.1691	.2302	.2874	.3410	.3913	.4392	.4844	.5274	.5683	.6075	.6448	.6808	.7153	.7483	.7803	.8111	.8408	.8696	.8974
9	.9579	.0350	.1062	.1717	.2327	.2896	.3432	.3934	.4411	.4863	.5292	.5700	.6091	.6464	.6822	.7167	.7497	.7816	.8124	.8420	.8708	.8986
9½	.9613	.0382	.1089	.1744	.2350	.2918	.3454	.3955	.4429	.4880	.5308	.5716	.6107	.6479	.6837	.7180	.7510	.7829	.8136	.8432	.8719	.8997
10	.9646	.0414	.1119	.1770	.2375	.2942	.3475	.3976	.4450	.4898	.5326	.5733	.6123	.6494	.6852	.7194	.7524	.7842	.8148	.8445	.8731	.9009
10½	.9680	.0441	.1146	.1796	.2400	.2964	.3497	.3995	.4468	.4916	.5343	.5750	.6138	.6510	.6866	.7208	.7537	.7855	.8161	.8457	.8743	.9020
11	.9713	.0473	.1173	.1821	.2425	.2989	.3518	.4016	.4487	.4935	.5361	.5767	.6154	.6525	.6881	.7222	.7551	.7868	.8174	.8469	.8755	.9031
11½	.9746	.0504	.1199	.1847	.2448	.3010	.3539	.4036	.4506	.4953	.5378	.5783	.6170	.6540	.6895	.7236	.7565	.7881	.8186	.8481	.8766	.9042

Diameter, Inches	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
0	.9054	.9321	.9580	.9832	.0077	.0314	0546	.0774	.0993	.1206	.1414	.1620	.1821	.2014	.2206	.2393	.2577	.2755	.2929	.3103	.3272	.3436	3598
½	.9065	.9332	.9591	.9843	.0086	.0322	.0554	.0781	.1000	.1216	.1424	.1629	.1827	.2022	.2214	.2400	.2584	.2762	.2936	.3109	.3278	.3442	.3604
1	.9076	.9343	.9602	.9853	.0099	.0334	.0565	.0792	.1011	.1225	.1433	.1638	.1836	.2030	.2222	.2408	.2591	.2769	.2945	.3118	.3286	.3450	.3612
1½	.9088	.9354	.9612	.9863	.0107	.0342	.0573	.0799	.1017	.1232	.1440	.1644	.1844	.2038	.2230	.2415	.2598	.2776	.2951	.3124	.3292	.3456	.3617
2	.9099	.9365	.9623	.9874	.0116	.0354	.0584	.0810	.1028	.1242	.1449	.1652	.1853	.2047	.2238	.2423	.2605	.2785	.2960	.3130	.3298	.3464	.3625
2½	.9110	.9376	.9633	.9884	.0124	.0362	0592	.0817	.1035	.1248	.1458	.1661	.1861	.2055	.2245	.2430	.2613	.2792	.2967	.3137	.3304	.3469	.3630
3	.9122	.9387	.9644	.9894	.0137	.0374	.0603	.0828	.1045	.1258	.1467	1670	.1870	.2063	.2253	.2438	.2620	.2799	.2973	.3145	.3312	.3477	.3638
3½	.9133	.9398	.9654	.9904	.0145	.0382	.0611	.0835	.1055	.1268	1477	.1679	.1878	.2071	.2261	.2445	.2627	.2806	.2980	.3151	.3318	.3483	.3646
4	.9144	.9409	.9665	.9914	.0158	.0394	.0622	.0846	.1065	.1278	.1486	.1688	.1886	.2079	.2269	.2455	.2636	.2813	.2989	.3160	.3326	.3491	.3653
4½	.9155	.9419	.9675	.9925	.0166	.0402	.0630	.0853	.1072	.1284	.1492	.1694	.1892	.2087	.2276	.2463	.2643	.2819	.2995	.3166	.3332	3497	.3659
5	.9166	.9430	.9686	.9935	.0179	.0414	.0641	.0864	.1082	.1294	.1501	.1703	.1901	.2095	.2284	.2470	.2651	.2828	.3002	.3172	3341	.3504	.3666
5½	.9177	.9441	.9696	.9945	.0187	.0422	.0648	.0871	.1089	.1303	.1511	.1711	.1909	.2103	.2292	.2477	.2658	.2835	.3008	.3179	.3347	.3510	.3672
6	.9189	.9452	.9707	.9955	.0195	.0430	.0660	.0881	.1099	.1313	.1520	.1720	.1917	.2111	.2299	.2485	.2665	.2842	.3017	.3187	3355	.3518	.3679
6½	.9200	.9463	.9717	.9966	.0204	.0438	.0667	.0892	.1109	.1319	.1526	.1729	.1926	.2119	.2307	.2492	.2672	.2849	.3023	.3193	.3361	.3524	.3685
7	.9211	.9473	.9728	.9976	.0216	.0449	.0678	.0903	.1119	.1329	1535	.1738	.1934	.2127	.2315	.2499	.2681	.2858	.3032	.3201	.3369	.3531	3692
7½	.9222	.9484	.9739	.9986	.0224	.0157	.0686	.0910	.1126	.1339	.1544	.1746	.1942	.2135	.2322	.2507	.2688	.2865	.3038	.3208	.3375	3537	.3698
8	.9233	.9495	.9749	.9996	.0237	.0469	.0697	.0920	.1136	.1348	.1553	.1755	.1951	.2143	.2330	.2516	.2695	.2871	.3045	.3216	.3383	.3545	.3705
8½	.9244	.9506	.9759	.0004	.0245	.0477	.0704	.0927	.1143	.1355	.1559	.1761	.1959	.2151	.2338	.2524	.2702	.2878	.3051	.3222	.3389	.3551	.3713
9	.9255	.9516	.9770	.0017	.0257	.0488	.0715	.0938	.1153	.1364	.1569	.1770	.1967	.2159	.2348	.2531	.2711	.2887	.3060	.3228	.3395	.3558	.3718
9½	.9266	.9527	.9780	.0026	.0265	.0496	.0722	.0945	.1163	.1370	.1578	.1778	.1976	.2167	.2355	.2538	.2718	.2894	.3066	.3235	.3400	.3566	.3724
10	.9277	.9538	.9791	.0035	.0278	.0508	.0734	.0955	.1173	.1380	.1587	.1787	.1984	.2175	.2363	.2545	.2725	.2900	.3073	.3243	.3408	.3572	.3731
10½	.9288	.9548	.9801	.0043	.0286	.0515	.0741	.0962	.1179	.1389	.1596	.1796	.1992	.2183	.2370	.2553	.2732	.2907	.3079	.3249	.3414	.3577	.3738
11	.9299	.9559	.9811	.0056	.0294	.0527	.0752	.0973	.1189	.1399	.1605	.1804	.2000	.2191	.2378	.2560	.2739	.2916	.3088	.3257	.3422	.3585	.3746
11½	.9310	.9570	.9822	.0065	.0302	.0535	.0763	.0983	.1196	.1405	.1614	.1813	.2006	.2198	.2385	.2567	.2746	.2923	.3094	.3263	.3428	.3591	.3751

Diameter, Inches	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
0	.3758	.3915	.4069	.4219	.4368	.4513	.4657	.4799	.4937	.5075	.5209	.5342	.5473	.5601	.5728	.5852	.5976	.6098	.6217	.6336	.6452	.6567
½	.3764	.3920	.4074	.4226	.4374	.4519	.4663	.4804	.4943	.5080	.5214	.5347	.5478	.5606	.5732	.5858	.5980	.6102	.6222	.6341	.6457	.6572
1	.3771	.3927	.4081	.4232	.4381	.4526	.4669	.4810	.4949	.5085	.5221	.5353	.5483	.5612	.5738	.5864	.5986	.6108	.6227	.6346	.6462	.6576
1½	.3777	.3934	.4087	.4237	.4385	.4532	.4675	.4816	.4954	.5091	.5226	.5358	.5488	.5617	.5743	.5868	.5991	.6112	.6232	.6350	.6467	.6581
2	.3784	.3941	.4094	.4244	.4392	.4538	.4681	.4822	.4961	.5097	.5231	.5363	.5494	.5623	.5748	.5874	.5097	.6117	.6238	.6355	.6472	.6586
2½	.3789	.3946	.4099	.4250	.4398	.4541	.4686	.4827	.4967	.5103	.5236	.5368	.5499	.5628	.5753	.5878	.6001	.6123	.6242	.6360	.6476	.6591
3	.3797	.3953	.4106	.4257	.4404	.4550	.4692	.4833	.4972	.5108	.5243	.5374	.5595	.5632	.5759	.5884	.6006	.6128	.6247	.6365	.6481	.6595
3½	.3804	.3959	.4113	.4263	.4411	.4556	.4698	.4339	.4978	.5113	.5218	.5379	.5510	.5637	.5763	.5888	.6011	.6132	.6252	.6370	.6486	.6600
4	.3811	.3965	.4120	.4270	.4417	.4562	.4704	.4846	.4983	.5120	.5253	.5386	.5516	.5643	.5769	.5894	.6016	.6137	.6257	.6375	.6490	.6605
4½	.3817	.3972	.4125	.4275	.4423	.4568	.4710	.4852	.4989	.5126	.5258	.5391	.5521	.5648	.5775	.5898	.6022	.6143	.6261	.6379	.6495	.6610
5	.3824	.3979	.4131	.4281	.4429	.4574	.4717	.4857	.4995	.5131	.5265	.5397	.5527	.5654	.5781	.5904	.6027	.6148	.6266	.6384	.6500	.6614
5½	.3829	.3985	.4138	.4288	.4436	.4580	.4723	.4863	.5001	.5136	.5270	.5402	.5532	.5658	.5785	.5910	.6031	.6152	.6272	.6389	.6505	.6619
6	.3836	.3992	.4145	.4294	.4442	.4586	.4729	.4869	.5006	.5141	.5276	.5407	.5536	.5664	.6791	.5915	.6037	.6157	.6277	.6394	.6510	.6624
6½	.3842	.3998	.4150	.4299	.4447	.4592	.4735	.4874	.5012	.6147	.5281	.5412	.5541	.5669	.5796	.5920	.6042	.6163	.6282	.6399	.6515	.6629
7	.3849	.4005	.4156	.4306	.4453	.4598	.4741	.4880	.5017	.5153	.5287	.5418	.5547	.5675	.5801	.5925	.6048	.6168	.6287	.6404	.6520	.6633
7½	.3856	.4011	.4163	.4312	.4459	.4604	.4747	.4886	.5023	.5159	.5292	.5423	.5552	.5680	.5806	.5930	.6052	.6172	.6291	.6409	.6524	.6638
8	.3863	.4017	.4170	.4318	.4465	.4610	.4752	.4891	.5030	.5164	.5298	.5429	.5558	.5686	.5812	.5935	.6057	.6177	.6296	.6414	.6529	.6643
8½	.3869	.4023	.4175	.4325	.4472	.4616	.4758	.4897	.5035	.5169	.5303	.5434	.5563	.5690	.5816	.5940	.6062	.6183	.6301	.6418	.6534	.6647
9	.3876	.4029	.4181	.4331	.4478	.4622	.4764	.4904	.5041	.5176	.5308	.5439	.5569	.5696	.5822	.5945	.6067	.6188	.6306	.6423	.6539	.6652
9½	.3881	.4036	.4188	.4338	.4484	.4628	.4770	.4909	.5046	.5181	.5314	.5444	.5574	.5701	.5826	.5951	.6072	.6192	.6310	.6428	.6544	.6657
10	.3888	.4043	.4195	.4344	.4490	.4634	.4776	.4915	.5051	.5186	.5320	.5451	.5580	.5707	.5832	.5956	.6078	.6197	.6315	.6433	.6549	.6661
10½	.3895	.4048	.4200	.4349	.4496	.4639	.4781	.4921	.5057	.5192	.5325	.5456	.5585	.5711	.5837	.5960	.6082	.6202	.6321	.6437	.6553	.6666
11	.3902	.4055	.4206	.4355	.4502	.4645	.4787	.4926	.5064	.5196	.5331	.5462	.5591	.5717	.5842	.5966	.6087	.6208	.6326	.6442	.6558	.6672
11½	.3908	.4062	.4213	.4362	.4507	.4651	.4793	.4932	.5069	.5204	.5336	.5467	.5595	.5722	.5847	.5970	.6093	.6212	.6331	.6447	.6562	.6676

Diameter, Inches	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	.6681	.6792	.6904	.7013	.7121	.7227	.7333	.7137	.7540	.7641	.7742	.7840	.7939	.8036	.8132	.8227	.8321	.8414	.8505	.8596	.8686	.8775	.8864
½	.6686	.6797	.6908	.7017	.7125	.7231	.7337	.7141	.7544	.7645	.7745	.7845	.7943	.8040	.8136	.8231	.8324	.8417	.8509	.8600	.8690	.8779	.8867
1	.6690	.6802	.6913	.7022	.7130	.7236	.7341	.7145	.7548	.7649	.7750	.7849	.7947	.8044	.8140	.8235	.8328	.8421	.8513	.8604	.8694	.8783	.8871
1½	.6695	.6807	.6917	.7026	.7134	.7240	.7345	.7149	.7552	.7653	.7753	.7853	.7950	.8048	.8144	.8239	.8332	.8425	.8517	.8608	.8698	.8786	.8874
2	.6700	.6812	.6921	.7031	.7138	.7245	.7350	.7454	.7556	.7657	.7758	.7857	.7955	.8052	.8148	.8243	.8336	.8429	.8520	.8611	.8701	.8790	.8878
2½	.6704	.6816	.6926	.7035	.7142	.7249	.7354	.7458	.7560	.7662	.7762	.7861	.7959	.8056	.8152	.8247	.8340	.8432	.8524	.8615	.8705	.8794	8882
3	.6709	.6821	.6931	.7040	.7147	.7253	.7358	.7462	.7565	.7666	.7766	.7865	.7963	.8060	.8156	.8250	.8344	.8437	.8528	.8619	.8709	.8797	8886
3½	.6714	.6825	.6936	.7044	.7152	.7257	.7362	.7466	.7569	.7670	.7770	.7869	.7967	.8064	.8160	.8254	.8347	.8440	.8532	.8623	.8712	.8801	8889
4	.6718	.6830	.6940	.7049	.7156	.7262	.7367	.7471	.7573	.7675	.7774	.7873	.7971	.8068	.8164	.8258	.8352	.8444	.8536	.8627	.8716	.8805	8893
4½	.6723	.6834	.6944	.7054	.7160	.7266	.7371	.7475	.7577	.7678	.7779	.7877	.7975	.8072	.8168	.8262	.8356	.8448	.8539	.8630	.8720	8808	8896
5	.6727	.6839	.6950	.7058	.7165	.7271	.7376	.7480	.7582	.7683	.7783	.7882	.7980	.8076	.8172	.8266	.8359	.8452	.8544	.8634	.8723	.8812	8900
5½	.6732	.6844	.6954	.7062	.7169	.7275	.7380	.7483	.7585	.7687	.7787	.7885	.7983	.8080	.8176	.8270	.8363	.8455	.8547	.8637	.8727	.8816	8904
6	.6737	.6848	.6958	.7067	.7174	.7280	.7385	.7488	.7590	.7692	.7791	.7889	.7987	.8084	.8180	.8274	.8367	.8460	.8551	.8642	8731	.8820	8908
6½	.6741	.6853	.6963	.7071	.7178	.7284	.7389	.7492	.7594	.7695	.7795	.7894	.7991	.8088	.8184	.8278	.8371	.8463	.8555	.8645	.8734	.8823	8911
7	.6746	.6857	.6967	.7076	.7183	.7288	.7393	.7497	.7599	.7700	.7800	.7898	.7995	.8092	.8188	.8281	.8375	.8467	.8559	.8649	8738	.8827	8915
7½	.6750	.6862	.6971	.7080	.7187	.7292	.7397	.7501	.7603	.7703	.7803	.7902	.8000	.8096	.8192	.8285	.8378	.8471	.8562	.8652	8742	.8830	8918
8	.6756	.6866	.6977	.7085	.7192	.7297	.7402	.7505	.7607	.7708	.7807	.7906	.8004	.8100	.8195	.8289	.8383	.8475	.8566	.8656	.8746	.8834	8922
8½	.6761	.6871	.6981	.7089	.7196	.7301	.7406	.7509	.7611	.7712	.7812	.7910	.8007	.8104	.8199	.8293	.8387	.8479	.8570	.8660	.8749	.8838	.8925
9	.6765	.6876	.6985	.7094	.7201	.7306	.7411	.7514	.7616	.7717	.7816	.7914	.8011	.8108	.8203	.8297	.8390	.8482	.8574	.8664	.8754	.8842	.8929
9½	.6770	.6881	.6990	.7098	.7205	.7310	.7415	.7517	.7619	.7720	.7820	.7918	.8015	.8112	.8207	.8301	.8394	.8486	.8578	.8668	.8757	.8845	.8933
10	.6774	.6885	.6995	.7103	.7210	.7315	.7419	.7522	.7624	.7725	.7824	.7923	.8020	.8116	.8211	.8305	.8398	.8490	.8581	.8671	.8760	.8849	8937
10½	.6779	.6890	.6999	.7107	.7214	.7319	.7423	.7526	.7628	.7728	.7828	.7926	.8024	.8120	.8215	.8309	.8402	.8494	.8585	8675	.8764	.8852	8940
11	.6783	.6894	.7004	.7111	.7218	.7324	.7428	.7530	.7633	.7733	.7833	.7930	.8028	.8124	.8219	.8313	.8405	.8498	.8589	.8679	8768	.8856	8944
11½	.6788	.6898	.7008	.7116	.7222	.7328	.7432	.7535	.7637	.7737	.7836	.7934	.8032	.8128	.8223	.8317	.8409	.8502	.8593	.8682	8771	.8860	.8947 8951

Curve 3b shows graphically a few of the values given in Table 3. The plotting and method of using this curve is the same as Curve 1b.

Curve 4b shows graphically some of the values given in Table 4. This curve is plotted similarly to Curves 1b and 3b, except that the light lines, representing the corrected number of cubic feet of pulp, are in this case located above the heavy lines, since the correction is added instead of subtracted as in Curves 1b and 3b.

We are indebted to Prof. L. M. Hoskins of the Department of Applied Mathematics and to Prof. Fernando Sanford of the Department of Physics of Stanford University for several valuable suggestions in connection with this work. We also wish to acknowledge the faithful and painstaking work of E. P. Bly and G. W. Hawley in connection with the making of certain of the routine calculations.

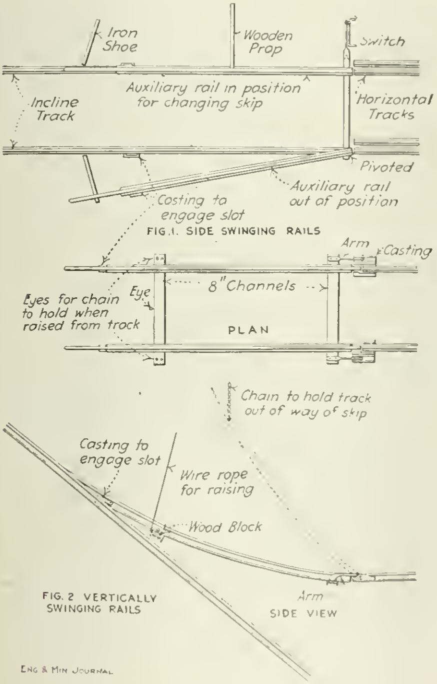
NOTE—The characteristics of the logarithms in the above table are best determined by looking up the natural number to which they refer, and calculating as is done with ordinary logarithms. These characteristics may be 3, 2 or 1. The change in the characteristic can always be told by inspection through the change in the mantissa so that with experience, the characteristic can be immediately deduced from the part of the table in which the logarithm occurs.

Details of Practical Mining

Skip Transfer at Incline-Shaft Collar

By Arthur C. Vivian

At the conglomerate shafts of the Calumet & Hecla, in Michigan, the skips and man cars when not in use are stored on horizontal tracks in a detached building, about 30 ft. from the shaft house proper. The conveyances are transferred from the incline tracks of the skip road to the horizontal surface tracks over short pieces of track curved in vertical section, which may be swung into place for that purpose. When not in use these sections of auxiliary track must be out of the way of skips in the shaft, and two methods of disposing of them are employed, the choice of which depends upon the weight of the skip used.



Iron Shoe
Wooden Prop
Switch
Incline Track
Auxiliary rail in position for changing skip
Horizontal Tracks
Pivoted
Auxiliary rail out of position
Casting to engage slot
FIG. 1. SIDE SWINGING RAILS
Arm
Casting
Eyes for chain to hold when raised from track
Eye
8" Channels
PLAN
Chain to hold track out of way of skip
Casting to engage slot
Wire rope for raising
Wood Block
FIG. 2 VERTICALLY SWINGING RAILS
Arm
SIDE VIEW
ENG & MIN JOURNAL

Arrangements of Rails for Transferring Shaft Vehicles from Inclined Tracks to Horizontal

The simpler and more convenient of the two methods may be used only with a small skip, such as is in service in the scramming operations at Hecla shafts Nos. 2 and 3, this for the reason that the two rails have no lateral bracing except that afforded by the makeshift wooden prop, and a heavy skip would be likely to spread the rails in passing over them. This method is shown in Fig. 1 in plan only, but a side view would correspond except in details to the side view of the other method shown in Fig. 2. Rails of about 90 lb. weight are used, and they are not reinforced or connected with each other in any way except near their junctions with the horizontal track, where they are both pivoted to a switch bar so that their upper ends may be swung aside horizontally to clear the skip. The switch is used to make connection with either of two tracks, one holding the skip, the other the man car. The method is obviously applicable only to a single-skip-road shaft, as there would not be room between the adjacent, inside rails of two skip roads to allow the auxiliary rails to be swung aside. A casting riveted to each rail near its upper end projects below it and engages a corresponding slot in the track stringer to hold the rail in place; a sprag is braced against each rail from the sides of the shaft house to prevent the rails from spreading. The rails can be thrown in and out of position easily and quickly by one man, and it is unfortunate that this simple method is not of wider application.

Where heavier skips are used the second method is employed, and this conforms in principle to that used at most of the shaft houses of the district. The two rails are connected rigidly by crossbraces, and they are hinged at their junction with the horizontal track so that their upper ends may be lifted high enough to clear the skip. The method is illustrated in plan and side elevation in Fig. 2. Most shaft houses are equipped with a pony winch for handling timber and this may be utilized in lifting the auxiliary rails, or in the absence of this accessory they may be lifted by hand. When not in use, they are suspended by chains hung from the roof.

The illustration shows a heavy rail without any reinforcement in the way of backing, but at other mines it is usual to mount the rail for part of its length on a wooden stringer. On steeply inclined tracks, such as those at the Allouez shafts and Nos. 3 and 4 shafts of the Ahmeek, where the track is inclined at 80°, this reinforcement takes the form of guides for the skip wheels, so that they will not leave the track on the sharp vertical curves used.

⁂

Tailings Disposal in California

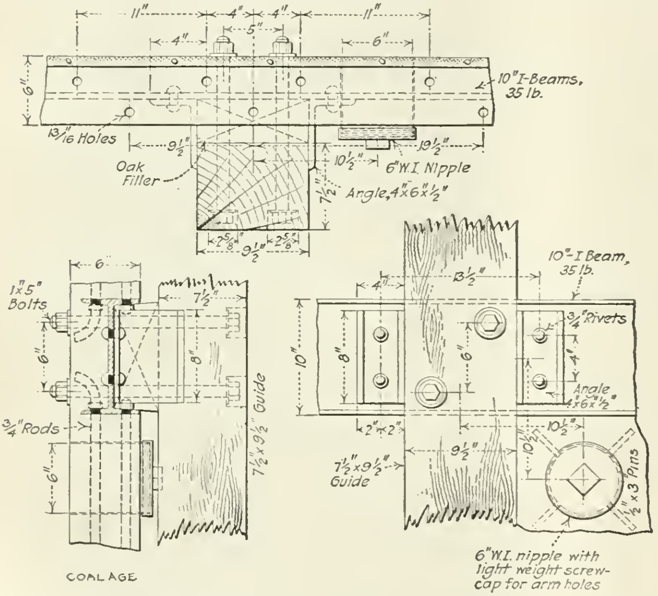
Tailings-disposal arrangements at all the stamp mills along the Mother Lode in Amador County in California will be completed before the end of the year, in compliance with an order of court requiring such distribution of the tailings as to prevent alleged damage to agricultural lands in Amador and Sacramento Counties. The South Eureka was the first to complete its system [illegible] date. The Kennedy followed with the installation of [illegible] and is now completing a large dam [illegible] an [illegible] method of [illegible] that may [illegible] actually necessary for several years. The A[illegible] [illegible] Kennedy on the south, and the Central Eureka, [illegible] adjoining the South Eureka on the north, [illegible] adopted the flume-and-dam system, and both are well prepared for holding the tailings for a long period of years. Extending further north, in the order named, the Keystone, Original, Amador, Bunker Hill and Fremont are likewise completing installations of flumes and dams.

⁂

Guide Fastening to Steel Divider

An auxiliary shaft recently sunk by the Bunsen Coal Co., of Danville, Ill., is lined with concrete and divided into three compartments by means of 10-in. steel I-beam dividers. Between the cage compartment and the airway a concrete curtain wall was provided, as described in *Coal Age*.

The yellow-pine guides are 7½x9½ in. and are fastened to each divider with two 1-in. bolts. White-oak filler blocks were inserted between the guides and the webs of the I-beam dividers. At the side of the guide and below each divider on the curtain-wall side a 6-in. nipple of heavy pipe was set in the concrete and closed with a plug or cap. The nipple serves as an arm hole when it becomes necessary to reach the nuts of the guide bolts.



Detail of Guide Connections to Buntons

A space of 1½ in. was left between the back of the guide and the concrete, so that vibration might not be transmitted. The details of the connection are shown in the accompanying illustration.

⁂

Ash Filling on the Rand

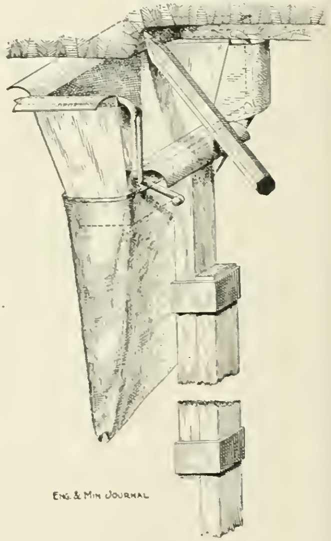
The Witwatersrand is recognized as having carried to a higher point of development than any other metal-mining district the system of filling worked-out areas with sand. For this purpose ashes also are used. The latest annual report of the Department of Mines of the Union of South Africa notes the fact that at the Consolidated Main Reef mine, where the Vereeniging railway crosses the outcrop, the worked-out stopes have been filled with ashes which contain a considerable amount of clinker and make a satisfactory filling material. At Randfontein No. 6 section also ash filling is being resorted to for supporting the area below the railway line.

⁂

Sample Catcher for Backs

By A. Livingstone Oke*

In the course of sampling the back of a level or other working, there is always a certain amount of difficulty in insuring that all of the material broken from the cut is collected without admixture from extraneous sources or loss from splintering. After experimenting with numerous methods and devices, I finally arrived at the simple arrangement shown in the illustration, for simultaneously collecting and bagging the material forming the sample.



Catcher in Use on Staff

It consists essentially of a two-pronged fork, the upper extremities of the prongs being bent backward, parallel to each other and at right angles to the original plane, as shown. On these bent portions of the prongs is hung a canvas or soft leather, square-sectioned funnel, which is open at the top and bottom and also has one side partly cut out. On the lower part of this funnel are four hooks from which the sample bag is hung. The upper part of the funnel has wings attached which are stiffened around their free edges by being sewn over pieces of copper wire. The metal part of the fork is attached rigidly to a wooden handle made in two pieces, arranged to slide over each other and so permit of adjustment for height.

The fork when in use is held firmly up against the back in such a way that the three upper wings press against the irregular surfaces on either side of the proposed cut, while the moil is used through the opening between the two prongs.

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*Mining engineer, 3 Marine Terrace, Penzance, Cornwall, Eng.

The material from the cut falls directly into the bag and requires no further handling. There is practically no loss from splintering, as the cut is surrounded on three sides by the funnel and the fourth side is also partly closed by the sampler's hand as he holds the moil.

I have found that it is desirable to have some means of keeping the fork pressed tightly against the roof and this may be done by drilling holes an inch apart in the center of the upper half of the handle and using as a lever a spike resting on the top of the lower half.

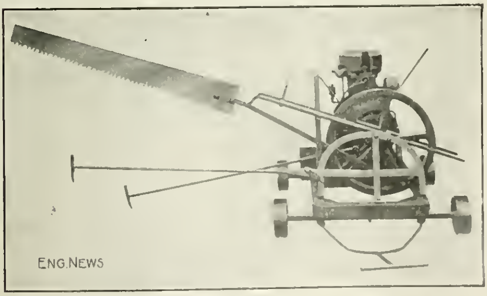
In certain kinds of rock there is a tendency for large pieces to flake off from the sides of the cut and, as these do not properly belong to the sample, it is desirable to prevent them from falling into the bag. To do this it is only necessary to place a wide-spaced screen in the contracted throat of the funnel, below the level of the crossbar; or a few bars of suitable wire can be fixed across it permanently. The material of the funnel can be strong canvas or well softened goat-skin. The wings can be bent to various outlines to meet the irregularities of the roof, due to the malleability of the copper wire stiffening around their edges.

The dimensions of the whole apparatus will vary with the individual requirements, but the size shown is one I have found most convenient after several years' use, particularly in comparatively narrow workings.

⁂

Gasoline-Engine-Driven Saw

A crosscut saw driven by a gasoline engine is built by the Whitman Agricultural Co. In a run recently it cut



Portable Gasoline Engine and Crosscut Saw

14x14-in. timbers in one minute each, according to *Engineering News*. The engine is a $2\frac{1}{2}$-hp. Sultan with clutch and gear transmission to the saw crankwheel. The saw and engine are mounted on a truck so as to be brought up easily to the timber. Dogs for holding the work are pivoted on the frame. The clutch allows throwing the saw out of action instantly.

⁂

Electric Warning Device for Hoisting Engineer

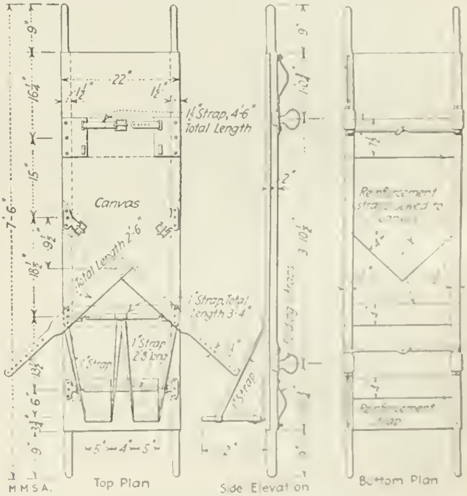
The Rogers-Brown Ore Co., Crosby, Minn., is using an electric device to warn the hoisting engineers that the skip is nearing the collar or has passed it. In the words of its inventor, J. P. Wallheus, master mechanic for the mining company, the device is intended "to keep the engineer's mind on the reverse lever and to warn him when the skips are near the dump." A 60-cp. electric lamp is mounted on a board in front of the engineer and is painted red. This lamp, reverse lever and indicator are connected to an electric circuit. The circuit is open until the skips are about 30 ft. from the dump, at which point the circuit is closed by an automatic switch attached to the indicator. This turns on the red light, showing the engineer that the skip is near the dump. The red light remains on until the engine is reversed, when the circuit is opened and the red light disappears.

Its application to the cage hoist, which does not run in balance, is as follows: The automatic drop switch is on the indicator. This switch will drop only when the cage is hoisted a little above the collar of the shaft, and at this point the red light will flash on, indicating to the engineer that he has hoisted too high or that he is going in the wrong direction, as the case may be.

⁂

Underground Stretcher

The accompanying illustration shows a stretcher for underground use mentioned by B. F. Tillson in a recent *Bulletin* of the Mining & Metallurgical Society of America, as employed at the Franklin Furnace mine of the the New Jersey Zinc Co.



Three Views of Stretcher

⁂

Chart for Platting Dips

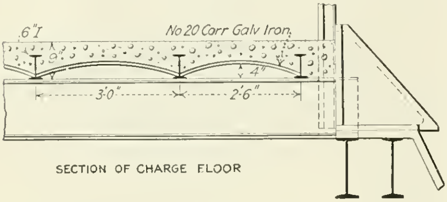
In the Journal of Oct. 24, 1914, p. 740, there appeared an article having the above title. This was taken from an article by Howland Bancroft, in the Bulletin of A. I. M. E., July, 1914. Through inadvertence [illegible] credit for this article was not given [illegible] such acknowledgment is made herewith.

Details of Milling and Smelting

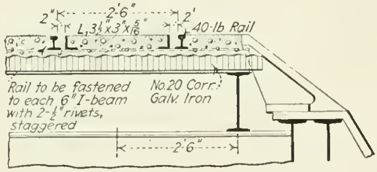
Concrete and Steel Charge Floor

By Percy E. Barbour*

Much trouble was experienced at a Tennessee smelting plant by reason of ore dropping through chinks in the feed floor, close to the blast furnace, where castings and pipes prevented joints from being dirtproof. A shower of dust on the back of his neck would effectually dampen and restrain the efforts of the man below punching the tuyeres, and a piece of ore the size of a walnut would make a bad cut. Finally something had to be done. The old charge floor was replaced with a new one having arches of corrugated galvanized steel covered with concrete. This made it possible to make a perfectly dustproof charge floor at the odd corners of the furnace castings and no further trouble was had with the tuyere punchers on this account. The floor was durable and satisfactory in every way.



SECTION OF CHARGE FLOOR


2"
2'6"
2'
L, $3\frac{1}{2}$"x3"x$\frac{5}{16}$"
40-lb Rail
Rail to be fastened to each 6" I-beam with 2-½" rivets, staggered
No.20 Corr. Galv. Iron
2'6"

SECTION OF CHARGE TRACK

Eng & Min Journal

Galvanized-Iron-and-Concrete Blast-Furnace Feed Floor

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Rubber-Belt Data

Some interesting suggestions and data on the use and selection of rubber drive belts are given in a booklet on "Mechanical Rubber Goods," issued recently by the Goodyear Tire & Rubber Co., Akron, Ohio.

Not more than a 5-ply belt should be used on an 18-in. pulley, a 6-ply on a 24-in., and an 8-ply on a 36-in. pulley. The pulley face should always be wider than the belt. Large pulleys are desirable, since the larger the pulley, the less strain is there on the belt.

Four-ply rubber belt is equal to a single leather belting. Six-ply rubber belt is equal to a double leather belting. Rawhide lacing is preferable to clamps or hooks. In case a step splice is used, run the belt *with* the splice rather than *against* it. If dressing is required, use boiled linseed oil. Avoid the use of cross belts if possible. Cut ends square and the belt ⅛ in. per ft. shorter than the measured length around the pulleys.

The following is a simple method of obtaining the horsepower of a belt: Multiply together the number of plies in the belt, its width in inches, the pulley diameter in inches, and the speed in number of revolutions per minute, then divide by 12,000. To find the proper weight belt to be used, multiply the horsepower by 12,000 and divide by the product of the belt width in inches, the pulley diameter in inches and the pulley revolutions per minute.

To find the width and weight of belt, multiply the horsepower by 12,000; multiply the pulley diameter in inches by the r.p.m.; divide the first by the second and then divide by various numbers of plies till a desirable corresponding belt width is secured. To find the speed necessary, other conditions being fixed, multiply the horsepower by 12,000 and divide by the product of the number of plies in the belt, the width of the belt in inches, and the pulley diameter in inches.

To compute the length of an endless belt, add the sum of the diameters of the pulleys in feet, multipled by 1.57, to twice the distance from center to center of the pulleys. To this add the difference in the diameter of the pulleys multiplied by itself and divided by four times the distance from center to center. When ordering endless belts, always give steel-tape-line measurements about the pulleys, or the exact figures.

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General Considerations Concerning Copper Leaching

The introduction to Stuart Croasdale's paper, "Leaching Experiments on the Ajo Ores," read at the Salt Lake meeting of the American Institute of Mining Engineers, is a good epitome of the underlying factors considered in choosing a copper-leaching process. The following are excerpts from this portion of his paper which apply to low-grade deposits of mixed oxide and sulphide ores in an arid region.

Methods of Treatment

It will be seen that the problem demands simplicity of process and large scale of operations. Whether the ore should be taken to water or water brought to the ore is a factor to be considered, and may depend to a certain extent on the method of treatment adopted, when freight and fuel costs are estimated.

Methods of leaching with solutions of reducible salts, like ferric sulphate, ferric chloride and cupric chloride, have some advantage in their solvent power on cuprite and chalcocite or other intermediate sulphides, but have little action on chalcopyrite. These salts are expensive and their value as commercial solvents depends upon their regeneration by some cheap method of oxidation after the dissolved copper has been precipitated. This difficulty has not yet been overcome, nor have those of the sulphurous acid and ammonia processes.

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Two reliable methods, however, are available. One of these is the old Henderson process of roasting with salt, and the other is leaching the raw ore with sulphuric acid. Under the former, I include the so called sulphatizing roast of Wedge, and the modification used at Anaconda.

A comparison of these two methods may be made briefly as follows: With the chloridizing roast, all ores could be treated by the same process. This would mean the construction of only one plant. The average extraction of the copper would probably be higher than with acid leaching, and the small amount of silver in the ore would be largely recovered. By mixing the ores, little if any sulphur would have to be added as pyrite. The only chemicals required would be salt, to the extent of 5 to 10% of the ore treated, and possibly a small amount of pyrite ore. There would be less corrosive solutions to handle. There would be a minimum amount of iron and alumina passing into solution. There would be no appreciable absorption of copper by slimes.

On the other hand, this method would require dry crushing of the ore to 20 or 40 mesh, which would be troublesome if not prohibitive on the oxidized ores on account of the difficulty in controlling the poisonous dust, in addition to the expense of grinding. It would involve a roasting cost. It would mean a more expensive plant, and a more extensive plant for the same capacity, due to the slower percolation of the fine material, which would require a much larger vat area of less depth to hold the tonnage required. It would mean a supply of cheap salt. A chemical precipitant would probably have to be used to recover the copper.

By leaching with sulphuric acid, the oxidized ore can be treated raw and need not be crushed finer than ½ in. or 2-mesh size. Sulphuric acid can be made as a by-product at a roasting plant, or if the calcines are converted into sponge iron and used as a precipitant for copper, the low-grade pyrite can be cheaply transported and acid made at the mine.

On the other hand, sulphuric acid alone will extract none of the copper existing as sulphide, only half of the copper existing as cuprite, and may be indifferent about the silicate of copper. It will extract none of the precious metals. Considerable iron and alumina pass into solution as readily as the copper, which will seriously interfere with any form of electrolytic precipitation and render the amount of acid regenerated a doubtful asset when compared with the amount consumed. As an offset to this objection, some of the iron is in a ferric condition, which assists materially in the solution of the minerals mentioned above.

If acid is made elsewhere than at the leaching plant, it will have to be transported in tank cars, which will have to be returned empty. If acid is made at the mine from low-grade pyrite, a gain will be made in transportation, but the cost of an acid plant will be added to the cost of the leaching plant and the calcines will have to be utilized. Almost an entirely new plant will have to be constructed for treatment of the intermediate and sulphide ores. The problem is clearly one in arithmetic as well as metallurgy.

Repairing Pipe Leaks

I have found the following repairs successful, says James E. Noble, in *Power*. A 4-in. cast-iron pipe broke apart under a building foundation. To have the water on again as soon as possible, I used the clamp *A*, 6 in. wide and $\frac{1}{4}$ in. thick (Figs. 1 and 2), with sheet-rubber packing wrapped around the pipe, and two pieces of sheet copper *D* and D_1 6 in. wide, where the edges of the clamp came together. This job was done seven years ago and is still satisfactory.

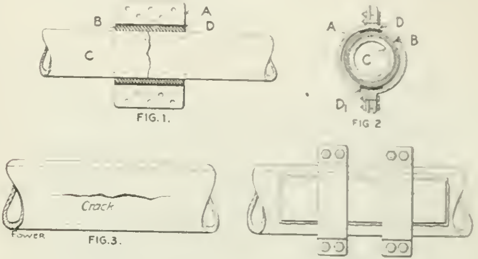


FIG. 1. FIG 2 FIG. 3. FIG 4

Broken Pipes Clamped

Another 6-in. cast-iron water pipe had a 15-in. crack, Fig. 3. A piece of $\frac{1}{4}$-in. iron 4 in. wide formed to the shape of the pipe, with sheet rubber placed under it, was clamped over the break, Fig. 4. This has also proved successful.

A 3-in. steam pipe leaked at the flanges, because the threaded ends were badly corroded. A copper sleeve and a 5-in. pipe 8 in. long were slipped over the open ing after the flanges were removed, Fig. 5. The space between the outside of the 3-in. pipe and the inside of the 5-in. pipe was then filled with Smooth-On, iron and elastic cement mixed. Heat from a blow-torch was then applied for half an hour, and in two hours steam was turned on.

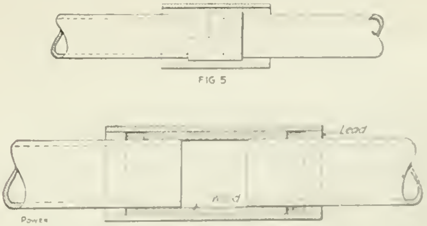


FIG 5 FIG 6

Pipe Ends Joined with Sleeves

In extending a cast-iron water main it was found that what should have been the connecting length was a foot short and there was no more pipe of the same size on hand. Instead of sending to the city for a pipe and sleeve, one of the men went into the workshop and in a few minutes turned out a wooden sleeve 16 in. long to fit over the pipe. Next a 20-in. piece of larger pipe was cut and placed over the pipe ends and the wooden sleeve, Fig. 6. The joint was then run with lead in the usual way.

Mining & Metallurgical Machinery

Ready-Made Houses

Building a house is usually considered a question of proper combination of art and money in the thickly populated districts, but in the mining camps it is likely to be anything for a shelter. Inconvenience and ugliness are characteristics of the camp dwelling, added to which it is usually expensive. A way to obviate these difficulties, however, is presented by the North American Construction Co., of Bay City, Mich., makers of Aladdin houses. This company controls a number of lumber-producing plants, and has built up a business in furnishing all the requirements for a complete building, the material being all cut to proper dimensions for immediate erection.

A Ready-Made Home

It is, in effect, a "knock-down" house, but not what is generally known as a "portable" house, since the latter class is intended for removing from one site to another. Aladdin houses seem particularly adapted to mining camps, since the designs run from the simplest workman's cottage to the pretentious home of the manager, embracing all grades between. They are reasonable in cost and great time savers, as they can be erected quickly. Every piece is marked in a way to show its use and location, just as structural steel is prepared and marked in the shop for erection.

A Small Refrigerating Apparatus

The Montclair Refrigerating Corporation has brought out a small refrigerating apparatus that ought to be a boon for the mess houses and club houses of mining companies operating in tropical countries or in any region where ice be not easily available. The apparatus is a self-contained machine comprising an electric motor and a rotary compression pump. The refrigerating agent is ethyl chloride. The pump compresses the gas in an upper or condensing cylinder. The liquid is sent through an expansion valve into a coil where it expands into a gas again (causing refrigeration), the gas being drawn back to the compressor, thus completing the cycle of operation.

The apparatus is easily fitted to any ordinary ice box, the expansion coil being dropped in through a hole cut in the top so as to take the place of a cake of ice. It is also fitted with means for giving a supply of ice for table purposes.

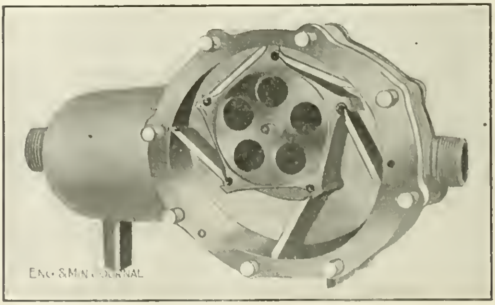
The apparatus is made in three sizes, the smallest requiring a $\frac{1}{8}$-hp. motor and the largest a $\frac{1}{2}$-hp. motor. The smallest apparatus costs $165; the largest $325. In its operation the apparatus is automatic, being controlled by a thermostat.

Compressed-Air Meter

A meter which measures easily and accurately the amount of compressed air being used by any tool or flowing through any pipe line is an instrument which should find much use and favor among mining men. The Kreutzberg Volumetric Meter, placed on the market recently by J. S. McChesney & Co., Chicago, is designed to do this.

The meter operates on the principle that if the flow of a fluid through a container be divided into sections of definite volume and the number of sections be recorded as they pass a given point in a given time, the result is the velocity and volume of the fluid.

This illustration shows a cross-section of the meter. The flow of the air is divided mechanically into sections of definite volume and the number of revolutions of the drum is recorded on a register which gives direct readings of the flow. The pressure on each side of the vanes is theoretically the same, and in practice differs only by the energy required to rotate the drum. In pressures greater than five pounds this amount is negligible. The wear on the vane is at the end and this is automatically taken up. The energy actually required to operate the meter is a small fraction of an ounce.



Compressed-Air Meter

The machine is constructed entirely of phosphor bronze, to prevent erosion, and the machining is accurate to within 0.00025 in. The meter is made in sizes capable of recording capacities from 0 to 75 to from 0 to 700 cu.ft. per min. The former is made for a $1\frac{1}{2}$-in. and the latter for a 2-in. pipe connection. Larger sizes can be made. Not alone air but such commodities as oil, alcohol, turpentine, gas and steam under high pressure can be rapidly measured in commercial quantities with this meter, but its possibilities for mines in connection with the measurement of compressed air are unusually interesting. Undoubtedly, much efficiency is lost in the utilization of compressed air in rock drills. Up to date, so far as known, there has been no ready means of determining just exactly the amount of air a drill uses under any given conditions; the air it is using today as compared with a month ago, etc. It is quite likely that many drills do very inefficient work, as regards consumption of air, six months after being installed. If they are merely overhauled generally at regular intervals or specific repairs made, it does not follow that the drill as repaired is consuming the amount of air it should, unless the drill has been positively tested, under the same conditions, before and after. The Kreutzberg meter can be cut in on the line of any drill. It would seem that efficiency engineers, particularly, should be interested in this machine.

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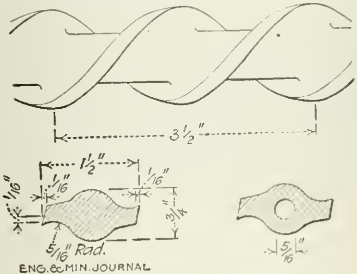
Spiral Drill Steel

Spiral steel has long been used in coal mining, where it serves for making coal augers, but in metal mining there has been no use made of it, except to a small extent recently in iron mining. Believing that it may have some advantages in hard-rock work, the Forsbacka works, of Sweden, makers of the well known Fjab steel, have produced a rolled spiral shape which is now offered for trial. The accompanying illustration shows one form of the spiral bar in detail. It may be had solid or hollow, as desired. Many other variations of special bars are made. A. Milne & Co., 745 Washington St., New York, are American sales agents for all the Fjab steel products.



Spiral Drill Steel
Solid and Hollow.

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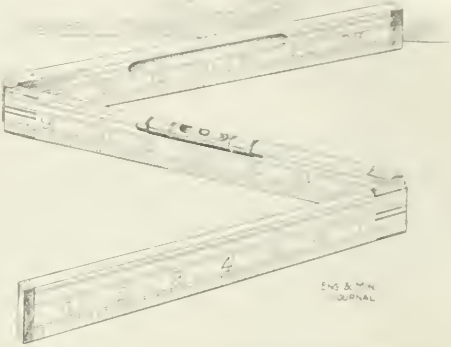
New Jackhamer Auger Record

In the Journal of Oct. 24, some results were given of operations with the Ingersoll-Rand Jackhamer auger drill at the Cavour mine on the Mesabi range, Charles H. Claypool, superintendent. It was stated that previous to the installation of the auger drills, the production ran about 3.75 tons per man for every man employed, while with the new drills and mining system this figure was increased to 5.25 tons. Since then, Mr. Claypool has advised that the tonnage figure has been increased still further. The average production, including all surface men, even himself, has reached as high as 6½ tons.

A Combination Pocket Rule and Level

The Lufkin Rule Co. has brought out an ingenious pocket rule and level, which is shown in the accompanying engraving. When folded it is but 8 in. long. When open it is 2 ft. The joints being stiff, this affords a long base. The design of this instrument is ingenious, and being substantially made, it is a practical tool in every way.



Lufkin Combination Rule and Level

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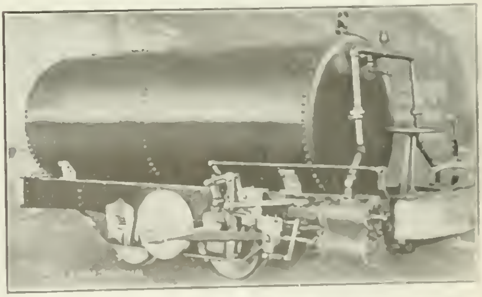
Compressed-Air Locomotive for Victoria Mine

The Journal for Sept. 12 contained an article describing a compressed-air locomotive which the Lake Shore Engine Works, Marquette, Mich., built recently for the Victoria Copper Mining Co., in the copper country. This locomotive is shown in the accompanying illustration. It was constructed according to the designs of George Hooper, superintendent of the mining company, and is the first low-pressure air locomotive ever built for use in the Lake Superior copper country.



Compressed-Air Locomotive for Victoria Mine

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A New Dipper Handle for Dredges [illegible]

Photographs from the Field

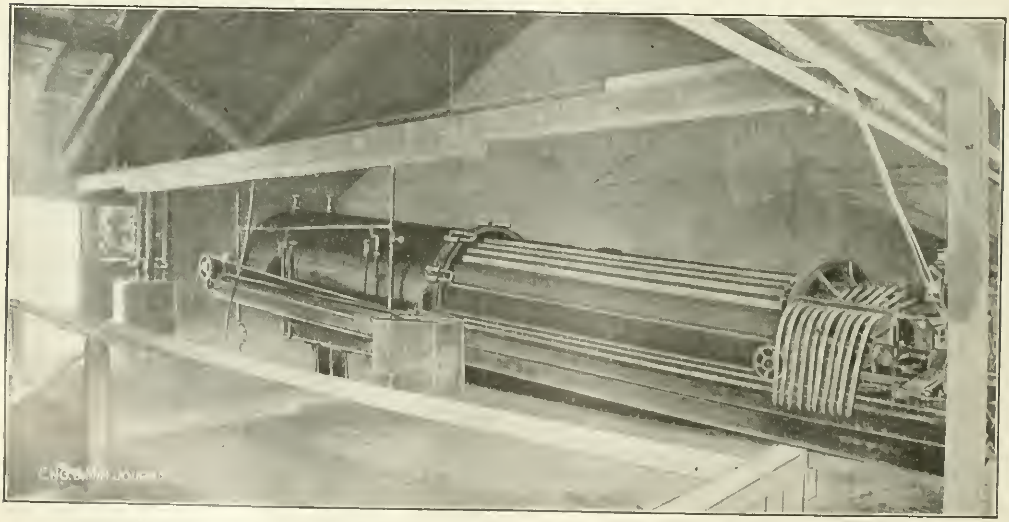
GETTING A LARGE TUBE MILL INTO MANHATTAN, NEV.

A 5x20-ft. mill for the Big Pine ground. The shell weighs 14 tons, and is drawn by a team of 18 horses.

THE WHITE PINE COPPER CO.'S PROPERTY, ONTONAGON, MICH.

General view, showing the shaft houses, boiler house and residences.

The new stamp mill having 1000 tons daily capacity. Crushing plant is behind the building.

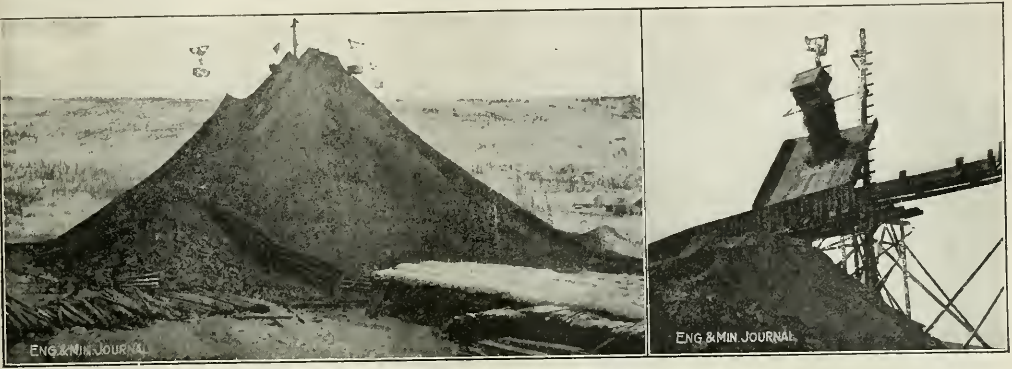


A 100-TON KELLY FILTER PRESS AT BUTTE & SUPERIOR COPPER CO.'S MILL, BUTTE

Three of these presses are installed and are used for drying flotation concentrates.

WHITESIDE DRIER INSTALLATION ON THE MESABI RANGE

Rotary tubular drier reduces moisture from about 16% to 7 or 8%. Ore issues principally in agglomerated balls. Each drier, 9x75 ft., handles 50 to 75 tons per hour. Photographs show the driers, the dry ore discharge into cars, and the coal chutes in the rear.



GRAVEL HANDLING IN THE FAIRBANKS DISTRICT, ALASKA

A single ginpole serving for four gravel buckets.

Dumping gravel into the sluice head.

GRAVEL-WASHING OPERATIONS AT FAIRBANKS, ALASKA

Winter dumps ready for spring sluicing.
Sluiceway, and bucket dumping on apron.

Old opencut mining system, using wheelbarrows.
The cleanup after sluicing part of a winter dump.

NEW PUBLICATIONS

THE STONE INDUSTRY IN THE UNITED STATES IN 1913. By Ernest F. Burchard. Mineral Resources of the United States, 1913, Part II. Pp. 126, illus. U. S. Geological Survey, Washington, D. C.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, VOL. VI. 1913. 6¼x9¼, pp. 268, illus. Published by the Institute at the office of the Secretary, Cooper Union, New York.

PETROLOGY AND MINERAL RESOURCES OF JACKSON AND JOSEPHINE COUNTIES, OREGON. By A. N. Winchell. "The Mineral Resources of Oregon, Vol. 1, August, 1914." Pp. 265, illus. Oregon Bureau of Mines and Geology, Corvallis, Oregon.

ROBERTS-AUSTEN. A RECORD OF HIS WORK. Compiled and Edited by Sydney W. Smith. 9x6½, pp. 382, illus. Charles Griffin & Co., Ltd., London: J. B. Lippincott Co., Philadelphia.

Roberts-Austen published one famous treatise, his "Introduction to the Study of Metallurgy," which immediately became a classic of the literature. Apart from this his contributions were confined to papers presented to several scientific and technical societies. These have now been collected in a memorial volume by one of his former assistants, who prefaces them by appreciative and interesting biographical notes of their distinguished author. Roberts-Austen is one of the great names in metallurgy and it is fitting that there should be this memorial to him.

THE DEPOSITS OF THE USEFUL MINERALS AND ROCKS, Vol. I. By F. Beyschlag, J. H. L. Vogt, and P. Krusch. Translated by S. J. Truscott. Pp. 514, illus. MacMillan & Co., London. Price, $5.

The very important treatise on ore deposits by professors Beyschlag, Vogt and Krusch has already been reviewed in the "Journal." It is satisfactory that S. J. Truscott, a well known mining engineer of London, is making it available to those geologists and engineers who do not read German. His translation is well done. There will be three volumes.

STRUCTURAL ENGINEER'S HANDBOOK. DATA FOR THE DESIGN AND CONSTRUCTION OF STEEL BRIDGES AND BUILDINGS. By Milo S. Ketchum. 6x9¼, pp. 896, illus., leather; $5. McGraw-Hill Book Co., New York.

We have often had occasion to speak favorably about Professor Ketchum's books, and we do not have to change our note with respect to this last one. Its title is fully descriptive and we will be brief in the recommendation to every structural engineer to get it. This applies to engineers engaged in mining and metallurgical constructions as well as other kinds. What amazes us about Professor Ketchum is his ability to turn out excellent work with such rapidity. His publishers list six important treatises and hand-books that have appeared in less than a dozen years. Besides his engagement in the preparation of these, Professor Ketchum is Dean of the College of Engineering and Professor of Civil Engineering in the University of Colorado, and is a consulting engineer with a considerable practice in Denver. The evidences of his industry excite universal admiration.

THE SAMPLING AND ASSAY OF THE PRECIOUS METALS: COMPRISING GOLD, SILVER, PLATINUM, AND THE PLATINUM GROUP METALS IN ORES, BULLION, AND PRODUCTS. By Ernest A. Smith. 6¼x9, pp. 460, illus.; $4.50. Charles Griffin & Co., Ltd., London, Eng.

The chapter headings are: Introductory, design and equipment of assay office; assay furnaces; furnace implements; balances and weighing; gold and silver, physical and chemical properties; valuation of ores, sampling; preparation of samples for assay; fluxes and other materials employed; principles of fluxing; assay of silver ores; assay of gold ores; assay of complex ores; special methods of ore assay; bullion, valuation and sampling; assay of gold bullion; assay of silver bullion; assay of base bullion; assay of industrial gold and silver alloys; assay of metallurgical products; assay work in a cyanide mill; platinum and metals of the platinum group; the assay of platinum.

In general this book is stronger on the assaying than it is in sampling. The questions of the accuracy of machine sampling and wherein the chances of error lie, are treated in a very perfunctory manner. The sampling of copper bullion is barely touched upon, and antiquated and worthless methods given. The sampling of precious-metal bullion is treated in much better style, but the American sampler, except in offices where gold-silver alloys, sweeps, etc., form the bulk of the work, has little to learn from this book.

The assay methods are of a higher standard, but even there, the methods for copper bullion are poor; the sulphate method not being touched upon at all.

Hydraulic Mining at Circle

By Hubert I. Ellis*

Handling gravel by means of the hydraulic giant has never found wide application in the interior of Alaska, chiefly owing to the low gradients of most of the creeks, the difficulty and expense of obtaining sufficient water during the dry season, and the depth of bedrock. Except at Valdez Creek, which is not in the Yukon drainage, the only really successful installations have been in the Circle district, and possibly in the Fortymile. Some six or eight small plants were in operation last season in the vicinity of Circle, most of them small and comparatively simple. It is the usual practice to elevate the tailings with one of the giants, since this requires less water than the hydraulic elevator and is more applicable to small installations. The following notes are based on recent operations at the plant of Theron E. Fell, on Mastodon Creek, Circle district.

The ditch system carries an average of four sluice heads of water about 4 cu.ft. per sec. to the penstock, which delivers it to the mine under a head of 100 ft. The penstock is 2500 ft. long and includes 1000 ft. of 14-in. pipe and 1500 ft. of 10- and 8-in. pipe. The equipment includes four gates, two No. 1 giants, and one No. 2 giant.

The sluice boxes are 30 in. wide and are all fitted with simple block riffles, except one that has patent riffles and undercurrent for saving fine gold. Since the gravel is thoroughly washed before entering the sluice, it has been found that six boxes, each 12 ft. long, are sufficient. They are set near bedrock, with an open sluiceway to remove tailing. The operators are able to ground-sluice a cut 200x175 ft. and 8 ft. deep into and through the boxes before it is necessary to do any piping.

For stacking tailings, all the boxes are discharged into a common sump and with a No. 2 giant the gravel is piled 35 ft. high without difficulty. When water is slack, a bottomless scraper of 1 cu.yd. capacity is used to assist the giant; this is seldom necessary, however.

The depth of the alluvial material is about 9 ft.; from 2 to 4 ft. of coarse, slabby bedrock is also removed, making a total average depth of 12 ft. of material handled. With a 100-ft. head of water, it is possible to raise fairly heavy slabs of bedrock and to work the ground absolutely clean without crevicing. Men with wheelbarrows are employed to remove the larger boulders and pieces of bedrock. It is immaterial whether the ground is partly frozen or not, since in working frozen material the giants move all that the boxes can carry. With six sluice heads of water, excluding from calculation the time required for cleaning bedrock, 600 cu.yd. a day has been handled in partly frozen material. This corresponds to a duty of 2½ cu.yd. per miner's inch per day of 20 hr., but it must be remembered in making comparisons that the head is only 100 ft. and that part of the water is used in stacking tailings.

When water is plentiful the day shift consists of three nozzle men and two rock wheelers, while the night shift consists of three nozzle men and one rock wheeler working part of the time. When water is low and the reservoirs are brought into play, three men work each shift, wheeling rock, making repairs, etc., while waiting for the reservoirs to fill.

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*Mining engineer, 4352 Ninth Ave. N. E., Seattle, Wash.

In a typical season, operations on the first cut began May 14, before the surface ice had entirely disappeared, all work being done in frozen material. The cut, 150x 170 ft. and 12 ft. deep, was cleared by June 2, a total of 20 days, at an expenditure of 165 shifts of labor, representing $1290 for wages and board. Measurements show that 11,552 cu.yd. of gravel was removed, an average of nearly 600 cu.yd. a day; the operating cost was about 12c. per cu.yd. Later in the season, when low water forced intermittent operations, the cost averaged from 14 to 17c. per cu.yd., and when the water was at the lowest stage the cost rose to 21c. These figures represent operating expenses only, no charge being made for superintendence, interest, depreciation, or for moving and setting up the plant.

It has been proved that small hydraulic plants are best for the interior of Alaska, since they can be operated at low stages of water when a larger plant would be partly or wholly idle. Their low first cost and ease of installation are also important advantages where capital is limited and the workable deposits of gravel comparatively small. This is well illustrated by the work done by the Berry interests in the Bonnifield district, where $100,000 was lost in attempting to install and operate a fairly large plant; the greatest trouble here came, however, from the periodic failure of the ditch system. The same trouble has been met throughout the North where ditches are made in muck and other frozen material, but the general experience has been that after two or three years they cease to be so troublesome. The development of tailings congestion, added to ditch difficulties, led to the abandonment of this undertaking.

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The International Zinc Convention

According to the *Borsen Zeitung* (Berlin), through the *Chemical Trade Journal,* it appears that the dissolution of both the International Zinc Convention and of the German Zinc Verband is imminent, the war having made it impossible to carry out a large number of the contracts previously entered into.

The International cartel consists of three groups—viz., the German Association, including the majority of the Belgian works, which were largely founded on German capital, the French group, and the English works.

The German-Belgian group has the character of a definite cartel, fixing both price and output, while the French and the English works are only associated in so far as determination of output is concerned. The German group, to which the most important Austrian works also belong, is responsible for about one-half of the world's total production of zinc and nearly three-quarters of the European output.

Certain German works which had announced their determination to secede from the German union at the end of 1914, now take up the attitude that, owing to the outbreak of war, and consequent falling away of the English and French groups from the International Convention and also the inability of the Belgian works to carry out their contracts, not only the International Convention, but also the German association, is to be regarded as dissolved. This point of view is not accepted by another portion of the German works, which contends that contracts are not rendered void by the war, but merely are suspended. It is at present uncertain whether the whole question will be contested at law.

[The matter of contracts for ore supplies, sales of metals, etc., that have been interrupted by the war, is a very bitter subject among the respective parties, especially if they happen to be of hostile nationalities, and many hard feelings are developing in this way.—Editor.]

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Samuel Benedict Christy

By R. W. Raymond

The death of Prof. Samuel Benedict Christy on the 30th of November, at the age of 61 years, cuts short a brilliant and influential professional career. He was born in San Francisco, Aug. 8, 1853, and was graduated as Bachelor of Philosophy at the University of California in 1874. For the five years that followed, he studied mining and metallurgy as a post-graduate in the same institution, serving also as instructor in analytical chemistry, and becoming in 1879 instructor in mining and metallurgy—a position which he held until 1885. During this period he became known also by his contributions to technical literature, the earliest of which, perhaps, was his report on the Monte Diablo coals (in 1875); but the first which drew my attention to him was an exceedingly able discussion (in 1879) of the genesis of the quicksilver deposits of California, in which he followed with much acuteness and originality the lead of Professor Becker, who had been teaching at the University of California. The notion of the thermo-aqueous formation of such deposits was then new; and the laborers in a field

Samuel Benedict Christy

now familiar to every student deserve the credit due to pioneers.

For some years the subject of quicksilver seems to have occupied much of Christy's attention. In 1877, he described the mines and works at Almaden, Spain; in 1884, the Imperial quicksilver works at Idria, Austria; in 1889, the New Almaden mines of California.

But his great work was the creation of the school of mining and metallurgy at the University of California, which may be said to have begun with his occupancy of a full professorship of these branches. It is not necessary here to recount the early difficulties and perils of the University, and its long struggle for academic independence of political control or interference. The battle is over, and the institution is now upheld by the intelligent loyalty of the citizens of California, without regard to party. But while the issue was uncertain, the development of special schools of applied science was scarcely practicable. Doctor Becker and William Ashburner had given up the school of mines as a hopeless task when Christy, younger and less experienced, took it up. As he wrote me in February, 1901—

> I took an empty building without equipment, and with half a dozen students. Now I have a fully equipped department, adapted to our local needs better than any I have seen in the world. I have now nearly 250 students; and I am willing to compare the record of our graduates, now scattered all over the world, with that of any other institution of equal age.

The secret of this success lay in the enthusiasm, pertinacity, industry and personal charm of Christy himself. He was able not only to inspire his students, but to impress upon their parents and the public at large the value of the thorough training given them under his direction. His own example was contagious. Besides the practical labors of his office, he prosecuted laboratory researches of the most delicate and complicated character, in which it was a privilege for any student to be his assistant.

Before the famous Hearst building was erected and equipped for the School of Mines, Professor Christy traveled through Europe, inspecting the great laboratories and plants of technical instruction. By that time, his work had made him widely known; and I remember still with what simple-hearted surprise he expressed his gratitude for the reception he had encountered abroad.

Yet this already illustrious teacher, investigator, organizer and leader, who was delivering every year to scores of young graduates their diplomas as mining or metallurgical or chemical engineers, held no degree himself, except the primary baccalaureate in philosophy, required before he began his technical course. The reason was that in 1879, when he finished that course, the University of California was not yet granting technical degrees.

In 1902 Columbia University put an end to this anomaly by conferring upon the head of the California University School of Mines—one of the foremost rivals of its own school—the honorary degree of Doctor of Science. This graceful recognition was creditable alike to giver and recipient, and it was a great joy to Professor Christy, after his long and arduous labors in a distant field, to be thus received into the academic brotherhood. He traveled extensively at that time in the Eastern States and the Lake Superior region, studying everywhere with keen observation the methods and appliances of mining and metallurgy. In June, 1902, just after he had received his doctor's gown, he wrote me:

> We went today through the subway with Mr. Parsons and examined the part where the landslide took place. They secured the mining ground in a most original way—ran in several thousand barrels of cement grouting—and are now drilling and blasting out the cemented ground. Verily, you do wonders here in New York!

I cannot at this time present a complete catalog of Professor Christy's published works and professional activities. A man so intensely and continuously active in so many directions leaves "footprints on the sands of time" too numerous to be traced and interpreted by a hurried reporter. I know that he discussed in 1891 the practice of chlorination at the Alaska-Treadwell mine; that he was engaged for a series of years in the U. S. Circuit Court as an expert in the metallurgy of quicksilver and of lead; and that in 1900, as the result of patient and thorough experiment, he patented an improved process for the recovery of gold and silver from dilute cyanide solutions. And I know that to the *Transactions* of the American Institute of Mining Engineers (of which he became a member in 1883, and was a vice-president in 1891 and 1892) he contributed a series of highly original and important papers on the metallurgy of gold, silver and mercury, and on the training of mining engineers and the relation of American mining schools to the mining industry, as well as a remarkable biographical notice of Joseph Le Conte, his friend and colleague, which has been recognized as the most appreciative and satisfactory of the tributes paid to that illustrious and beloved leader and teacher. But beyond this list, which is enough of itself to secure for Professor Christy a permanent place in the history of American scientific and technical progress, there remains his work in connection with the California Academy of Sciences (of which he was a life member, and for five years corresponding secretary), the Society for the Promotion of Engineering Education (of which he was three years vice-president), the California Miners' Association and other bodies.

I cannot altogether forbear, though I hesitate, to speak of more sacred things—of his marriage in 1881 and the companion who is left desolate by his departure; of the anguish which they suffered in the death of a son on whom their hopes were set; of the close sympathy into which I was then drawn, by reason of my own similar bereavement, and of the unbroken loyal friendship, both before and after that event, which time did not, and death cannot, impair. I rejoice that a quick and peaceful end has crowned a fruitful life, and that the bright, strong spirit of my dear friend, "crossing the bar," went out to sea through the Golden Gate he knew and loved so well.

German Metal Production in 1912

In 1912 there were 11 German works producing copper, lead, gold and silver, employing 9068 laborers. The production figures were as follows: Furnace-refined copper, 35,982 metric tons; electrolytic copper, 9483; cement copper, 3982; copper ore, 2574; bronze and brass, 3251; copper sulphate, 5955; soft lead, 165,865; hard lead, 10,768; work lead, 15,985 metric tons carrying 27,386 kg. of silver; silver contents of silver bars, 895,830 kg.; gold, calculated as fine gold, 43,412 kw.; doré, carrying 107,305 kg. of silver and 608 kg. of gold; residues carrying 19,368 kg. of silver, and 272 kg. of gold; lead oxides, etc., 4135 metric tons; purple ore, 308,707; zinc sulphate, 6413 metric tons.

There were 31 zinc works operating, employing 13,108 aborers, producing 187,697 metric tons of rough zinc; 81,464 of refined zinc; zinc dust and zinc oxide, 22,455; lead from zinc refining, 1513 tons; cadmium, 43 metric tons.

There were also produced 10,646 metric tons of tin; 32,232 metric tons of tin-scrap and 3091 metric tons of tin ashes.

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Meeting of Chicago Section of A. I. M. E.

Special Correspondence

The first meeting for the winter of the Chicago Section of the A. I. M. E. was held at the Chicago Engineers' Club, on the evening of Dec. 12. About 25 members were present for the dinner, and this number was increased to 30 before the close of the evening. The section was fortunate in having for its guest, in addition to Charles H. MacDowell, president of the Armour Fertilizer Works and the speaker of the evening, Bradley Stoughton, secretary of the Institute, who came to Chicago especially for the meeting.

Following the dinner, Chairman Robert W. Hunt introduced Mr. Stoughton, who responded with an interesting address in which he outlined briefly the activities of the Institute during the last year. He told something of the new sections that have been formed, mentioning particularly the Chicago, Pittsburgh and Pennsylvania Anthracite sections and describing in a general way the manner in which they hold their meetings, etc. The quantity and quality of papers that the Institute has received for publication this year have been gratifying and have far exceeded the average for years past. This has led to an unusual amount of increase in publishing and corresponding expense, and he said that it would be necessary to reduce this amount of publishing in the future or the Institute would be swamped.

He went into the matter of the various prizes, including the Hadfield prize of $1000, that are now available as awards for research work; the committees that had been appointed to coöperate with the Bureau of Mines and other Government bodies, and expressed the hope that the work of these committees would be helpful and continued. The Institute finances, he said, are in good shape, despite the fact that the receipts for several months have been seriously affected by the European war. Notwithstanding this and the increased publishing of bulletins, no increase of dues will be necessary now.

Secretary Stoughton closed his remarks by referring to the amendments that will soon be submitted to the members for their approval. There are three of these, and the most important of them is the one which, if passed, will authorize the officers to depart from the tradition of the Institute of 43 years' standing in the matter of questions of public interest. This amendment would enable the Institute to place itself on record and express itself on such questions as mining laws, etc. This matter, he said, has been ably debated on both sides, is a very important one and will likely cause some bitterness. He urged that when it comes before the members for their approval or otherwise, it be given the most serious consideration and thought, before final action is taken.

At the conclusion of Mr. Stoughton's remarks, Chairman Hunt introduced Charles H. MacDowell, who then read a paper on "The Present State of the Potash Industry," on which he is a recognized authority, and his paper on this timely subject was intensely interesting. He has spent many years in the study and investigation of the occurrence and mining of potash, especially the German deposits, but perhaps the most interesting part of his paper was that devoted to the possibilities for securing our supplies of potash from within our own borders; research and experiment work that has been done here with that object in view, and the success of the various attempts to date. The paper aroused much discussion, and Mr. MacDowell's prompt answer to all questions showed his thorough knowledge of the subject. Samples of potash salts were passed around, and geological maps of Germany, showing the location of the deposits and mines, were available.

The meeting closed with a short address by Prof. Henry W. Nichols, secretary of the Chicago Section, in which he said that plans are under way to hold a meeting in January, at which it is hoped to have Professor Moore, of the Bureau of Mines at Denver, to deliver a paper on "Carnotite." Should it be impossible to make this arrangement, a paper on "Ferromanganese," or some other timely subject, will be given.

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American Mining Congress in Phoenix

The 17th annual meeting of the American Mining Congress opened in Phœnix, Ariz., on Dec. 7. A noteworthy feature of the first day's session was a letter of greeting from President Wilson. The President's letter laid particular emphasis on the work of the Congress in promoting the interests of safety in the mining industry through its successful efforts to create the Bureau of Mines.

He urged further effort in safety work in order to reduce the number of deaths and injuries in the mining industry, still unnecessarily high. The President also called attention to the necessity of considering the conservation and proper use of the nation's mineral resources.

In the second day's session the methods of taxation of metal mines were discussed. There was a spirited debate on this question. The ad valorem or physical-valuation system was supported by R. C. Allen, of Michigan; a system of taxation, however, based on net production was indorsed by the Congress.

Protection for American copper shipments and the opening of all possible markets for the metal by the several branches of the Government were demanded in a resolution presented by Charles W. Dern, of Utah, but no action was taken on this resolution. There was a general discussion as regards the creating of public interest in mining investments.

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Production of White Arsenic in 1913 in the United States amounted to 2513 short tons, according to the U. S. Geological Survey. This was all produced by the Anaconda Copper Mining Co., the United States Smelting Co. and the American Smelting & Refining Co. About 50 tons of paris green and london purple and 4701 tons of white arsenic and arsenic sulphide were imported, making the total consumption of arsenical compounds in the United States about 7500 tons, a decrease of 2500 tons.

Editorials

Pulp Constants

As an important labor-saving device which promotes accuracy and aids in securing reliable mill reports, we can think of nothing that is of more importance to the wet-milling industry in general than the extensive work on "Pulp Constants," which is presented in another part of the Journal. Professor Clevenger and his assistants have accomplished a noteworthy step in facilitating the work of mill operators.

In establishing the tonnage of slime-pulp charges operators have heretofore been accustomed to assume the specific gravity of the solution as 1, believing that while the actual figure was somewhat higher, it was not sufficiently so to influence the final result. We are now shown that this assumption is untrue, and that serious error in tonnage estimations may be introduced by neglecting the specific-gravity of solutions, particularly in the case of very dilute pulps. No one but the mill operator himself can truly value the importance of this information, since he has long been harassed by the difference between theoretical and actual recovery figures for which no accounting could be found. It is by no means impossible that much of the difference has been in tonnage estimation, both in the coarse-ore bins and in the pulp tanks. Professor Clevenger's work will have an important influence toward eliminating the latter.

Besides showing the sources of error, Professor Clevenger has outlined the best method of determining specific gravities of pulp and of dry slime, and has derived formulas by means of which any pulp problem may be solved. In addition to this, however, and most important to the convenience of mill operators is the fact that tables are presented whereby anyone working with any ordinary slime may determine the tonnages without any calculation whatever. The pulp weight and percentages for various specific gravities of dry slime are shown, and also the corrections for solutions of various specific gravities, all of these covering the ordinary range of milling work. For the convenience of those who desire to make their calculations by logarithms, corresponding tables are given which may be applied in ordinary routine work.

The convenience of this set of tables can hardly be overestimated. It will find an almost universal field of service in the cyanide process, particularly in those plants where a total slime is made. It will also be of great service in the practice of copper hydrometallurgy, serving to estimate tonnages of slimes in dilute or thick pulps. It will furthermore serve as a means of estimating the loss of light slimes in dam overflows or in mill-tailings discharges, a procedure which, due to the involved methods of calculation, has rarely been attempted. In fact, it is hard to say in what wet metallurgical process this article will not be helpful.

It is an unusual event for the Journal to publish a 16-page article in one issue, but the advantage of having it all together and in such form as to be of maximum service to the operator, has led to departure from the usual procedure. It is to be hoped that all of those interested in wet milling processes will appreciate the efforts of the author to bring long calculations into such form that they may be used without trouble or effort.

Professor Clevenger is to be congratulated upon the successful result of his endeavor to systematize these tonnage estimations. The Journal is glad now, as always, to present a feature of unusual interest and of great value to operators.

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The Hill Iron-Ore Lands

The final surrender of the Hill leases on the northern Mesabi by the United States Steel Corporation at the close of 1914 ends a period of eight years during which the Corporation's subsidiary, the Great Western Ore Co., has spent over $6,000,000 for development work and has mined approximately 27,000,000 tons of ore. At the time the lease was made, in 1906, the terms were considered rather onerous, and the opinion was freely expressed that the lease was made less for any profit there might be in it than to forestall the possibility of the absorption of these lands by a competing combination. This opinion was confirmed by the fact that notice of the surrender of the lease was suspiciously coincident with the beginning of the suit for the dissolution of the Corporation under the Sherman law.

The terms of the lease compelled the Steel Corporation to spend a large amount in development at once, in order to avoid the payment, without equivalent, of heavy minimum royalties. This was done and the result was the opening of eight large mines, which have been heavy shippers. The lease fell below its minimum for several years, as was inevitable, but gradually caught up until at the opening of the present year it was only about 440,000 tons behind. The minimum provided in the lease was 750,000 tons for 1907, the first year, and increased by 750,000 tons each year, so that the maximum for 1914 was 6,000,000 tons. The figures for the year have not been made up, but it is believed that the total ore taken out has been close to 6,500,000 tons, so that the lessee will come out even. To do this the Corporation mines on the southern and western Mesabi have been rather neglected and will make but a poor showing for the season. Next season, of course, their production will have to be increased.

According to the estimate of the Minnesota Tax Commission the Hill ore lands contain a little over 400,000,000 tons of iron-ore reserves, which can be increased by some deposits which may be made available by washing and concentration. The Great Northern Iron Ore trustees, in whom the titles are vested, have announced that arrangements have been made by lease or otherwise to continue the workings of the mines already opened. It is hardly likely that they will be pushed to their full capacity as they have been for the past two or three years; but allowing for less intensive working, this means that somewhere between four and five million tons will be added to the supply of merchant ore which is offered for sale to furnaces. This is more than the market will stand unless there be a large increase in demand. The Steel Corporation has abundant reserves for its own needs, and it may be some years before outside interests can take up the surplus which can be offered by the mines on the Hill lands.

An Arizona Decision Respecting Mining Rights-of-Way

The appeal of the Inspiration Consolidated Copper Co. vs. the New Keystone Copper Co. to the Supreme Court of Arizona was lately decided in favor of the New Keystone company. The property of this company separates the Inspiration and Live Oak branches of the Inspiration company. It was alleged by the Inspiration company, "That for the successful working of the Live Oak group of mines it is necessary and indispensable to have a right-of-way through one of the Keystone mines for the construction, maintenance and operation of a drift 9 ft. high and 11 ft. wide." The Keystone company having refused permission for this, the Inspiration started to drive it anyway, whereupon the Keystone obtained an injunction and a favorable verdict in the lower court, from which the Inspiration appealed to the Supreme Court.

We have previously referred to this case. The Supreme Court of Arizona has now decided against the Inspiration on the ground that the purpose for which the right-of-way is sought is clearly for a private use and not a public use, and therefore an act of taking for the purposes alleged would clearly be an unconstitutional exercise of the right of eminent domain. The removal of all doubts upon this point by the Supreme Court of Arizona is an important thing in connection with the mining industry of that state. As between the Inspiration and New Keystone companies, the natural result was the renewal of overtures by the Inspiration to purchase the New Keystone property, and an arrangement has been made whereby Inspiration will absorb Keystone, giving one share for nine.

California Redwood

California redwood is a remarkable material. It is a wood that is obtainable in large boards, is straight-grained, free from knots, is easily worked, being soft, and yet it is tough and durable. For the manufacture of tanks, rectangular and round, it is the ideal wood, and it has been extensively used for them in the cyanide process and in ore-concentrating mills. Lately it has been finding wide employment also in copper-extraction plants.

Apropos of the last use, Lawrence Addicks, who is certainly an authority, recently made an interesting remark in a technical meeting. Mr. Addicks lately changed from running a great copper refinery near New York to the direction of a copper-extraction plant at Douglas, Ariz. He said:

> There are two questions I want to ask. One is regarding the apparently remarkable wood in the West, which seems to withstand the acid liquors. I am used in all my experiences in electrolytic work in the East to see wood, after an exposure to sulphuric acid, reduced to a soft charcoal through which you can poke your finger. If redwood will withstand acid to the extent which my brief observation indicates, I do not see that there is any problem entailing the use of asphalt mixtures and other protective coatings for this work.

Other observers have been equally amazed when beholding the unlined redwood tanks at Butte, Mont., and elsewhere filled with acid liquor and apparently unaffected after prolonged use. It would be interesting to have a scientific explanation of the undoubted resistivity of redwood in this respect.

German-Owned Belgian Works

It has perhaps heretofore escaped general attention that some of the important metallurgical works of Belgium were owned and operated by Germans previous to the war. Thus, the zinc smelteries at Overpelt and Lommel are concerns of Beer, Sondheimer & Co., who are also heavily interested in Engis and Prayon, while the great silver-lead refinery of the Usine de Desargentation Soc., Hoboken-lez-Anvers, is a plant in which the Metallgeschaft and the Deutsche Gold- und Silber-Scheideanstalt are heavily interested. It is a fair assumption that special pains have been taken to keep these works out of harm's way. The refinery at Antwerp was uninjured during the bombardment and remained in operation up to Oct. 6. It then became idle, but German papers of the latter part of October reported that it would be put in operation again as soon as possible. According to recent reports zinc smelting is going on right along at Lommel and Overpelt, and but little damage is said to have been done to the works on the Meuse.

Anaconda Resumes Construction

It is reported that the Anaconda company will resume its plans for the reconstruction of its electrolytic refinery at Great Falls. The new plant will have a capacity of turning out 120,000,000 lb. of refined copper per annum. In some respects Great Falls is very well situated as a copper-refining point; in other respects it is not quite so well off. It enjoys uncommonly cheap hydro-electric power, and geographically a western refinery naturally commands the copper consumption of the Middle West. A New York refiner supplying a manufacturer in Detroit, for example, has to pay freight on copper from Montana to New York, let us say, and then back to Detroit, while the Western refiner can supply Detroit without paying any back freight. Such conditions permit copper refined in the West to come as far east as Rome, N. Y., in certain circumstances.

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Respecting the copper situation in Germany, a newspaper dispatch of last week reported that the scarcity had become so acute that domestic pans and kettles were being requisitioned for brass-making for cartridges; which is probably nonsense. However, with copper worth more than 20c. per lb., old copper kettles are a realizable asset and the junkmen of Germany are doubtless doing a good business. Another cable dispatch in the same paper said that the reason why the British are so slow in searching detained ships is that copper is being concealed *in* and *under* bales of cotton. About the *in* we guess it is nonsense. As to the *under* that is probably a fact. It is customary in loading mixed cargoes to put pigs of metal at the bottom. We never heard of stevedores loading metal on top of cotton.

BY THE WAY

The American Smelting & Refining Co. has leased quarters in the new Equitable Building, now nearing completion, at 120 Broadway. The lease covers a period of 10 years, at an aggregate rental of approximately $1,250,000. The company will occupy the entire 34th and half of the 35th floor in the new building, which has been erected on the site of the old Equitable Building, destroyed by fire several years ago. The Smelting Company, until the completion of the new building, which is expected to be ready by Mar. 1, 1915, will occupy its present quarters in the City Investing Building, at 165 Broadway.

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Apparatus described as a device for locating mineral deposits thousands of feet underground, which was established by men believed to be German engineers at Alamo, Lower California, is shown now to be a radio station equipped to operate over a radius of 2000 miles, says the N. Y. *Evening Post*. The plant was seized by Mexican authorities, according to a letter received at San Francisco on Nov. 14. Alamo is a mining town, 60 miles back in the mountains from Ensenada, at an altitude of about 1000 ft. The station is said to have been erected by three Germans, supposed to have been landed somewhere along the coast from the German cruiser Nurnberg.

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The Arizona mining companies are not exhibiting any great alarm over the 80% law, meaning that 80% of their employees must be American citizens, which was adopted by the state at the last election. If the law goes into effect, its constitutionality will promptly be tested, and means will be found to carry the case, if necessary, to the U. S. Supreme Court without any delay. Such action has not yet been in order, for the reason that the diplomatic representatives of Great Britain and Italy have protested against the proposed law to the Department of State, and upon the representations of the Secretary of State, the Governor of Arizona has withheld the promulgation of the law, wherefore conditions in Arizona are still in *statu quo,* in so far as the employment of labor is concerned. However, the Governor of Arizona has indicated that he has no right to defeat the will of the people and will not try to do so.

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Here is how Brother Wilson, who is at the head of the Department of Labor, hands one to James MacNaughton in his annual report:

> If the owners of the mine properties in the Calumet copper region and the Colorado coal fields had been on the ground at the inception of the strikes, and personally in charge, there is reason to believe that no strikes would have occurred. If the managers of the property involved in the Michigan strike had dealt with the dispute at its inception, as its principal owners (Messrs. Shaw and Agassiz) might have done had they been on the ground and personally in charge, there is reason to believe that no strike would have occurred. But the local superintendent, doubtless an excellent property manager, appears by the reports to have been a poor manager of men. Whatever may have been the responsibility of the workmen for the strike and its incidents, the local management cannot be wholly acquitted; and upon the elementary principle of agency, as sound in morals as in law, ultimate responsibility must rest upon the owners.

We do not think that Mr. Shaw and Mr. Agassiz, who have always been sincere and earnest in their attention to company affairs, would relish this any more than Mr. MacNaughton if it came from a serious source, but coming from the U. S. Department of Labor all three will doubtless regard it as a joke; but for our own part we think it is a shame that such things should be inscribed in official records.

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Effect of the War on Chemical Laboratories

The following excerpts from *Metal Industry,* December, 1914, while written about English conditions, find application in the United States:

"One of the businesses badly hit by the war is that of analytical chemistry. Most of the glass and porcelain apparatus used in chemistry is made in Germany and Austria. Bohemian glass, Royal Berlin porcelain, Dresden porcelain and Jena glass are names known to chemists all over the world. It must not be thought that the apparatus is cheap, and that this is the cause of foreigners having the market; the sole reason they have obtained the trade is that they have studied the scientific manufacture of the articles and with the aid of well equipped laboratories have obtained the best results. The price of these goods went up 50% immediately war was declared, and as the stocks in this country are being rapidly depleted, further advances are to be looked for. Some apparatus is already unobtainable.

"Filter papers are another line of which the price has advanced 50%, and the German stock in England is running out. These are also largely obtained from Sweden but the prices have also gone up 50%. Some filter papers are made in England, but the climate is not cold enough to make the high-class chemical filter papers and, consequently, they will always have to be obtained from colder countries. Intense cold for weeks at a time is necessary to obtain good quality filter papers. The pure chemicals used in analysis are largely obtained from Germany, but the supply being cut off and stocks giving out, prices are advancing from 50 to 600%. Unfortunately, these goods cannot be made quickly, even if the works and material are on the spot. We understand that it takes two years from the time the clay of which the Royal Berlin porcelain is made is mined, until it becomes the finished article known to laboratories. Not only for their own benefit, but for the benefit of the trades of the nation, chemists should economize in glass and porcelain apparatus as much as possible. If the war lasts six months longer, as, unfortunately, there is every possibility of it doing, some laboratories will probably have to close down for lack of apparatus."

In commenting on the above to the JOURNAL, one of the leading American chemists remarked that Royal Berlin porcelain was unobtainable in New York, but that the more expensive fused silica was a partial substitute. For Jena glass, he was finding some of the American glasses a fair substitute. Filter papers were list plus 50%. Although small shipments of chemicals and supplies were coming through Holland, the general market is greatly upset. Certain of the more uncommon chemicals are absolutely unobtainable, and American chemists should be as economical as possible in their use of both chemicals and apparatus.

PERSONALS

Dr. L. D. Ricketts is expected in New York to spend the holidays.

L. Selmi has become chief chemist for the Otis Steel Co., Cleveland, Ohio.

Fred F. Hunt has removed his office and laboratory to 10 & 12 Old Slip, New York.

Dwight E. Woodbridge, Duluth, Minn., recently spent several days in Chicago and several in New York.

A. L. Flagg, of Kelvin, Ariz., manager of the Kelvin-Sultana Copper Co., is in the East for a brief vacation.

H. V. Snell, lessee of the Warrior Copper Co., Globe, Ariz., passed through Chicago recently on his way west.

N. O. Lawton, Lawton, Mich., will be at Hurley, Wis., until Jan. 1, for the Montreal Mining Co., on special work.

C. B. Lakenan, general manager of Nevada Consolidated, is visiting in the East and will spend a little while in New York.

H. W. Hardinge has gone to Arizona for a three weeks' tour of the mining camps and to attend the American Mining Congress.

The Perkin medal to be presented in January, 1915, has been awarded to Dr. Edward Weston, of Waverley, N. J., for his work in metallurgy.

R. N. Copeland, mine superintendent of the Cia. Estanifera de Llallagua, arrived in New York last week from Bolivia, for a visit to the United States.

Samuel Hale, manager of the Algoma Steel Corporation, Sault Ste. Marie, Ont., is retiring owing to ill-health. J. Frater Taylor, the president, will take charge of the operation of the plant.

J. Parke Channing, of New York, was in Houghton, Mich., recently, consulting with Sidney W. Lang, engineer in charge of the Naumkeag exploration operations relative to the progress of the work.

C. W. Shepard has been appointed general superintendent of North works, Illinois Steel Co., succeeding William H. Pratt, deceased. He had been assistant superintendent up to the time of Mr. Pratt's death.

George Safford, of London, who founded, and has edited the successive editions of "Who's Who in Mining and Metallurgy" is now preparing the 1915 edition of the book, and requests engineers to send in their records without delay.

J. P. Bickell, of Toronto, Ont., has returned from a prospecting trip of several months in northern Alberta and British Columbia. He located a placer gold deposit on a tributary of the Findlay River above the headwaters of Peace River.

Bradley Stoughton, secretary of the American Institute of Mining Engineers, was in Chicago on Dec. 12, to attend the meeting of the Chicago Section. While in the West, Mr. Stoughton called on the Student Section at Madison, Wisconsin.

Heinrich J. Freyn resigned as third vice-president of H. Koppers Co., Chicago, Dec. 1. Mr. Freyn, who is a member of the American Iron & Steel Institute, the American Society of Mechanical Engineers and the American Institute of Mining Engineers, and resides at 5201 Harper Ave., Chicago, has not yet announced his plans for the future.

Professors Malcolm and Ellis, of the Queen's School of Mining, Kingston, Ont., have been given leave of absence to go to the front with the Fifth Canadian Engineering Corps. Prof. E. A. Stone, of Vancouver, has been appointed acting professor of Municipal and Structural Engineering in place of Professor Malcolm, and J. B. Harvey, late of McGill University, acting professor of General Engineering and Surveying, to take the place of Professor Ellis. J. E. Hyde, assistant professor of Geology, has resigned to accept a position in the Western University.

OBITUARY

William Henry White, of White & Brother, Inc., Philadelphia, died in that city, Dec. 14.

Charles J. Canda, vice-president of the Chrome Steel Works, died at Summit, N. J., Nov. 29, aged 76 years. He was prominent in business and politics and served for several years as assistant treasurer of the United States at New York.

Captain Richard Trevarthan, a type of the Cornish miner who did more to develop the Michigan copper district than any other set of men, died at Houghton, Mich., Dec. 10. For 22 years he was mining captain in charge of all underground work at the old Atlantic mine, then under Stanton management, now a part of the Copper Range Consolidated. He came to America in 1872 and entered the employ of Calumet & Hecla in 1874; went to Atlantic 34 years ago and became captain two years later. When the Champion mine was opened he was in charge of the work, continuing there as head mining captain for six years. Then he went to Ojibway and opened that mine, retiring when that property closed down. He has a son, Richard S. Trevarthan, clerk at the Mohawk mine.

Joseph Block, founder of the firm of Block & Pollak and the Cincinnati Forge & Iron Works, which later were merged into the Block-Pollak Iron Co., Chicago, died Dec. 6, aged 83 years. He was born in Phaffenhofen, France, and came to this country at the age of 7. The firm of Block & Pollak was organized in the early sixties. Mr. Block had great confidence in the industrial possibilities of Chicago, and in 1893 joined in the organization of the Inland Steel Co., which began as a small operation at Chicago Heights. He continued as a director in that company from its inception, and he was in no small measure responsible for the establishment of its Indiana Harbor works. He was also a director of the Buffalo Steel Co., Tonawanda, N. Y. Mr. Block was a member of the Standard Club and the Lake Shore Country Club. He leaves three sons, all of whom are active in the organization of the Inland Steel Co., and four daughters.

News has been received of the death of William H. MacGarvey, oil operator, at Vienna, Austria, at the age of 71 years. He was born at Huntington, Que., and at an early age removed to Petrolea, Ont., where he speedily acquired wealth in connection with the oil discoveries. He was the first mayor of Petrolea, and held that office for many years. In 1876 he was employed by the Canadian government to locate coal deposits in the west and was successful in making discoveries in the Estevan district, Saskatchewan. The last 25 years of his life were spent in Europe, where he controlled large oil interests in Galicia. Mr. McGarvey received decorations from the Austrian Emperor for introducing Canadian oil-drilling methods into that country, and was called upon to advise the British Admiralty when the naval board had under consideration the use of oil for naval purposes. He sustained enormous losses during the present war, the town of Mrianpol, which he founded and where he had 2000 employees, having been destroyed in the course of recent fighting.

SOCIETIES

University of Minnesota—The corner stone of the new School of Mines Building was laid Saturday, Nov. 28, in the presence of the Board of Regents of the University, the faculty of the School of Mines, students and friends. Dean W. R. Appleby and President G. E. Vincent officiated.

Engineers' Society of Pennsylvania—The following candidates have been nominated for office during the year 1915: President, Farley Gannett, Harrisburg; first vice-president, Charles H. Mercer, Harrisburg; second vice-president, J. Murray Africa, Huntingdon; secretary, Edward R. Dasher, Harrisburg; treasurer, R. Boone Abbott, Harrisburg; resident directors, Thomas Earle, C. A. Emerson, Jr., F. Harbert Snow, Harrisburg.

Colorado School of Mines—This school at Golden, has announced its intention of giving a short course for practical prospectors, covering about three weeks, some time during the coming spring. The course will include the elements of chemistry, blowpipe analysis, mineralogy and geology, the object being to give men without technical education a better working knowledge of those subjects that will aid them in finding or identifying minerals in the field. The course will be free to all residents of Colorado.

International Engineering Congress—A circular from the Committee of Management says that some confusion seems to have arisen in the minds of at least certain of the engineers of this country, between the International Electrical Congress, which it was proposed to hold in San Francisco in September, 1915, and the International Engineering Congress, which is to be held during the same month. Owing to the unfortunate situation existing abroad, and the impossibility of convening the International Electrotechnical Commission, under whose authorization the Electrical Congress was to have been held, it has been decided by the governing body of the American Institute of Electrical Engineers to postpone indefinitely the holding of the Electrical Congress. This does not affect the

International Engineering Congress, which goes ahead as originally planned. Marked progress is being made in connection with the latter, and papers have already been received from several of the foreign countries, and everything points to a successful issue.

American Institute of Mining Engineers—The fourth annual meeting and banquet of the Columbia Section was held Nov. 20, at the Spokane Hotel, with 40 members in attendance. Prof. Francis A. Thomson, of Pullman, head of the department of mines at Washington State College, retiring president, was toastmaster, and L. K. Armstrong, secretary-treasurer, was master of ceremonies. The principal address was made by Prof. F. M. Handy, of Pullman, associate professor of geology at the college, on the "Economic Geology of Eastern Washington." Other speakers were Loren A. Campbell, of Rossland, B. C.; Oscar Lachmund, Greenwood, B. C.; Frederic Keffer, Greenwood, B. C.; G. H. Wyman, Jr., Wallace, Idaho; Sam H. Richardson, mining engineer, Republic, and Prof. D. C. Livingston, Moscow, head of the mining department at the University of Idaho. The report of the secretary-treasurer for the year showed that the membership had increased from 120 to 150, and that the section was in good financial condition. F. A. Ross, of Spokane, was elected president; Rush J. White, of Wallace, Idaho, vice-president; L. K. Armstrong, of Spokane, secretary-treasurer. Mr. Armstrong has been secretary-treasurer of the section since it was organized four years ago.

INDUSTRIAL NEWS

The Pacific Tank & Pipe Co. will open an office on Jan. 1, 1915, in the Lewis Building, 275 Oak St., Portland, Ore.

Sullivan Machinery Co., Chicago, Ill., reports the following sale to the Vindicator Consolidated Gold Mining Co.: One Sullivan class "WN-2" direct-connected motor-driven unit compressor, size 26x14½x18 in. This machine has a piston displacement of 1984 cu.ft. at 10,000 ft. altitude.

F. L. Bunton, formerly manager of the Chicago office of the Heine Boiler Co., has severed his connection with that company to become manager of the Chicago office of The Goulds Manufacturing Co., 3801-3811 South Ashland Ave., Chicago, Ill., manufacturers of pumps and hydraulic machinery.

The main floor of the power house of the new smeltery of the Arizona Copper Co. consists of Berger Multiplex steel plate laid on structural steel I-beams and covered with concrete, the concrete being reinforced with ½-in. and ¼-in. rods. Berger Multiplex plates were also used in the construction of the roof. In this case they were wired to the purlins with No. 10 wire. The concrete was then filled in and troweled smooth, and when dried out was waterproofed with a composition of tar, cement and coal oil, followed by a coating of hot naphtha into which was embedded a layer of 3-ply roofing paper.

TRADE CATALOGS

Cutler-Hammer Mfg. Co., Milwaukee, Wis. Catalog. Magnetic Switches. 16 pp., illus., 5x8 inches.

Williams Bros., Ithaca, N. Y. Circular. Well Drilling Machinery & Tools. 12 pp., illus., 10½x8 inches.

The Hitchcock Mfg. Co., Tarentum, Penn. Catalog. Turnouts, Switches and Frogs. 38 pp., illus., 6x9 inches.

The Cleveland Rock Drill Co., Cleveland, Ohio. Bull. No. 33, Cleveland Hand Rotated Hammer Drills. 8 pp. illus. 9x6 inches.

P. H. & F. M. Roots Co., Connersville, Ind. Catalog 42, Roots Blowers, 47 pp., illus., 7½x10 in. This catalog describes the Root line of blowers for smelting furnaces; contains charts and data, also views of the installations at the plants of the British Columbia Copper Co., Anaconda Copper Mining Co., United Verde Copper Co., and the U. S. Smelting Co. Catalog 46, Foundry Blowers, 47 pp., illus., 7½x10 in. Some blowers shown in this catalog may be used for mine ventilation, and are capable of operating against pressures varying from ½ lb. to 10 lb. per sq.in., but the company builds blowers of any desired capacity, some of the largest having a displacement of 400 cu ft. per revolution. The machines shown are of the positive pressure type. Catalog 48, Vacuum Pumps, 16 pp., illus., 6x9 in. These pumps have recently been found to be of use in connection with filtration in cyanide plants Catalog 47, General Catalog, 16 pp., illus., 6x9 in. In a condensed manner gives the full line of blowers, pumps and exhausters made by the Roots company.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

DRILL Pneumatic Tool. John F. Clement, Philadelphia, Penn., assignor, by mesne assignments, to The Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 13,826, reissue; Nov. 17, 1914.)

DRILL—Rock Drill. Michael Smith, Bisbee, Ariz. (U. S. No. 1,116,146; Nov. 3, 1914.)

DRILL—Rock Drill Bit. Moses Arthur Knapp, Oakland, Calif. (U. S. No. 1,118,292; Nov. 24, 1914.)

DRILL EXTRACTOR. Edward Wilson and William A. McLeod, Bisbee, Ariz. (U. S. No. 1,117,468; Nov. 17, 1914.)

DRILL PULLER. Howison Crouch, Grass Valley, Calif. (U. S. No. 1,117,554; Nov. 17,1914.)

DRILLING—Core-Drilling and Hoisting Machine. Paul J. Diemunsch and Thomas H. Dobbins, New York, N. Y., and Edmund Dalgleish, Cleveland, Ohio; said Dalgleish assignor to said Diemunsch and Dobbins. (U. S. No. 1,117,806; Nov. 17, 1914.)

DRILLS—Improvements in Feeding Means of Percussive Rock Drills, Coal Cutters and the Like. F. Simon and J. W. Scott, Minnaar, Transvaal. (Brit. No. 16,144 of 1913.)

ELECTRIC FURNACE. Walter N. Crafts, Oberlin, Ohio. (U. S. No. 1,114,733; Oct. 27, 1914.)

EXTRACTION BY ELECTROLYSIS—Process of Separating Metals from Ores. Herman A. Wagner, East Orange, N. J. (U. S. No. 1,115,351; Oct. 27, 1914.)

FERROPHOSPHORUS—Manufacture of Ferrophosphorus. David I. Miller, Birmingham, Ala. (U. S. No. 1,115,471; Oct. 27, 1914.)

FILTERING MEDIUM. James Edward Porter, Syracuse, N. Y., assignor to General Filtration Co., Rochester, N. Y. (U. S. No. 1,117,601; Nov. 17, 1914; and 1,118,441; Nov. 24, 1914.)

FINK PROCESS—Process of Reducing Metals. Colin G. Fink, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,119,588; Dec. 1, 1914.)

FLOTATION PROCESS—Method of Concentrating Ores. William Sydney Stevens, Magdalena, N. M., assignor, by mesne assignments, to The Ozark Smelting & Mining Co., Cleveland, Ohio. (U. S. No. 1,116,642; Nov. 10, 1914.)

FUME HOOD for Chemical Laboratories. Silas E. Coleman, Oakland, Calif. (U. S. No. 1,117,551; Nov. 17, 1914.)

GRIZZLY. Edmund W. Paget, Portland, and Nathan L. Raber, Corvallis, Ore. (U. S. No. 1,117,897; Nov. 17, 1914.)

KELP REDUCTION. Harry Wilson, San Francisco, Calif., assignor to Pacific Kelp Co., San Francisco, Calif. (U. S. No. 1,116,965; Nov. 10, 1914.)

LAMP—Mine Safety Lamp. Fritz Fäber, Dortmund, Germany. (U. S. No. 1,116,048; Nov. 3, 1914.)

LEACHING—Process of Extracting Copper from Ores. George D. Van Arsdale, East Orange, N. J. (U. S. Nos. 1,119,477 and 1,119,478; Dec. 1, 1914.)

MANGANESE STEEL—Manufacture of Manganese Steel from Scrap. Henry M. Howe, Bedford Station, N. Y., assignor to Taylor-Wharton Iron & Steel Co., High Bridge, N. J. (U. S. No. 1,117,384; Nov. 17, 1914.)

METALLURGICAL FURNACE. Herbert Davison and Leonard Charles Harvey, Battersea, London, England, assignors to The Morgan Crucible Co., Ltd., London, England. (U. S. No. 1,118,534; Nov. 24, 1914.)

MINE AMBULANCE. Cornelius P. Moran, Tunnelhill, Penn. (U. S. No. 1,115,560; Nov. 3, 1914.)

MINE CAR-DOOR LATCH-PLATE. James R. Fleming, Scranton, Penn. (U. S. No. 1,116,258; Nov. 3, 1914.)

MINE CARS—Means for Holding Cars on Mine Cages. Clarence W. Parsons, St. Louis, Mo. (U. S. No. 1,118,510; Nov. 24, 1914.)

MINING-CAR WHEEL. Alfred Bryant Day, Knoxville, Tenn. (U. S. No. 1,117,344; Nov. 17, 1914.)

MINING APPARATUS. Utley Wedge, Ardmore, Penn. (U. S. No. 1,116,182; Nov. 3, 1914.)

MOLYBDENUM—Process for Recovering Molybdenum from Its Ores and Concentrates. Frederick D. S. Robertson, Toronto, Ont Canada, assignor of three-fourths to Michael J. O'Brien, Renfrew, Ont., Canada. (U. S. No. 1,118,150; Nov. 24, 1914.)

NODULIZING—Process and Apparatus for Removing Adherent Material from Nodulizing Kilns. Francis Bird Dutton, Lebanon, Penn., assignor to the Pennsylvania Steel Co., Lebanon, Penn. (U. S. No. 1,117,814; Nov. 17, 1914.)

ORE DRESSING—Improvements in a Process of Dressing Ores by Means of Gas. K. Takeda, Tokyo, Japan. (Brit. No. 20,158 of 1913.)

ORE TREATMENT—Process for Treating Ores. William A. Thacher, Lake City, Colo., assignor to the Acid Process Co. (U. S. No. 1,119,473; Dec. 1, 1914.)

PNEUMATIC HAMMER. Lewis E. Summers, Detroit, Mich., assignor to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S. No. 1,115,985; Nov. 3, 1914.)

QUICKSILVER—Process for Extraction of Mercury from Its Ores and other Materials. Edwin Bryant Thornhill, Gray Summit, Mo. (U. S. No. 1,119,377; Dec. 1, 1914.)

RABBLE ARM—Air-Cooled Rabble Arm. Charles C. Fisher and Hubert H. Rountrey, South Norfolk, Va. (U. S. No. 1,116,255; Nov. 3, 1914.)

RARE EARTHS—Method of Separating the Rare Earths, together with Thorium, Cerium, and Zirconium, by Electrolysis. Louis M. Dennis, Ithaca, N. Y. (U. S. No. 1,115,513; Nov. 3, 1914.)

Editorial Correspondence

SAN FRANCISCO—Dec. 9

Impounding Dams for storing tailings from stamp mills in Amador County have all been completed and the mines on the Mother Lode are now operating within the rules laid down by the court in response to the demands of the farmers along the several creeks. The creeks are now carrying only clear water. The water from the mills is also being conserved by the mining companies, so there will be no possible cause for further complaint of damage to agricultural land.

DENVER—Dec. 10

A Mediation Board is proposed for establishment by Governor-elect Carlson in a preinaugural announcement, its function to be the impartial settlement or arbitration of all disputes that may arise in this state between labor and capital. Mr. Carlson feels that more attention paid to safety and sanitation in all working places and a workmen's compensation law will bring about marked improvements in the attitude of labor toward capital.

Tungsten Miners of Boulder County are anticipating a resumption of activity. Whereas the principal purchasers of tungsten concentrates maintain that the demand for the metal shows no appreciable increase and that the market is bound to remain unstable for a while, the fact remains that practically all the concentrates accumulated during the recent slump have been disposed of. Accordingly, the producers believe they are warranted in renewing operations and preparations are in progress.

BUTTE—Dec. 10

Among the Unions, the Silver Bow Trades & Labor Council, on Dec. 6, recommended that a general committee of one or more members of each local be appointed to take whatever action is deemed advisable in an effort to try and bring about a settlement of the factional fight among the miners of the Butte district. This action is the first taken since the revolt from the Western Federation of Miners last June. Lazar Tomich, a miner, was convicted, Dec. 9, on the charge of taking dynamite from the West Stewart mine to blow up the Miners' Union hall, in June, and was sentenced to spend five years in the state penitentiary at hard labor.

Anaconda has plans for expansion according to statements made by John D. Ryan, president of the Amalgamated, who, with President Thayer, of the Anaconda, is on a tour of inspection of the company's properties in Montana. These plans call for the reconstruction and enlarging of the Great Falls smelting plant, and the construction of a copper refinery at these works, representing an investment of more than $1,000,000. President Ryan also intimated that extensive additions are likely to be made to the Washoe plant, to handle the increased business expected after the war. Among other undertakings contemplated is the elevation of the Black Eagle dam at Great Falls, in order to provide more power.

EL PASO—Dec. 9

Zapata has won laurels by his behavior in Mexico City. He was expected to loot the city, whereas he has been most active in maintaining order.

Destruction of Bridges on the Nacozari R.R. in Sonora, it is thought, will interfere with the operation of the Moctezuma mine of Phelps, Dodge & Co.

SALT LAKE CITY—Dec. 10

Salt Lake County will have to return $27,678 to Utah Copper, as it appears from a certified copy of the decision of the United States court of appeals, received from St. Paul, Dec. 5. The amount was previously thought to be $1765.

A Sulphuric-Acid plant installation in this section is being investigated by the American Smelting & Refining Co. Inquiry is being made as to a possible market for the product in the leaching of ores, and in the production of superphosphates and other fertilizers. The company wishes to know of ores susceptible to leaching, what tonnage is available, what the ore assays, what tonnage of acid would be required, what grade of acid expressed in degrees Baumé, what price per ton could be paid for the acid f.o.b. mine, and at what point acid would be delivered. Assays of low-grade oxidized siliceous copper ores are asked for, and if these are not available a request for samples is made. It is probable that Utah Copper is considering the leaching of its large tonnage of oxidized capping, carrying from ½ to 1% copper, and the inquiry is being made by the A. S. & R. to find out what additional market there would be for the acid.

PORTLAND, ORE.—Dec. 9

A Nitrate discovery reported from Vale, Malheur County, has caused a good deal of excitement. There is said to be a vast bed of nitrates of potash and soda about 30 miles south of that city. Six sections of land have been filed on by a company prospecting there, and those who have made an examination of the field report that it extends to a depth of 75 ft. Further prospecting of the field shows an extension into Idaho to a point on the Snake River where Jump Creek empties into that stream, and there all traces disappear. Following the report of the discovery, experts were sent out by the Government to make an examination. Following their report six Government men were ordered out and have just arrived. Capitalists from Los Angeles, it is said, are now negotiating with the discoverers with a view to taking over their holdings and starting development work on a large scale. This will necessitate building in a railroad. George D. Huntley, a rancher living in the field, has sold his ranch to the company and has taken an interest in the company. The California company has sent representatives who are now making a careful examination of the entire territory and sending samples for assay tests.

TUCSON—Dec. 9

In the Baca Float case, the Supreme Court of the United States handed down a decision, Oct. 28, denying a motion for rehearing. The court takes occasion to amplify its previous decision in some particulars, but in one particular it makes no final decision, that is in the matter of land patented by the Government, which conflicts with this grant. On the Baca Grant, there are perhaps a dozen mining claims patented, mostly dated in the '80s, and about 30 more with patents held up for some years pending the decision just made. The court, however, holds that it is without jurisdiction to try these conflicting claims, which must be taken up in the state courts, and has merely passed on the counter claims of the Baca heirs and the Government; it is not quite clear to the lay mind whether this decision is to be taken to mean any more than that the Baca heirs take all the grant that nobody else claims.

It appears that there was a conflict between the Baca Grant and the grant to the town of Las Vegas, which was settled by an act of Congress June 21, 1860; this enabled the Bacas to select an equal acreage out of the Government domain, but this land was to be unoccupied and nonmineral and upon the final interpretation of these terms depend rights to a good deal of the land claimed, because no lands could be selected "which were then known to contain mineral." Some formalities were imposed on Baca, and these having been complied with, the court holds on the pleadings that the title passed out of the Government in April, 1864, a little over 50 years ago.

There is no doubt that all unclaimed land goes to the Baca heirs; the action was brought against a lot of homesteaders in the Santa Cruz Valley, and they lose out; but the status of the mineral claimants, especially those to whom patent has been issued, is left for further decision by the local courts.

The principal beneficiaries under this decision are General Watts and Mr. Davis and the Matthews estate, of West Virginia, though there are several others who claim various interests under Baca, and it will be remarkable if the last state of these claimants is not worse than the first. The West Virginia claimants have offered to make suitable compromises with the persons claiming against them; yet some of the mineral claimants still propose to make further contest.

The principal mines involved are the Alto, with a good record of production; the Salero, a wide vein of promise; the Royal Blue, which has shipped many cars of good ore; the Bland, thought to be a good mine; the Viceroy, also a shipper; the Montezuma, which has sent out bonanza ore, $300 a ton or better; the Empress of India, Eureka, Victor, Burro and many others; besides the patented claims among which are some fine showings of ore; many of them have shipped.

The grant runs from seven miles north of Nogales to Tubac, the east line crossing the Sonoita River a few miles below Patagonia, the Alto postoffice being a mile north of the north line of the grant, near its northeast corner at the foot of Salero Mountain. It is described as Baca Float No. 3, and contains altogether 100,000 acres, lying in the center of Santa Cruz County, Arizona.

A speedy determination of the rights still in dispute is hoped for by all, as the state of the title has retarded the development of the whole county.

DULUTH—Dec. 12

Gilbert, a village on the Mesabi range, by the decision of a suit contested in the courts for several years, is at last permitted to annex 1880 acres of valuable mining property, thereby boosting the village's assessed valuation from $275,000 to over $5,000,000. Among the suffering mines are the Gilbert and a portion of the Genoa, operated by the Oliver Iron Mining Co., the Pettit and Schley, of the Republic Iron & Steel Co., the Hobart, of M. A. Hanna & Co., and the Malta, of Pickands-Mather & Co. Annexation was bitterly contested by the mine operators.

M. A. Hanna & Co., it has finally been authoritatively stated, will act as sales agents for the Great Northern production, beginning Jan. 1, 1915. The Great Northern mines now stockpiling are the Leonard, Harold, North Uno and Mississippi. Openpits being stripped are the Dean at Buhl, the Dunwoody at Chisholm and the Hill Annex at Marble. A new underground mine, the Thorne, is also being opened at Buhl. The company has no interests elsewhere than on the Mesabi range. The affiliation with M. A. Hanna & Co. has removed the uneasiness prevalent among iron ore producers as to the anticipated method of marketing this large production. M. A. Hanna & Co. are already large producers, as well as sales agents, and it is not surmised that anything will be done by them to disturb existing conditions in iron-ore circles.

CHICAGO—Dec. 12

The Republic Iron & Steel Co. mining department, at Gilbert, Minn., advises that it has plans for a small mill. Although nothing has yet been done toward its construction, it is possible that work on it may start in the spring.

Lake Superior Exploration is at a low ebb, as evidenced by figures obtained recently from a Middle Western machinery firm. It is generally accepted that the amount of exploration under way is a fair indication of the state of the mining industry. Two years ago between 800 and 900 diamond drills were in use in the United States, Mexico and Canada. At present, in the same territory, reports indicate that only about 200 to 250 are in use. In the Lake Superior district, two years ago, there were reported to be owned about 300 diamond drills, with 110 working at the time. A report on the situation, about two months ago, showed that about 15 or 20 were then in operation. This shows beyond question a decided falling off in exploratory work during the last year or two, and checks fairly well with what is known to be true about the decline in mine development.

Conditions around Globe, Ariz., according to an engineer who is operating a mine there, and who passed through Chicago on his way west recently, are better than the present average for the copper districts. Inspiration is continuing its preparatory work without slackening, and the 600-ton test concentrator, where tests on a commercial scale have been under way for many months, is still operating. It is understood that it has practically been decided to use jigs, fine grinding, and the flotation process in the new concentrator, although the names of the machines finally selected for the work have not been made public. It is reported that H. Kenyon Burch, working with another engineer, has developed a machine for fine grinding that will be used. This machine is said to have increased the recovery substantially. The history of operations at the test concentrator will form an interesting story, if the facts are ever available. The scheme itself, of building a 600-ton concentrator, for test purposes, in which it would be possible for competing manufacturers to test their machines and prove their claims on a commercial scale, with full facilities for experimentation, was a shrewd one. That it has been taken advantage of by the manufacturers is evident from the reports that have emanated from Globe and which are circulating among the makers.

The Hill-Annex mine on the western Mesabi is also reported as planning to build a concentrator. An engineer in Chicago recently stated that this report is probably correct. This mine will produce a large tonnage and the concentrator would probably have a capacity of 6000 tons per day. The method to be used would probably be patterned after that at the Trout Lake washery. There has been some talk on the Mesabi range, too, of the construction of a commercial treatment plant for certain ores. A plant of this sort would be of considerable interest. The Hill-Annex is being stripped by Guthrie & Co., contractors, St. Paul, Minn., and in this work they are said to be using the largest steam shovel now employed on the Mesabi range. A large manufacturer of steam shovels states that the use of such a large machine for that work is rather unusual, as there has been a tendency on the part of contractors and mining companies on that range, during the last three years, to keep away from the use of extremely large shovels. Prior to 1905 most of the shovels on the Mesabi were 65- and 70-ton machines. From 1905 to 1910, a large proportion of the shovels furnished for mining work, exclusive of those for stockpiling, were 95-ton machines. Since 1910 both the contractors and the large mining companies, the latter being the principal purchasers of the 95-ton machines, have been against the use of a shovel quite so heavy, and most of the shovels furnished since then have been either Bucyrus 85-C or Marion 76. These run from 85 to 90 tons, shipping weight, and many operators feel that such shovels are the most economical in the long run.

CRYSTAL FALLS—Dec. 12

The Carpenter mine this year entered the shipping list, sending out about 50,000 tons, all from development work. The work of developing and equipping the property was carried on steadily throughout the year; a new steel head frame was erected, the necessary machinery installed and a number of dwellings built for company employees. The property is proving to be a good-sized one and will be a fine addition to the Hanna company's holdings. The work of developing the Monongahela property adjoining the Carpenter on the northwest is now being undertaken from underground workings of the Carpenter. The Carpenter installed a Curtis turbine directly connected to a General Electric dynamo and makes and transmits the electrical energy required for the Hanna company's Ravenna mine, which lies two miles to the northeast and is electrically equipped throughout. At the Hollister, the season saw the last of the Hanna company's work. This consisted of loading by steam shovel the 34,045 tons of ore remaining in stock. This was loaded directly into cars and was not put through the drier in which the product formerly was treated. All equipment has been removed, including buildings, and the lease was allowed to revert to the fee owners.

HOUGHTON—Dec. 12

The Total Shipments of copper during the season of navigation by the several smelters of the Lake Superior district amounted to 90,000,000 lb. approximately. During the last seven months there has been little copper shipped by rail, except to a few manufacturing points in Wisconsin and Minnesota. The water shipments represent practically the total output from May until Dec. 1, and indicate the falling off in the output as compared to normal.

The Tonnage-Tax proposal will probably not be pushed this year. The state grange has backed water on the whole plan. While the proposal of some of the leaders to drop the petition altogether was not accepted and while nominally the grange continues on record as favoring the tax, the fact remains that general sentiment at the meeting was so mixed that everybody posted knows that nothing will be done. The members were ashamed to drop the proposal like a hot potato, but as a matter of fact the grangers at the meeting were convinced of the unfairness and unreasonableness of the scheme and were frank enough to acknowledge it. While the thing is out of the way for this year, it is likely to come up again next year, and the upper peninsula is getting into shape a well organized opposition to it. At the Marquette meeting, Dec. 15, it practically was decided to have a working fighting force established among nonmining corporation taxpayers of the upper peninsula, interests who realize that a tonnage tax on the mines is not only an unfair burden on the mining companies themselves but also an extra tax on the workingmen and the taxpayers who reside in mining sections. This organization will be prepared to take action whenever necessary.

TORONTO—Dec. 12

A Shortage of Pebbles for the mills of Porcupine and Cobalt was lately experienced on account of the cutting off of supplies from France and Denmark. The difficulty has been overcome by the bringing in of 39 carloads of Newfoundland pebbles.

The Mining News

ALASKA

TELLURIDE SAND, near Nome, reported as found recently by R. A. Miller on Brunside Creek in Candle country.

ARIZONA

Pinal County

KELVIN-SULTANA (Kelvin)—Directors recently voted to resume operations at mine after shutdown of 30 days. Mill will not be operated at present, all energies being directed to extensive development work on 500-ft. level. New undertaking calls for about 5000 ft. of work to south of Westfall shaft, opening up ground hitherto unexplored. Condenser to be added to power plant and numerous improvements in equipment made at mines. New compressor of 1000-cu.ft. capacity to be installed at once.

Santa Cruz County

O. K. (Tubac)—Work progressing regularly with about 25 men. About 10 tons per day extracted and shipped to El Paso. Ore said to net about $10 per ton, and operation is paying its way. Ore shipped is carbonate, but thought market will be found shortly for sulphide, of which there are large quantities in sight. Some permanent improvements now under consideration will begin soon.

FLUX (Patagonia)—Messrs. Collie and Bierce have taken possession; so far have done only exploratory work; contract calls for mill, and now announced this will be built in Flux Cañon, just below mouth of what is called the lower tunnel. County road passes along near mouth of shaft above, and spur will be run down cañon to hit road at lower level.

CALIFORNIA

Amador County

ORIGINAL AMADOR (Amador City)—Dam for impounding mill trailings is being constructed three miles west; will be 30 ft. high, said to be capable of holding 1,000,000 tons.

Calaveras County

HARDY-McCREIGHT (Angels Camp) — Reported large amount of high-grade ore extracted recently from depth of 125 ft. Mine under bond to James and David Maltman, who have been operating for two years.

Eldorado County

GREENWOOD DISTRICT, sometimes known as Garden Valley, attracting locators of mining claims and water rights. Reported W. E. Gill and D. L. Shepard contemplate installation of mill of five to 10 stamps on property partly developed.

INVINCIBLE MINES CONSOLIDATED (Placerville)—This property, including claims in Horseshoe Bar and Volcanoville districts which extend into Placer County, and other claims in vicinity, sold to John A. Britton, of San Francisco. Property covers large area. Purchasc price not made public as yet.

Kern County

AMALIE-CALIENTE MINING & MILLING CO. (Amalie)—Five-stamp mill being installed for treating custom ore in Amalie district.

BLUE MOUNTAIN MINING CO. (Woody)—Ten-stamp mill completed. Old workings cleaned out; some ore extracted.

Mariposa County

MOUNTAIN KING (Mariposa)—Power dam completed Oct. 31; expected to have plant finished by Dec. 15. New flume part of equipment. Moving mill to point near main working tunnel contemplated, also installation of electric tramming instead of mules. Estimated improvements will reduce cost of mining and milling to $2.25 per ton.

Nevada County

MARYLAND GOLD QUARTZ MINING CO. (Grass Valley)—Bond held by Idaho-Maryland Development Co. surrendered and property reverted to owners.

UNION HILL (Grass Valley)—Reported high-grade ore encountered in two places in mine; believed 20-stamp mill will soon go into commission. One find, free-milling ore, at 710 ft. depth, other on 300-ft. level.

Placer County

GARDELLA DREDGE (Lincoln)—Expected dredge will be completed by end of year. Will have 5-cu.ft. buckets. Hull 90 ft. long and 40 ft. wide.

Shasta County

MAMMOTH (Kennett)—Baghouse improvements nearing completion. Cost will be about $110,000. Approximately 500 tons of structural steel used. Additional miners expected to be put on to keep up ore reserve for plant.

Tulare County

TULARE MINING CO. (Porterville) — Preparations being made to test new magnesite grinding mill manufactured by John Horstmann & Co., of San Francisco. Magnesite mine now employs 35 men.

Tuolumne County

BLUE EAGLE (Sonora)—New compressor, gasoline engine and drills being installed. Owing to inaccessibility of Jawbone district machinery had to be packed over by animals and sleds. C. Lumsden superintendent.

McALPINES MINES CO. (Sonora)—New corporation organized with capital stock of $1,500,000. Directors are Frank R. Whitcomb, C. L. La Rue, M. C. Hassett, of San Francisco, A. R. D. Barnard, of San Anselmo, and Fannie W. McLean, of Berkeley. Head office, San Francisco.

COLORADO

Boulder County

COLORADO METALS & CHEMICAL CO.—Consolidation with Consolidated Copper Mining, Milling & Smelting Co. announced. Companies own properties in Boulder and Grand Counties, .formerly known as Fourth of July group.

WHITE RAVEN (Ward)—Mine in fine condition, but Manager Ewing restricting production to cover operating expenses only until price of silver advances materially. Is pushing development and has blocked much ground running high in silver.

MACKEY (Boulder)—Mill being overhauled and placed in condition to make test run on ore recently taken from mine. If results are favorable company will consider sinking to greater depth and driving drifts on vein. John McColl, of Idaho Springs, in charge of operations.

GOLD HILL DEEP (Rowena)—Loveland and Boulder business men have organized this company. Under management of R. G. Hackett, High Line adit will be driven to intercept numerous veins traversing property which comprises 17 lode claims and millsite on Left Hand Creek.

CARDINAL (Cardinal)—Mill has been undergoing numerous changes in equipment. Policy of Henry T. Lowe, manager, to test machines and methods on commercial basis rather than on small laboratory scale. Now believes research has proceeded far enough to continue regular operations with following equipment: Blake crusher, 10 stamps, 12x6-ft. tube mill, 4½-ft. Hardinge mill, five Card tables, two Wilfley slimers, 12 canvas or "rag" tables.

Clear Creek County

ANNAMOSA (Georgetown)—Recently purchased by E. G. Hurst, of Denver, who is making arrangements for active development.

ONEIDA-STAG (Idaho Springs)—New 50-ton cyanide mill ran well in week's tryout; now in regular commission treating large quantity of ore previously stocked.

MIXSELL MILL, Idaho Springs, purchased by Edgar L. Payne, manager of Seaton Mountain and Idaho Bride mining properties. Will hereafter treat his own ores as well as conduct custom business.

BIG FIVE TUNNEL (Idaho Springs)—About 1200 cars of ore transported during November and delivered to Newton and Jackson mills. Five sets of lessees engaged in development and mining operations through tunnel, employing about 40 men.

MEMPHIS & IDAHO SPRINGS GOLD MINING CO. (Idaho Springs)—Property between Gem and Sun & Moon mines on line of Newhouse tunnel, leased to group of operators from Denver. Active development work will be carried on through tunnel.

ARGO MILL (Idaho Springs)—Supply of ore from mines working through Newhouse tunnel up to mill's capacity and additional machinery being installed in preparation for larger business. New machines include tube mill and 80-ton Portland filter. Among mines sending ore to this mill are Gunnell, Gem, Golden Edge, Kansas and Pozo.

PRIMOS MINING CO. (Idaho Springs)—Company plans to continue vigorous development work throughout winter. New buildings completed, including bunkhouse and compressor plant; compressor installed and ready for operation. New adit started 300 ft. above compressor plant and necessary air lines laid. Last 200 ft. of development encouraging. About 50 men will be employed on property.

OLD TOWN (Idaho Springs)—Development on 1300-ft. level encouraging during past month. Vein widened from 1 ft. to 4, with average assay value given as $15. Probable this oreshoot is same as the one opened above on 1100-ft. level. Company will advance 1500-ft. level about 300 ft. to prospect for same shoot. On 1100-ft. level winze sunk 60 ft. in payable ore. Possible ore reserve now estimated at 100,000 tons ranging from $5 to $10. Geo. K. Kimball manager.

NEWHOUSE TUNNEL (Idaho Springs)—During month past development and production increased in properties operated through tunnel. In November tunnel company handled average of 300 tons of ore a day, which was treated in the Argo and Newton mills. Argo mill produced four cars of concentrates per week. Several new leases granted and increased development anticipated. Properties tributary to tunnel now employing about 150 men. Additional equipment being installed in Argo mill, which will result in considerable increase in capacity. Includes tube mill and filtering apparatus.

STANLEY MINES CO. (Idaho Springs)—Three of placer claims belonging to this company leased to James W. Myers, who is installing Cornish pump to unwater shaft west of compressor plant. Pump will be operated night and day by steam and shaft will be unwatered to bedrock, distance of about 40 ft. Two years ago these placers were worked by James E. Bowden with encouraging results. Stanley dumps and Salisbury mill leased to Thomas M. Egan, of Idaho Springs. Tramway installed to convey material from dump to mill. Mill overhauled; some additional equipment will be added, including stamps, plates and Egan concentrating tables. Water-power plant which operates mill has been placed in working order. Lessee contemplates treatment of custom ores in addition to ores from dumps. Road adit level of Stanley mines being cleaned out and retimbered on company account preparatory to resumption of development on this level. Company plans to advance this adit along Stanley vein into Spring Gulch territory. Development operations on company account under direction of Harry J. Wolf, consulting engineer.

Gilpin County

BURROUGHS (Central City)—Block of ground 300x500 ft. leased to Messrs. Morrison, Ulrich & Horn. Lessees now equipping property to carry on operations through Newhouse tunnel.

Lake County

LITTLE BOB (Leadville)—George Campion, veteran operator, has secured long-time lease and is removing ice and water from workings he drove years ago.

NORTH SIDE (Leadville)—New shaft started by W. J. Davis has finally reached bedrock. Wash 115 ft. deep, 30 ft. more than ever before disclosed on Pryor Hill.

San Miguel County

LAKE SUPERIOR-OPHIR MINING CO. (Ophir)—This company, which operates Calumet property, will install two-bucket tramway between mine and mill.

TOMBOY (Telluride)—New cyanide mill in Savage Basin nearly completed, may start this month. Provision made for strict economy in use of water, scarce during winter and late summer.

SUFFOLK (Ophir)—Mill being overhauled and repaired by lessees. Two bumping tables added to equipment; air compressor placed in working order and now operated by water power. Ore being delivered to mill.

ALTA—Active production discontinued. Reported ore reserves are ample but owners do not desire to mine while silver price is low. Development work in Palmyra crosscut will continue. Management considering advisability of installing cyanide treatment in mill.

Summit County

HELEN (Breckenridge)—Small plant in which crushing unit is Huntington mill almost ready to run. Aërial tramway will be erected to deliver ore from adit, 1400 ft.

Teller County

ECONOMIC (Cripple Creek)—Dump leased to H. C. Harris and W. E. Vansant. Material being sorted and shipped to Copeland sampler at rate of about one car a day.

COPELAND ORE SAMPLING CO. (Cripple Creek)—Company has completed addition to its ore-sampling plant of department designed to take care of high-grade ores. New equipment includes crusher, rolls and grinder. Small smelting furnace added to handle rich ores and zinc slimes.

IDAHO

FRISCO (Frisco)—This property, acquired about two years ago by Federal Mining & Smelting Co., reopened last week after shut-down of about six months. Immediately after purchase from D. M. Hyman, of New York, who held title through foreclosure sale, extensive improvements were made. Mine, which had been filled with water for several years, pumped out, requiring approximately six months' time; shaft retimbered; various levels put in working shape; old mill repaired and new machinery added. Active mining operations then begun and force increased as work progressed. Considerable trouble experienced from start with the milling operations, owing to refractory character of ores. Plant operated for some time, but no ore shipped by company, then mine again closed down. Since then, mill practically rebuilt and dry magnetic system successful in other mining districts, but never attempted in Cœur d'Alenes, installed. Understood mine is opened only for experimental run of one month. At end of that time operations will be thoroughly checked over, and continuation will depend a great deal upon success of new milling facilities and upon metal prices. Frisco, in early days one of big producers of district, acquired by Federal for $100,000, and in addition purchasers agreed to expend $150,000 in unwatering and equipping it. Federal to take back from earnings of mine $250,000, and thereafter entitled to one-half proceeds, remaining one-half reverting to Hyman. At time of purchase estimated that ore reserves amounted to approximately $242,000. Up to Aug. 31, 1913, Federal had expended $118,476 in placing mine in working shape; evident that considerable more than $150,000 has been spent up to present time.

MICHIGAN

Copper

NAUMKEAG (Houghton)—Continues exploration of Pewabic lode branch, opened for 1300 ft. Unbiased miners claim this has commercial assurance of success. Management refuses to talk.

TAMARACK (Calumet)—Absolutely no operations except in construction of regrinding plants for mill sands, isolated instance of Calumet & Hecla's construction work in county. Best Tamarack miners given jobs as trammers at C. & H. Red Jacket shaft.

AHMEEK (Ahmeek)—Running two shafts, Nos. 1 and 2. Costs lower than ever before and rock running 24 lb. North Ahmeek shafts, 3 and 4, shut down since war started, boilers simply caring for water. No intention of resumption. One Calumet & Hecla subsidiary that is making good profit. Dividend possible.

MOHAWK (Mohawk)—Making a little better than 1,000,000 lb. copper a month. This figure will be exceeded in December by at least 300,000 lb. if present rate is continued. Largest output Mohawk ever showed and cost of production lower than ever before. Recovery of copper raised from 15 lb. to 18. Coming to point where it will rival and outclass even Wolverine in earning possibilities and quality of rock. At present management is bending energies to increase output from No. 5, one of southerly shafts. Quality of rock from this shaft better than average secured from northerly shafts. No. 6 shaft producer only in limited way, is sending up best rock Mohawk has found anywhere.

TRIMOUNTAIN (Trimountain)—Mine continues to make regular shipments of one- and two-ton lot chunks of copper from what is unquestionably richest and largest mass of copper ever found anywhere. This mass was first cut a year ago, 50 ft. above 25th level, has average lateral distance of 40 ft. with thickness of about 8 in. Has been opened for over 250 ft. to date, beyond the 27th level and there is no sign of its pinching out. Runs 95% copper. Two miners chisel on it all the time, using coal chisel attached to air riveter. Wages paid out of chips which fall from chisels. Some miners claim this is not mass but rather fissure, but there is not much chance for dispute on subject, as formation is continuous and appears in footwall. Similar formation was once found at No. 11 shaft of Calumet & Hecla in conglomerate. It ran for eight full levels, but frequently broke out and would not show for a few feet, and then would be found again. At Ahmeek, in one shaft, fissure of practically solid copper was picked up right at first level and followed down to 16th level, in hanging wall. It was rich and fat.

Iron

WAKEFIELD (Wakefield)—Butler Bros. will finish stripping contract by Jan. 1, and remainder of stripping will be done by operators, M. A. Hanna.

AMERICAN (Diorite)—Closed Aug. 1 for repairs, will open again Dec. 15 with full crew. Some ore will be shipped during winter by rail to Algoma Steel Co. at Canadian Soo.

ASHLAND (Ironwood)—One of few mines on Michigan ranges working with full force. About 350 men employed. All ore in stock shipped and company looks for another good year in 1915.

MINNESOTA

Cuyuna Range

CUYUNA-SULTANA (Ironton)—Air compressor being installed. Construction on headframe for No. 2 shaft will begin in few days.

WILCOX (Brainerd)—Mine drowned out due to succession of pump troubles. Added equipment now overcoming trouble, and mine will be unwatered in few days.

Mesabi Range

EATON (Buhl)—Mine will soon be reopened. Should produce probably 50,000 tons annually. New leaseholder, the Robertson-Hoar Co., has subleased to Captain Hoar, who proposes to operate property on profit-sharing plan. Mining cost will be placed at certain figure, beyond which company will bear excess. Mine has been idle for some time, largely, it is claimed, on account of several restrictive clauses in former lease, which owners have now removed.

Vermilion Range

McCOMBER (Tower)—Mutual Iron Co., operators, state this mine will stockpile throughout winter.

MISSOURI-KANSAS-OKLAHOMA

THE DEEPEST ORE of any importance discovered in the Baxter, Kan., district just made in drill hole put down by T. F. Lennan, on the line between Miami Lead & Zinc Co. and the Lennan Lead & Zinc Co. Drill put to work northwest of the deep pump shaft, where mining operations are being conducted at depth of 320 ft. Orebody from shaft dipped to northwest and it was to determine extent of pitch that drill hole was put down. Zinc and lead encountered at 320-ft. level continuing down to 370-ft. level, with drill still in ore.

BLACK HILLS MINING CO. (Galena, Kan.)—Operations resumed after shutdown of two months to install new gas engine and make other needed repairs; mill now running steadily from two mines on land on which it is situated. Fred Stone superintendent.

McDONALD MINING CO. (Joplin, Mo.)—Company purchased 300-ton mill of Portland Mining Co., and is moving it to leasehold on Connor land south of Carterville. Extensive sheet-ore formation opened there by McDonald company. Proposed to have reconstructed mill in operation in 60 days.

LOCKPORT (Galena, Kan.)—This property, on Windsor land, has shut down mill and mine to make repairs on mill and mill shaft; will install larger pumps to handle water which has become serious since heavy rains. Situated along Short Creek and during the heavy rainy season creek overflows mines. James Murphy owner.

MONTANA

Lewis and Clark County

FRED B. HALL reports finding strong lode on left side of Ten-Mile Creek, eight miles north of Rimini, at head of Little Bear Gulch.

Silver Bow County

BUTTE & SUPERIOR (Butte)—Repairing of shaft rapidly nearing completion. Manager Bruce hopes to start work again by end of December, which will mean the employment of 900 or 1000 men. On Sept. 17 when mine and mill closed down, throwing several hundred men out of employment, men remaining at work conceived idea of organizing among themselves to help out fellow miners who might need assistance. Organization formed with Paul Hudtloff as secretary-treasurer. Nearly every man remaining in employ of company gave portion of wages to proposed fund, which was turned over to safety-first committee entrusted with finding out who needed help. Plan was on loan basis. When resuming work, men will pay back to relief fund amount received in line of assistance. Result has been to bring about closer and more friendly relation among employees than ever existed before.

NEVADA

Esmeralda County

ATLANTA (Goldfield)—Unwatering completed Dec. 1. Considerable exploratory work will be done to find Jumbo Extension oreshoot on dip.

SAMPLER FOR GOLDFIELD may result from recent strike in Jumbo Extension, according to statement of Frank M. Manson, manager Western Ore Purchasing Co. Columbia sampler may be rebuilt or new one built.

Humboldt County

NEVADA PACKARD (Rochester)—Regular shipments of 300 tons ore per month made to Hazen plant of Western Ore Purchasing Co.; ore mined in tunnel C, assays 100 to 230 oz. silver and $2.50 gold per ton. Same shoot being opened on new level. Nevada Short Line now hauls this ore; temporary terminal established in Rochester Cañon

Lander County

COPPER STRIKE IN COPPER BASIN, eight miles from Battle Mountain, made. Stated shaft sunk 250 ft. in porphyry assaying 2% copper. Ore easily concentrated; tests being made at University of Nevada. Development work will be continued all winter.

Nye County

TONOPAH EAST END (Tonopah)—Power line extended to shaft house and electric hoisting now done.

HALIFAX (Tonopah)—Shaft will be retimbered from 400- to 700-ft. level; Oregon white cedar will be used.

JIM BUTLER (Tonopah)—Retimbering shaft to depth of 700 ft. just completed. There is installed double-drum Nordberg hoist operated by 125-hp. variable-speed motor.

CASH BOY (Tonopah)—Reorganization effected. Articles of incorporation filed with secretary of state; Carson City principal place of business; capitalization 2,000,000 shares of $1 each. Name, Tonopah Cash Boy Consolidated Mining Co.; will operate property in western zone of Tonopah district.

MONITOR BELMONT (Manhattan)—Installation of power line from Manhattan station to old camp of Belmont about completed. Understood mining machinery has been ordered by company and will be installed without delay. First work will be unwatering of deepest shaft in Belmont district, now containing over 300 ft. of water in its 500-ft. depth.

BIG PINE (Manhattan)—Equipment for new mill of Mushett & Wittenberg now en route between Tonopah and Manhattan. Heaviest single piece of machinery, tube-mill shell, weighs 14 tons. Haul from Tonopah being made with team of 18 horses across flat and when hill-climbing commences additional team of 10 horses will be added. At mill site, concrete in place for tube mill, and three shifts of workmen preparing for rapid installation of machinery when it arrives. Water tanks and 4½-in. pipe line from Union Nine ready.

Mineral County

IN GOLDYKE DISTRICT north of Luning several leases given on good property and long delayed work started on others.

FRANK EVERETT and associates have financed large holdings of H. H. Hill and C. Barr of Nevada Silver Peak and will erect mill at once on ground. Property lies about eight miles northwest of Luning, consists of four claims having series of well defined veins varying from 2 to 46 in. in width and carrying gold.

NEW MEXICO

Grant County

STAUBER & WRIGHT (Pinos Altos)—Force increased and two shifts put to work on high-grade shoot.

McKENNA & GERHART (Hanover)—Will begin extensive leasing on promising mines below Hanover. Work on Mountain Home group discontinued temporarily.

EMPIRE ZINC CO. (Silver City)—Grading for nine-mile tramway begun with large force of men; 50-ton electrostatic mill to be erected at Cleveland mine; concentrates to be hauled to Santa Fé. Power generated at Hanover.

85 MINE (Lordsburg)—Company shipping reduced output. Meeting of directors Dec. 10 will govern immediate policy. Approximately 60 men employed. New electrical hoist, etc., may be installed. W. F. Ritter in charge.

Lincoln County

BENDER MINES (Carrizozo)—Active development to be commenced by J. C. Bender on claims between Helen Rae and American Lode when power line is completed. Latter two properties may again become producers if present plans are carried out.

Socorro County

SERIES OF MISFORTUNES seems to be pursuing Mogollon mail contractor. Valuable pouch disappeared recently from auto, and Dec. 2 leaky gasoline tank ignited, causing total destruction of car.

OREGON

TITLE TO PLACER land involved in suit of Mrs. D. E. Richen and Curtis Haley against Titus Davies decided in favor of plaintiff establishing claim to 10 acres of placer ground near Sumpter. Decision stated clearing of land of timber by Mrs. Richen was legitimate assessment work on placer ground, inasmuch as ground is better suited for dredging than for other methods of working and must be cleared of timber as first step to put in condition for dredging.

RAWLEY COPPER (Drew Creek)—Mine recently sold to D. Van Ostrand, of Milwaukee, Wis., for $35,000. New owner now developing property

OREGON-IDAHO INVESTMENT CO. (Mormon Basin)—Humboldt mine being extensively developed by company, management having just completed sinking shaft to another level; station now being cut to start drifting on vein. Preparations being made to start up mill soon.

QUEEN MINING CO. (Leland)—Cyanide plant installed last summer under direction of W. A. Burr, has had successful test on 60 tons of ore. Capacity 30 tons.

OLD CHANNEL (Galice)—This, one of best known placer mines in Southern Oregon, on Galice Creek, sold for $65,000 to H. K. Owens, C. L. Creelman, and John C. Eaton, of Seattle. New owners will start work at once, it is said.

POWDER RIVER GOLD DREDGING CO. (Sumpter)—County court granted petition to operate dredge through county road near Sumpter, petitioners agreeing to replace highway and pay $50 for privilege. Dirt now mined said to pay better than at any time in previous history.

UTAH

Juab County

TINTIC DEVELOPMENT (Mammoth)—Hoist and machinery at this company's Sioux-Ajax claims being loaded and shipped to Yampa mine at Bingham. Two properties owned by same men.

Summit County

SNAKE CREEK TUNNEL (Park City)—November showed progress of 388 ft. New Bury compressor and motor installed. Country rock hard marbleized limestone. No diorite encountered, though it forms surface rock above tunnel. Face dry most of month, but at 9800-ft. point water encountered. Flow at portal about 450 gal. per min.

Tooele County

MOZART (Wendover)—Operations to be resumed; men and provisions sent out for winter work. Tunnel will be driven to cut vein.

WASHINGTON

HECLA (Chewelah)—Company now has boiler, hoist, compressor and other equipment; will sink 200 ft. to first level.

WESTERN UNION (Republic)—Lease and bond on Insurgent, "V" Fraction and Ireland mines given by G. B. Dennis, of Spokane, for $125,000. This completes arrangements for development of entire Republic group. Mining now under way on Insurgent and Ireland properties, payment of lease and bond to Mr. Dennis to be made on tonnage basis.

WISCONSIN

KITTOE (Benton)—Vinegar Hill Zinc Co. reassembling Masbruch mill on this new property.

CHAMPION (New Diggings)—New mill of Wisconsin Zinc Co. made initial run showing capacity of 400 tons of mine dirt in 10 hours.

THOMPSON (New Diggings)—New shaft 6x15-ft., three-compartment, being sunk and 250-ton mill will be erected by Field Mining Co.

WEST HILL (Platteville)—This new property making good; first two cars of concentrates produced assayed over 55% metallic zinc.

CANADA

Ontario

ELLIS CLAIMS in Kirkland Lake district report good gold discovery.

LA ROSE (Cobalt)—New shaft on Extension down 150 ft. and will be continued till contact with Keewatin is reached.

BUFFALO (Cobalt)—Property resumed operations Dec. 7. Low-grade mill again treating ore and operations will be on same scale as existed before shutdown.

MILLER LAKE-O'BRIEN (Gowganda)—Board of conciliation appointed by Canadian government to inquire into dispute over wages between owners and employees, reports all danger of strike averted.

JUPITER (Schumacher)—Option dropped by McKinley-Darragh. Terms option called for payment on Dec. 17 of $50,000 to retire outstanding bonds. Development of property will be continued by Jupiter company.

Yukon

YUKON GOLD (Dawson)—Company preparing to handle thousands of cords of wood this winter for thawing next summer; 2000 cords will be hauled to Bonanza; 3000 cords to dredge No. 9 on 21 Eldorado and N. A. T. & T. claim; several hundred cords to dredge No. 8 on 24 above Bonanza. Wood will also be hauled to dredge No. 1 near mouth of Bonanza and 6000 cords to dredge No. 6 on lower Gold Run.

CANADIAN KLONDIKE (Dawson)—Further details in regard to world's record recently established by dredge No. 3 operating in Bonanza Basin, when 110,045 cu.yd. of material was handled in one week, show that it was in operation 163 hr. 51 sec. with loss of time of 4 hr. 9 min., divided between operation 4 hr. 3 min. and repairs 6 min. Yardage per operating hour, 674; kilowatt-hours used, 106,000; kilowatt-hours per cu.yd., 96; average width cut, 280 ft.; average depth cut, 30.6 ft. Crew of dredge: Arthur Gibson, dredgemaster; Joe McKinnon, Stanley Gibson, Geo. Munroe, winchmen; James Forbes, oiler. Dredge built in 1913. New bucket line put on recently and bucket lips built up extra 2 in., thus giving capacity of 17 cu.ft. instead of 16 cu.ft. as originally designed.

CENTRAL AMERICA

Costa Rica

AGUACATE MINES (San Mateo)—Orebody now opened on seventh level for about 1200 ft. Ore milled in November averaged $28 per ton. Bonanza ore encountered between 550-ft. and seventh levels; this will be sorted and after preliminary treatment sent to U. S. smelters. Manager Spilsbury expects shortly to ship 50 tons averaging $2000 per ton.

BELGIAN CONGO

DIAMOND MINES still working; no suggestion of stopping.

COPPER MINES, contrary to report, not closed down; employees drawing half pay, remainder put in bank at 5%. Railroad construction work, which had reached kilometer 220, stopped.

The Market Report

METAL MARKETS

NEW YORK—Dec. 16

Copper and tin have been strong and advancing. Spelter and lead have been sluggish. In all the metals the present prices ought to be satisfactory to everybody, considering the conditions.

Copper, Tin, Lead and Zinc

Copper—A large business was done during our last week of record, each of the important selling agencies reporting transactions of millions of pounds. These were both for domestic and foreign account. England and France were buyers. The effect of the increased demand, which was genuine, was an advance of price, but this natural movement happening to coincide with resumption of trading in stocks in Broad Street, the daily papers indulged in rather flamboyant stories. The market was good, but not quite so good as pictured. There has been a wonderful recovery in copper but harm is done if anybody be led to forget that the industry is still on a 50% basis.

During the last two days some small sales were made at 13½c., regular terms, but the bulk of the business was done at 13⅜c., delivered, 30 days, in this country and at £62, less ½%, or about 13.40c., delivered in Europe. At the close copper was easily available on those terms, although some sellers were holding at 13½c. regular terms, and were indisposed to go below that.

A well informed estimate of the present consumption of copper in this country is 40,000,000 to 50,000,000 lb. per month. Estimating exports at 40,000,000 lb., deliveries are probably well ahead of current production.

Producers selling copper to Europe find it hard to reckon nowadays what they are going to realize; exchange, freights, insurance and war risk being such uncertain factors. The differential between c.i.f. London and f.o.b. New York is variously reckoned at ¼ to ⅜c. per lb., which is materially higher than the normal in ante-bellum times. Producers do not like to make a simple price f.o.b., New York, and let the foreign buyer do the figuring because of competition among themselves and the inability of the foreigners (or their supposed inability) to manage the machinery of the business so well; but if there were a single selling agency for export business, a change of that sort would be very likely to develop. Already some business with the neutral countries, which has become especially troublesome, is being done in that way.

Copper sheets, base price was advanced ½c. on Dec. 15, and is now 18½c. per lb. for hot rolled and 19½c. for cold rolled. Usual extras charged and higher prices for small quantities.

In the British House of Commons on Nov. 26, Sir Edward Grey, replying to Sir J. D. Reese, said that copper had been declared absolute contraband. Any copper shipped for an enemy through a neutral country was therefore liable to seizure and confiscation, and His Majesty's Government is effectively exercising its belligerent rights accordingly.

Tin—Spot supplies in New York being very small, a Russian inquiry for a few hundred tons which came into the market about the end of the last calendar week tended to advance prices materially. Futures, which are selling at a considerable discount, did not attract consumers and the business done was small in volume.

Lead—This market was again very dull and the price is a shade easier. A declining tendency is scented in the trade. Another Russian inquiry for a large tonnage of lead was in the market this week.

Spelter—Domestic demand continued to be conspicuous by its absence and the foreign demand became rather sluggish after certain large transactions in the early part of our week of record. London quotations indicated an ability of sellers to realize better than the market here, but just what the seller is going to realize on contracts for future deliveries abroad is an uncertain factor. Anyway the late London quotations seem to have been but nominal inasmuch as sellers who tried to realize them could not do so. A considerable business in brass specials was done.

Zinc dust is quoted at 10c. per lb., New York.

Aluminum—The market has been dull and rather easy. Some inquiries reported, but few sales. Quotations around 19c. per lb. No. 1 ingots.—**Antimony** is again quiet, with small business doing. Ordinary brands are 13@13½c. per lb., while 16@17c. is asked for Cookson's.—**Quicksilver** is quiet but strong, and quotations remain $52.50 per flask of 75 lb. in New York. London price is £11 10s. per flask.—**Nickel**—Ordinary forms—shot, blocks or plaquettes—are 40@45c. per lb., according to size and terms of order. Electrolytic metal is 5c. per lb. higher.

DAILY PRICES OF METALS

NEW YORK

Dec.	Sterling Exchange	Silver, Cts per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
10	4.8700	49⅞	12.60 @12.70	32¾	3.80	3.67½ @3.70	5.65	5.50
11	4.8745	50	12.70 @12.80	33½	3.80	3.67½ @3.70	5.65 @5.67½	5.50 @5.52½
12	4.8713	49⅞	12⅞ @13	34	3.80	3.67½ @3.70	5.65 @5.67½	5.50 @5.52½
14	4.8700	49⅞	12⅞ @13	34¾	3.80	3.65 @3.70	5.65 @5.67½	5.50 @5.52½
15	4.8706	49¾	13.15 @13.20	34¾	3.80	3.65 @3.70	5.65 @5.67½	5.50 @5.52½
16	4.8713	49⅝	13.15 @13.20	34½	3.80	3.65 @3.70	5.65 5.67½	5.50 @5.52½

The quotations herein are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer, and is subject to discounts, etc. The difference between the price delivered and the New York cash equivalent is at present 0.15 to 0.20c. on domestic business and 0.25 to 0.37½c. on European. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Dec.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts per Lb.	3 Mos	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
10	23⅛	56¾	12.30	56⅞	*	146	145	19¼	4.18	28¼	6.14
11	23⅛	57⅝	12.53	57⅞	*	147	146	19¼	4.18	28¼	6.14
12	23 1/16	.	....								. .
14	23 1/16	58¼	12.66	58⅜	*	150½	149½	19¼	4.18	28¼	6.14
15	23	58⅜	12.68	58⅝	*	149¾	148¾	19¼	4.18	28¼	6.14
16	22 15/16	57¾	12.55	58	*	149¾	148	19⅛	4.16	28	6.08

*No quotations.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26¼c. = £25 = .44c.; £50 = 10.88c. Variations, £1 = 0.21¾c.

Bismuth—Current sales have been at $2.75 per lb., New York.

Selenium—Quotations are $2@3 per lb. for larger quantities; $4.50@5 per lb. for smaller lots.

Gold, Silver and Platinum

Gold exports from Germany have been absolutely prohibited. Penalties of fine and imprisonment are provided for violations of this rule.

Total transactions in gold bars at the New York Assay Office in November amounted to $3,108,843, being $4,233,199 less than in October. For the 11 months ended Nov. 30, the total was $31,699,074 in 1913, and $58,869,980 in 1914; an increase of $27,170,960 this year.

Gold production in the Transvaal in November is reported at 715,886 oz., against 733,746 oz. in October and 673,486 oz. in November, 1913. For the 11 months ended Nov. 30 the total output was $167,881,926 in 1913, and $158,807,631 in 1914; a decrease of $9,074,295, or 5.4%, this year.

Silver—Owing to English Mint purchases and moderate buying on India account, price of silver has been fairly well maintained. Conditions in Mexico are improving somewhat from the mining interest point of view.

Platinum—The market is weak and uncertain, with business moderate only. Quotations for refined platinum are $42@43 per oz. Hard metal is $46@49 per oz., according to quality.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Dec. 12

The base price paid this week for 60% zinc ore was $47 per ton. The base price paid for 80% lead ore was $46 per ton. No shipments of lead were reported.

SHIPMENTS WEEK ENDED DEC. 12

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	4,302,520	....	336,100
Year	160,208,340	4,998,890	31,247,650

Shipped during week to separating plants, 4,343,190 lb. zinc ore.

JOPLIN, Mo.—Dec. 12

Blende, high price, $50; assay base, 60% zinc, $46@48.50; metal base, 60% zinc, $44@45; calamine, base, 40% zinc, $22.50@24.50; average, all grades of zinc, $44.78 per ton.

Lead, high price, $49; base, $47@48 per ton, 80% metal content; average, all grades of lead, $47.22 per ton.

The week's shipment is the largest in pounds of blende and galena of the entire year, and the value is the largest of any week of the year. Even with prices steadily advancing the demand for blende and calamine grows stronger.

SHIPMENTS, WEEK ENDED DEC. 12

	Blende	Calamine	Lead	Values
Totals this week	12,138,350	789,570	2,383,590	$345,780
Totals this year	492,602,810	37,264,070	85,427,810	12,328,200

Blende value, the week, $279,560; 50 weeks, $9,896,220.

Calamine value, the week, $9980; 50 weeks, $439,170.

Lead value, the week, $56,240; 50 weeks, $1,992,360.

IRON TRADE REVIEW

NEW YORK—Dec. 16

The iron and steel markets continue to show an improved tone, although the end of the year is approaching when there is usually a lull in business.

Exports from Baltimore, Nov. 11, included 12,886,657 lb. iron pipe and fittings to Abadan, Persia. This is an unusual destination for such exports.

Official announcement was made Dec. 14, that because of unsettled financial and industrial conditions, the United States Steel Corporation has decided not to offer its stock to employees for subscription in 1915. The practice of offering stock for the subscription of its employees was instituted by the Steel Corporation as far back as 1903, and this will be the first year since the profit-sharing plan became operative in which the employees will not have the privilege of subscription.

Imports at Baltimore for the past week included 30 tons Spiegeleisen and 1600 tons ferromanganese from Middlesboro, England.

United States Steel Corporation reports unfilled orders on its books on Nov. 30 at 3,324,592 tons of material; which compares with 3,461,097 tons on Oct. 31, 4,932,857 tons on June 30, and 4,396,347 tons on Nov. 30, last year.

PITTSBURGH—Dec. 15

The steel situation has shown further improvement, though the progress is slow. There are heavier bookings of orders for immediate shipment, but the total is still small, and not sufficient to occasion any increase in mill activity. The steel mills as a whole are operating at about 35% of capacity and instead of increasing this rate shortly will close down over the holidays in many cases. January, however, may see a 50% rate of production. There is ample pig iron accumulated for such an increase, and idle blast furnaces are not likely to be blown in, except in special instances, for some time. Steel prices are steadier than they were and in some lines may be regarded as quite firm.

Iron and steel exports are improving constantly. The October figures, just out, show 147,000 tons exported during the month, against 96,000 tons in September, 86,000 tons in August, 145,000 tons in July, and an average of 141,000 tons a month during the first six months of the year. Reports from steel manufacturers indicate that there has been a further increase since October.

Pig Iron—The American Steel Foundries has purchased 7500 tons of basic iron, at $12.75, delivered, figuring out $12.50 at furnace with some of the business, but somewhat lower prices as to the balance. There is a fair running demand for foundry iron, but nothing big, and quotations are unchanged: Bessemer, $13.75; basic, $12.50; No. 2 foundry, $12.75@13; malleable, $12.75@13; gray forge, $12.50@12.75, at Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese—The ferromanganese market remains quiet. Some consumers are apprehensive of further large advances, but are making no particular effort to cover. We quote prompt and contract at $68, Baltimore.

Steel—Negotiations are beginning on contracts for billets and sheet bars for next year's delivery. For early deliveries we quote billets at $18.50 and sheet bars at $19, at maker's mill, Pittsburgh or Youngstown. Rods are $24.50@25, Pittsburgh.

IRON ORE

Imports and Exports of Iron Ore in the United States 10 months ended, Oct. 31, in long tons:

	1913	1914	Changes
Imports	2,191,151	1,210,093	D. 981,058
Exports	907,251	548,827	D. 358,424

In 1914 the larger imports were 698,034 tons from Cuba; 275,953 from Sweden; 66,982 from Spain.

Imports of manganese ore for the 10 months were 288,188 tons in 1913, and 255,110 tons in 1914; decrease, 33,078 tons.

COKE

Coke production in the Connellsville region is reported by the "Courier" at 195,575 short tons; shipments, 196,157 tons. Production of Greenville and Upper Connellsville districts, 28,765 tons.

Exports and Imports of Fuel in the United States 10 months ended Oct. 31, in long tons:

	Exports		Imports	
	1913	1914	1913	1914
Anthracite	3,598,343	3,406,491	864	19,295
Bituminous	15,543,656	12,254,757	1,136,737	1,088,608
Coke	711,818	511,207	67,297	93,936
Bunker coal	6,483,020	6,285,770	.....	.....
Total	26,336,837	22,458,225	1,204,898	1,201,839

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The greater part of the trade, both imports and exports, is with Canada.

CHEMICALS

NEW YORK—Dec. 16

The general market continues slow and dull, with only a very moderate business doing.

Arsenic—Business continues quiet and unchanged. Current quotations remain at $3.75@4 per 100 lb. for both spot and futures.

Copper Sulphate—On a moderate business prices are unchanged at $4.35 per 100 lb. for carload lots and $4.60 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is dull and sales small. Prices are nominally the same as by last report, 1.85c. per lb. for both spot and futures.

Pyrites—Imports at Baltimore for the past week included 3464 tons of pyrites from Huelva, Spain

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev.	Jan. 5	Jan. 27	$0.03
Atlantic, Ida.	Nov. 28	Dec. 28	0.0005
Beaver Copper, Utah.	Dec. 3	Dec. 22	0.005
Caledonia, Nev.	Dec. 8	Dec. 31	0 05
Century, Utah.	Jan. 2	Feb. 2	0 01
Clear Grit, Ida.	Jan. 12	Jan. 29	0 0015
Con. Imperial, Nev.	Dec. 23	Jan. 15	0 01
Con. Ores, Utah.	Dec. 4	Dec. 20	0 25
Crown Point, Nev.	Dec. 8	Dec. 29	0.05
Darby, Ida.	Dec. 14	Jan. 14	0.001
Dld. Bk. Butte, Nev.	Dec. 1	Dec. 30	0.01
East Hercules, Ida. (post.)	Dec. 1	Jan. 2	0.001
Emerald, Utah (three instal.)	. . . .	June 9	0 01
Exchequer, Nev.	Dec. 21	Jan. 11	0 03
Gold Bond, Utah.	Nov. 24	Dec. 24	0 001
Grt. Copp. King, Utah.	Dec. 21	Jan. 21	0.001
Gypsy Qn., Nev.	Jan. 12	Feb. 16	0.01
Hale and Norcross, Nev.	Dec. 14	Jan. 4	0 03
Hilarity, Ida. (post.)	Oct. 12	Dec. 23	0.003
Hope, Calif.	Dec. 15	Jan. 11	0.05
Hypotheek, Ida.	Dec. 17	Jan. 11	0.006
Id.-Mont, Ida (post.)	Nov. 2	Jan. 8	0.001
Lehi Tintic, Utah.	Dec. 17	Jan. 16	0 0025
Lyon Big Six, Utah.	Nov. 21	Dec. 26	0 005
Majestic-Idol, Nev.	Dec. 15	Jul. 20	0.005
Mammoth Gold, Nev.	Nov. 23	Jan. 4	0 02
Maxfield, Utah	Dec. 9	Dec. 30	0.0016
New Yerington, Nev.	Dec. 23	Jan. 13	0 01
O. K. Silver, Utah.	Dec. 14	Dec. 31	0.00167
Oreano, Ida.	Dec. 26	Jan. 25	0.00075
Overman, Nev.	Dec. 22	Jan. 11	0.05
Phoenix, Ida. (post.)	Nov. 26	Dec. 26	0 005
Potosi, Nev.	Jan. 12	Feb. 4	0 02
Reindeer-Qn., Ida. (post.)	Sept. 21	Dec. 26	0.002
Rainbow, Ida.	Nov. 30	Dec. 31	0 002
Raven, Ida.	Dec. 30	Jan. 30	0 0003
Rexall, Utah.	Dec. 1	Dec. 21	0 002
Riverside, Ida.	Dec. 20	Jan. 20	0.001
St. Francis, Calif.	Dec. 8	Dec. 28	0 0025
Seg. Belcher, Nev.	Dec. 16	Jan. 11	0 02
Sheba, Utah.	Jan. 12	Feb. 24	0.05
Sonora, Ida.	Nov. 30	Dec. 30	0 002
Sunshine, Ida	Nov. 23	Dec. 22	0 001
Syndicate, Ida.	Nov. 26	Dec. 28	0 001
Tarbox, Ida. (post.)	Nov. 25	Dec. 28	0 0025
Tuscumbia, Ida. (post.)	Nov. 20	Dec. 21	0 002
Umatilla, Nev.	Jan. 4	Feb. 8	0.01
Utah-Yerington, Nev.	Jan. 2	Jan. 23	0 0006
Utah Zinc, Utah.	Dec. 7	Dec. 28	0.0025
Wheeler, Utah.	Dec. 21	Jan. 11	0 01
Wisconsin, Ida.	Nov. 16	Dec. 21	0.003
Yankee Con, Utah.	Dec. 17	Jan. 4	0.01
Zuma, Utah.	Dec. 21	Jan. 12	0.0025

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28 983	26 553
February	59 043	61 642	57.506	27.190	28.357	26 573
March	58.375	57.870	58 067	26.875	26.669	26 788
April	59 207	59 490	58 519	28.284	27.416	26 958
May	60 880	60.361	58 175	28 038	27 825	26.704
June	61.290	58 990	56.471	28 215	27.199	25 948
July	60 654	58 721	54 678	27.919	27 074	25.219
August	61 606	59 293	54 344	28 375	27 335	25.979
September	63 078	60 640	53 290	29 088	27 986	24 260
October	63 471	60 793	50 654	29 299	28 083	23.199
November	62.792	58 995	49 082	29 012	27.263	22.703
December	63.365	57.760	......	29 320	26 720	....
Year	60 835	59 791	.	28 042	27 576	..

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0 925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16 488	14 223	71 .741	64.304	77.750	69 488
February	14 971	14.491	65.519	65.259	71 575	70 188
March	14 713	14.131	65.329	64.276	70 658	69 170
April	15.291	14.211	68.111	64.747	74 273	69 313
May	15.436	13 996	68.807	63 182	74.774	67 786
June	14 672	13 603	67.140	61.336	70 821	66 274
July	14.190	13.223	64.166	60.540	69 446	64 955
August	15 400	*	69.200	‡	74 313	‡
September	16 328	*	73.125	‡	78 614	‡
October	16 337	*	73.383	‡	79.250	‡
November	15 182	11 739	68.275	53.227	73 825	*
December	14 224	.	65 223		69 583	. .
Year	15 269		68 335		73 740	

New York, cents per pound. London, pounds sterling per long ton. *Not reported. ‡London Exchange closed.

The usual pig-iron price averages are omitted for lack of space this week, but the omission is not permanent.

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50.298	37.779	238.273	171.905
February	48.766	39 830	220.140	181 556
March	46.832	38 038	213.615	173 619
April	49.115	36.154	224 159	163 963
May	49.038	33 360	224 143	150 702
June	44 820	30 577	207.208	138.321
July	40.260	31.707	183.511	142.517
August	41.582	*	188.731	‡
September	42.410	32.675	193.074	‡
October	40.462	30.284	184 837	‡
November	39 810	33.304	180.869	139 391
December	37 635	. . .	171.786	....
Av. year	44 252	. . .	206.279	..

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4 048	4 175	3 937	16.550	19 606
March	4.327	3 970	4.177	3 850	15 977	19 651
April	4.381	3.810	4.242	3 688	17 597	18 225
May	4.342	3 900	4.226	3 808	18 923	18.503
June	4.325	3.900	4.190	3 810	20 226	19.411
July	4.353	3 891	4.223	3 738	20 038	19 051
August	4.624	3.875	4.550	3.715	20.406	‡
September	4.698	3.828	4.579	3 658	20 648	‡
October	4.402	3.528	4 253	3 384	20.302	‡
November	4 293	3.683	4.146	3.585	19 334	18.500
December	4.047	.. .	3.929	....	17.798	......
Year	4 370		4 238	.	18 743	..

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5.228	25.338	21 413
March	6.078	5 250	5.926	5 100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5 074	5.256	4.924	24.583	21.393
June	5.124	5 000	4.974	4.850	22.143	21.345
July	5.278	4 920	5.128	4 770	20.592	21.568
August	5.658	5 568	5.508	5.418	20.706	‡
September	5.694	5.380	5.544	5.230	21.148	‡
October	5.340	4 909	5.188	4 750	20 614	‡
November	5.229	5 112	5 083	4.962	20.581	25 016
December	5.156	....	5 004	..	21 214	.
Year	5.648	...	5.504	...	22.746	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

COLO. SPRINGS Dec. 14	
Name of Comp.	Bid.
Acacia	.03
Cripple Cr'k Con.	.007
C. K & N.	.05½
Doctor Jack Pot	07½
Elkton Con.	41½
El Paso.	1 35
Findlay.	01¾
Gold Dollar	.03½
Gold Sovereign.	02½
Isabella	.11½
Jack Pot	06
Jennie Sample.	02
Jerry Johnson.	03
Lexington	‡ 003
Old Gold.	007
Mary McKinney.	40
Pharmacist.	‡ 003
Portland	1 10
Raven B. H.	.03½
Vindicator	1 15

SALT LAKE Dec. 11	
Name of Comp	Bid.
Beck Tunnel	04½
Black Jack	04
Colorado Mining.	10½
Crown Point	‡ 01
Daly-Judge.	4 60
Gold Chain	‡ 10
Grand Central	61
Iron Blossom.	1.10
Little Bell	10
Lower Mammoth	01¾
Mason Valley.	‡ 50
May Day.	11
Opohongo.	‡ 01½
Prince Con.	18
Silver King Coal'n.	2.40
Silver King Con.	1.72½
Sioux Con.	.02
Uncle Sam	.04
Utah Con.	.00½
Yankee	.01

TORONTO Dec. 14

Name of Comp.	Bid	Name of Comp.	Bid.
Bailey	.01½	Foley O'Brien.	18
City of Cobalt	.30	Hollinger	19 25
Coniagas.	5.50	Imperial	01
Peterson Lake.	.27	Jupiter	10
Right of Way	.03	McIntyre	.22
T & Hudson Bay.	30.00	Pearl Lake	.03
Timiskaming	.11	Porcu. Gold	.05
Wettlaufer-Lor.	.05	Preston E. D.	.01
Big Dome.	8 25	Rea	15
Dome Exten	08½	Seneca Superior.	1.75

SAN FRANCISCO Dec 14

Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks		Misc. Nev. & Cal.	
Alta	‡.05	Belmont	5.00
Belcher	‡.75	Jim Butler	.80
Best & Belcher.	.04	Lone Star	.09
Caledonia	.30	MacNamara	.01
Challenge Con	.12	Midway	.09
Confidence	‡.21	Mont.-Tonopah	.37
Con. Virginia	11	North Star	.19
Crown Point (Nev.)	‡ 40	Rescue Eula.	.07
Gould & Curry	.02	West End Con.	.64
Hale & Norcross.	.04	Atlanta	.44
Julia	.01	Booth	.15
Mexican	.29	C.O.D. Con.	.09
Occidental.	.85	Comb. Frac.	.10
Ophir	.09	Jumbo Extension	2.65
Overman.	.08	Pitts.-Silver Peak	.17
Potosi	‡.01	Round Mountain.	.39
Savage	.04	Sandstorm Kendall.	.13½
Sierra Nevada	04	Silver Pick.	.14
Union Con	06	Central Eureka.	‡ 25
Yellow Jacket	‡ 40	So. Eureka	‡1.80

N. Y. EXCH. Dec. 14	
Name of Comp.	Clg.
Amalgamated.	56¼
Am.Sm.&Ref.,com	60¼
Am. Sm. & Ref., pf.	100½
Am. Sm. Sec., pf. B.	‡78
Anaconda.	29½
Batopilas Min.	‡.75
Bethlehem Steel, pf.	87½
Chino.	36
Colo. Fuel & Iron.	25
Federal M. & S., pf.	29
Great Nor., ore., ctf.	28
Guggen. Exp.	47½
Homestake	‡110
Inspiration Con.	17½
Mex. Petroleum.	53
Miami Copper.	18½
Nat'l Lead, com.	42½
National Lead, pf.	103½
Nev. Consol.	13½
Ontario Min	‡2½
Phelps Dodge	‡175
Quicksilver, pf.	1½
Ray Con.	17½
Republic I&S, com.	20
Republic I&S, pf.	77½
SlossSheffi'd, com.	21½
Sloss Sheffield, pf.	‡82
Tennessee Copper.	33½
Utah Copper	50½
U. S. Steel, com	54½
U. S. Steel, pf.	104½

N. Y. CURB Dec. 14	
Name of Comp.	Clg.
Beaver Con	.19
Big Four.	.07
Blue Bell.	.06½
Braden Copper.	6½
B. C. Copper	.50
Buffalo Mines.	½
Can. Cop. Corpn.	1½
Can G. & S.	05
Caribou.	.66
Chambers Ferland.	.13
Con. Ariz. Sm.	7/16
Coppermines Cons.	1½
Davis-Daly	.75
Diam'field-Daisy.	09
Dia. Black B.	07
Ely Con.	‡ 01
Florence	.70
Goldfield Con.	1 9/16
Goldfield Merger.	41
Greene Cananea.	28
Kerr Lake.	4½
La Rose	½
McKinley-Dar-Sn.	56
Mines of Am.	2½
Mutual Min., pf	‡2½
Nevada Hills.	30
New Utah Bingham	7/16
Nipissing Mines.	5½
Ohio Copper.	11
Oro.	.17
Pacific Smelt	½
Stand'd Oil of N.J.	405
Standard S. L.	1½
Stewart	1 11/16
Tonopah	7½
Tonopah Ex.	2 11/16
Tonopah Merger.	.43
Tularosa.	5/16
West End Ex.	.03
Yukon Gold.	2½

LONDON Dec 1	
Name of Comp.	Clg.
Alaska Tre'dwell	£8 2s 6d
Camp Bird	0 6 0
El Oro.	0 11 0
Esperanza.	0 8 3
Mexico Mines.	4 0 0
Oroville	0 7 0
Santa Gert'dis	0 10 0
Tomboy	1 1 10½

BOSTON EXCH Dec. 14	
Name of Comp.	Clg.
Adventure	1
Ahmeek	255
Alaska Gold M	25¾
Algomah	‡.90
Allouez	37
Am. Zinc	17½
Ariz. Com., ctfs.	4 1/16
Bonanza.	‡.51
Butte-Ballaklava	‡2
Butte & Superior	‡25
Calumet & Ariz.	57½
Calumet & Hecla	380
Centennial	15
Cliff	‡1
Copper Range	31½
Daly West	‡2
East Butte	8½
Franklin	5½
Granby	66
Hancock	16
Helvetia	‡.30
Indiana	3½
Island Cr'k, com.	‡46
Island Cr'k, pfd.	‡87
Isle Royale	19
Keweenaw	‡3½
Lake	6½
La Salle	‡3½
Mass.	4
Mayflower	5½
Michigan	‡.60
Mohawk	45
New Arcadian	6½
New Idria Quick	‡3½
North Butte	22½
North Lake	1½
Ojibway	‡.90
Old Colony	4½
Old Dominion	45½
Osceola	68
Quincy	52½
Santa Fe	‡1½
Shannon	4½
Shattuck-Ariz.	20½
Superior	26½
Superior & Bost.	1½
Tamarack	29
Trinity	3½
Tuolumne	‡ 35
U. S. Smelting	30
U. S. Smelt'g, pf.	43½
Utah Apex	2½
Utah Con.	10½
Victoria	‡1
Winona	2
Wolverine	37
Wyandot	.37

BOSTON CURB Dec. 14	
Name of Comp.	Bid.
Alvarado	65
Bingham Mines	‡4.04½
Boston Ely	.22
Butte & Lon'n Dev.	.22
Calaveras	.93
Calumet-Corbin.	08
Chief Con	.75
Corbin	‡.90
Cortez.	.15
Crown Reserve	.74
Eagle & Bl'e Bell.	.90
First Nat. Cop.	1 1/16
Houghton Copper	2
Iron Cap Cop., pf.	‡5
Majestic.	.17
Mexican Metals.	.16
Nevada-Douglas.	.50
New Baltic	1½
Oneco	.70
Raven Copper	10
Smokey Dev.	.25
So. Lake	05
Tonopah Victor	‡ 29
Trethewey	15
United Verde Ext.	1 11/16

‡Last Quotations.

The Engineering and Mining Journal

VOLUME 98 DECEMBER 26, 1914 NUMBER 26

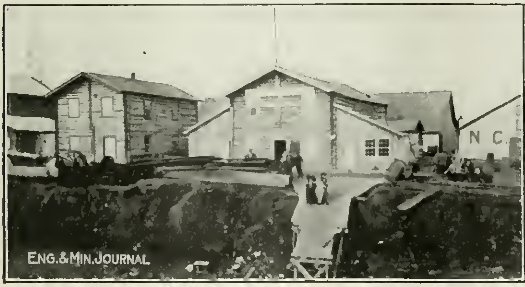
Dawson to Nome

By H. E. Chako

SYNOPSIS—Diary of a first trip down the Yukon River in Alaska. Methods of travel to and around the districts of Fairbanks, Ruby and Nome with notes on the Koyukuk, Iditarod and other less accessible points. Boat service uncertain. Roads wretched. Crying need of transportation facilities for interior Alaska. Famous U. S. Government wagon road from Ruby to Long Creek. Adventurous trip across from St. Michael.

⁂

There is coast Alaska and interior Alaska. Coast Alaska is a great country; it is interesting and it is different, but it is accessible. You can visit it at almost any time of year and with reasonable frequency, since the boats run at close intervals. This is especially true of Juneau, which is reached so much more easily than are the most northern parts of the territory as to be really a district by itself.



Steamboat Landing at Circle

On the bank can be seen parts of the Berry dredge, which will be hauled 70 miles overland this winter and erected.

Fort Yukon on the Arctic Circle

The dogs are waiting anxiously for the steamboat to land. The boat steward always saves a sack of meat scraps for the dogs in order to see them fight.

This article, however, treats of interior Alaska, where you may once in a while get a train and often catch a boat, but where mostly you walk—and it is the worst walking that ever I saw. I may not be etymologically correct, but I am convinced that the origin of the term "mushing," lies in the fact that the surface on which you walk is more like mush than any other known substance.

My travel experiences here recorded are no different from those of thousands of other tenderfeet who have gone through Alaska. But described from the *chechako* point of view, they may be illuminating to other *chechakos* who are going to follow my trail in great numbers through this vast country still little known.

I should qualify my statement that this account pertains only to interior Alaska. Nome is, of course, on the coast, and the Nome region is distinct from the interior; but Nome and its tributary districts are just as inaccessible as the interior itself. I left the sea at Skagway and reached it again at St. Michaels. But the fun began after I left Dawson.

Perhaps if I put my notes in diary form, they will be as intelligible as in any other shape.

On Boat—Aug. 12

We left Dawson Aug. 10 and are dropping down the Yukon. Below Dawson, 292 miles, we passed Circle. There is nothing in the town; it is 60 miles out over a wagon road to the mines and dredges. You can get across to Fairbanks, 180 miles away, but the trail is bad, following creeks and crossing two summits.

Beaver is about 400 miles below Dawson; I did not stop there. There is a so called government road from Beaver over to the placer region of the Koyukuk, and the camps of Coldfoot and Wiseman, but it is merely slashed out through the trees and brush and it is all grown up again so as to be hardly discernible. It is rarely used and there are no roadhouses. In fact, no one lives out in that country at all.

I didn't stop at Rampart, although there are some placer mines a mile above town and a number of prospectors working around there. Rampart is 620 miles below Dawson.

Fairbanks—Aug. 16

Left Dawson Monday morning, arrived here Sunday morning just after midnight. Time, six days; distance, 975 miles. We were one day late; got stuck all night on a sand bar opposite Tanana at the junction of the Yukon and Tanana Rivers. Then the boiler tubes began to leak, and it was difficult to keep up steam. The 275 miles up the Tanana River took us three days.

Fairbanks has a population of about 3000, the largest town in Alaska outside of Juneau and the most important interior town. If it does take almost a week to reach it from Dawson, at that it is the easiest town to reach of any in the interior.

Things are quiet here, and business is not over-good. The richest claims are worked out and they badly need capital, railroads, cheaper supplies, cheaper power, cheaper labor, cheaper machinery and cheaper everything else. They ought to get a good many of these things whenever the railroad comes and everyone is hoping that it won't be long delayed.

It has been raining four days steadily and is still at it. Alaska, rain and mud are inseparable in my mind. The autos cannot run to the various creeks, and therefore I am buying rubber "pacs" and will walk and wade it.

On Board Steamer "Tanana"—Aug. 26

Here I am dropping down the Yukon *en route* to Nome, instead of going across country to Chitina, Prince William Sound and thereabouts. The reason for this is that six days of steady rain made the trail to Chitina on the Copper River & Northwestern about impassable. The Tanana River rose 15 ft. at Fairbanks, washed out the bridge and flooded part of the town. The trail follows the Tanana from Fairbanks about a hundred miles to McCarty. Along this stretch the high water washed out one bridge, one ferry and one roadhouse. The Indians were charging $3 to take a man across each creek (white men have nothing on these Indians). Road Commissioner Zug had to leave a livery rig out along there and come in on foot. He is still paying about $10 a day for the team. An army lineman, just in when I left, said that the road was impassable for horses and not any too passable on foot, while the corduroy portions were all floating. It is likely to take them two or three weeks to lay brush on the road and fix the bridge and ferry, and all the while it looked as if another storm was threatening. With such roads it would have taken me over two weeks to walk the 310 miles to the railroad and would have cost me $7 a day besides for roadhouse service. It didn't look good to me to have to pay about a hundred dollars to walk over a trail like that. Therefore, I decided to come to Nome and make Prince William Sound later.

Prospectors Setting Out for the Hills from Fairbanks

Travel de Luxe—But Not Available in Summer

Sheldon runs a Ford between Fairbanks and Chitina and charges only about a hundred dollars for the trip. He is some auto driver. The Fairbanks people said he would come through if he had to build a raft and float his auto down the last hundred miles. There was no indication, however, that he would start back, and that was what was worrying me.

I find that in Alaska people don't make plans. The steamboats and the weather wait for no man, and so the man lives from day to day and does the best he can. The agent told me I would make an unusually good connection at St. Michael with the boats across the sea to Nome; in other words, I would have to wait only three days there, whereas usually you wait eight to 10 days. But the ticket agents for the boat line can give you little information. They don't even know two days beforehand when the boats will leave their own towns. For instance, from Dawson the boat left four days after it was scheduled to leave, while from Fairbanks they ran an extra boat to connect with the regular boat at Tanana, and this one left four days before it was scheduled. There you have it. The agent said he didn't know when the next boat to Nome would leave—maybe a week, maybe 10 days; there might be one more boat and there might be two, all depending on the freight for Nome; passengers can go to —other places

Ruby—Aug. 27

Here I am a little less than two days' time from Fairbanks. After deciding to go direct to St. Michael, I changed my mind and stopped off here. Out on Long Creek there is a good deal going on, about 15 operators working. This is about 30 miles or more beyond Ruby. The stage fare is $25 per round trip. A horse costs $15 a day plus $1 for each feed. The roads are knee-deep in mud and water, so I told the liveryman I would walk just as the others were doing. Expect to start in the morning. It seems the road houses here charge $1.50 a meal. Even the old-timers curse such a country.

Ruby—Sept. 2

Well, my little Long Creek trip cost me just 92 miles of walking and five days' time. The 60-mile round trip between the Creek and Ruby took three days' time, and then one day I walked 30 miles round trip in the rain to another creek 15 miles away, only to find one operator away and the other just sold out.

Did you ever see a Minnesota tamarack swamp? I suppose an Irish peat bog is very much the same. Well, that's what I've been wading in and walking over for these five days. On the map it is marked "U. S. Government Wagon Road." Lord, what a joke! It is like walking on a feather bed, or tramping back and forth in a haymow freshly piled with hay and with mud and water up over your ankles, or like a New Jersey cranberry bog when the tide has just gone out. Imagine such a feather bed or haymow or cranberry bog; then imagine trying to drive over it a loaded wagon hitched to four or six horses, although the load is light, crossing the little streams by throwing in poles and brush, sinking hub-deep in the swamps and making between one and two miles an hour. Then, if this rig gets through, call the tracks it leaves a road and you have an excellent picture of the U. S. Government road from Ruby to Long Creek over the tundra. The two feet of moss over the frozen ground not only acts like a spring, but holds water like a sponge, so the going is as bad on the tops of the ridges as it is in the creek bottoms. There are, however, some delicious blueberries which grow in the swamps and make the journey a little less unbearable. About all the Government road makers could do was to cut out the trees and underbrush, leaving the tree stumps close to the ground. Teamsters drive on the road when they can and to one side when they can't. Without question, this is the worst trail I ever saw in my life and I have seen bad ones. Yet, they tell me that the wagon road is good in comparison with some of the real *trails*. It reminds me of a time when I went to see a prospect in a little gully on the wooded side of a New Mexican mountain range. We had to leave the main trail at the top of the range, and as I looked dubiously over the unbroken expanse of oak-scrub and brush, I asked the prospector who was taking me in whether there was a road or trail down to his property. He scratched his head, then shook it, then said, "No, there ain't no road, and I don't know as there's exactly a trail, but down here there's a—a—a sort of a *thing*." A thing was about what this road was and a very poor thing at that.

YUKON RIVER POINTS

1. Nulato, the starting point for Bettles and the Koyukuk region. 2 and 3. Ruby, distributing point for one of the most promising placer districts.

RUBY—SEPT. 3

I asked some of the old-timers what a winter trail was like. They told me that in the winter the Government men go out and blaze a trail and cut out a few trees down to the snow level. Then in the summer these stumps stick up 2 ft. or more, while in the creek bottoms the willows or brush, which had been weighted down with snow and passing loads, straighten up so as to hide all trace of a trail, and consequently a winter trail is impassable in summer. They invariably added, "You can drive dogs anywhere in the winter and don't need winter trails. What we want is summer roads."

It costs $140 a ton to haul freight for 30 miles from Ruby to Long Creek over that road, and it costs $200 a ton to haul freight from Ruby to Greenstone Creek. On top of these figures add $42 a ton freight Seattle to Ruby, which has been raised $12 per ton since last summer because one boat line absorbed another and obtained a monopoly. Consider these facts awhile, and your predominating sensation will be surprise and admiration at the resources of both mines and miners which can not only pay wages but even show a proft while carrying such a load.

Lest I may be misunderstood as reflecting too much on the Government, I must add that it is now building a real road, and in four years has completed six miles. The method of construction is to place poles and brush across the roadway on top of the moss, ditch both sides and throw the underlying clay back on the poles. It makes a good road.

But the nerve of these operators! They have just clubbed together and bought a Ford machine in order to start a young man running a stage between Ruby and Long Creek over the road just described. He will not start, however, until the freeze-up comes. All true Alaskans have implicit faith in two things: First, in Alaska; second, in the Ford. There are Fords and there are automobiles, and the latter they assume not worthy of their consideration, for none but a Ford ever went out over one of these trails and got back again.

RUBY—SEPT. 11

Stuck here. No boats on the river for over two weeks. When I landed, the agent said he couldn't promise it, but he thought by the time I had walked out to the mines and back again that the boat which was coming up the river would be about ready to return. So I hustled off and hustled back, only to hear that the order had been changed—the boat had turned back farther down the stream. It was said that it ought to be in Sunday and would then return. As a matter of fact, it got in Monday night. Every plan they gave out they changed later. The boat agents know nothing and the captains know less.

The boat is now cleaning and washing her boilers and expects to leave for St. Michael tomorrow. We ought to reach there by the 14th. A U. S. judge and his court had to wait 10 days for a boat upstream. The sheriff and his party got tired of waiting and hired a gasoline launch to go down stream 300 miles, but had to wire Washington first to get authorization for the expense. The Government timber agents and fishing agents have their own rowboats, with Evinrude detachable motors.

The hotel people tell me that salesmen, judges and mine operators are often stuck for weeks at these towns. The hotel people don't mind in the least. Now that there is a monopoly of the river traffic, service is poor and the rates are higher. It is common talk here that poor service is given intentionally over the lower river to Nome, because the company is trying to force everybody to go up the river to Dawson and out over the White Pass & Yukon Route. The hotel people find it profitable and say that they have been lucky this year. The boat people laugh at you and say that a 10 days' wait is nothing. The interior of Alaska is a pocket, easy to get into, but hard to get out of.

I am convinced that there is only one way to travel through here; that is, to buy in Seattle an Evinrude motor, blankets, tent, mosquito netting, cooking outfit and grub. Then at White Horse, Yukon Territory, buy a boat for $20 to $40 and float down. In that way you can stop when you want to and go where you want to and you are not dependent on any steamboat monopoly. The Government men and miners do this regularly, and a woman not long ago came down to Ruby alone, 1500 miles.

ON BOAT—SEPT. 13

We finally got away from Ruby Friday morning. Between Tanana and St. Michael we passed Nulato and Holy Cross. The first is the junction point for the Koyukuk district, and the second the junction point for the Innoko-Iditarod. The Koyukuk is an awful place to get into. The mail is supposed to go by steamer four times a summer, but up to the time of my arrival there had been only one mail since spring. The steamer gets to Bettles, or as near as possible; and from there to Wiseman, which is one of the principal points, you go in a poling boat or are pulled in a barge by horses. (Let me say that one difficulty with Alaska is that the trails are too wet and the rivers too dry.) It costs about $60 from Nulato up to Bettles and about $40 from Bettles back down to Nulato. This is about 540 miles. The 90 miles from Bettles to Wiseman costs about $50 and the return trip about $10. In winter they get up there one mail of 150 lb. per month, brought in on dog sled, 300 miles from Tanana. The carrier camps out in the snow when it is 50° below and has to carry his own grub; shoots rabbits on the trail.

At Holy Cross there is a Catholic mission and a school with a fine garden and nothing else. The hotel and freight office are on a barge or an abandoned steamboat, and the rates are $4 per day. If you get off, you are likely to be kept there for 10 days or two weeks. There is no telegraph station, no news, nothing. From Holy Cross up to Dikeman, the head of navigation, is about 390 miles, and from there to Iditarod is about 80 miles, the distance being made in launches. The round trip is good for about three weeks first and last. In going up from Holy Cross to Dikeman, they carry a horse on the bow of the boat, so as to pull it over the sand bars.

THE RUBY WATER WAGON

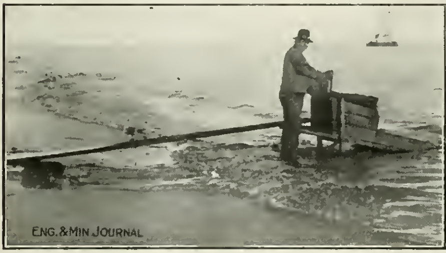
Seven dogs and the man work all day selling water around the town by the 5-gal. can.

STORM BOUND AT PORT SAFETY, 22 MILES EAST OF NOME—SEPT. 16

We got to St. Michael Monday morning, 738 miles in three days down the Yukon. We were told we would have to wait at St. Michael a week to get across to Nome; but in the afternoon a small sailboat with a 30-hp. gas engine in her came along, and six of us, including an army captain, engaged passage.

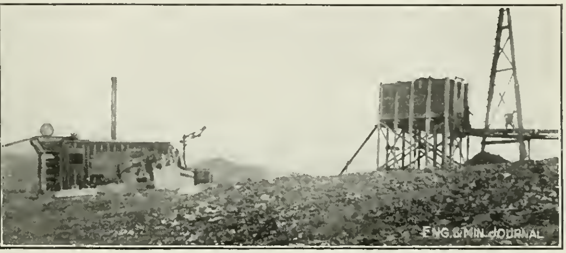
We left St. Michael at 5 p.m. Monday night. Within two hours a storm came up and we had to run for the lee of an island and anchor there all night. Rough? Wow! We were all seasick. The little boat had no berths. Most of the passengers lay either on two benches or on the floor of the forward cabin, as it was called. But three, of whom I was one, took two dirty bedquilts and slept on the curved bottom of the boat in the hold aft. I had a cork life preserver for a pillow and oars at my back. I wore everything I had—shoes, hat, sweater jacket, and everything else, trying to keep warm. We had to lie down for two nights and about a day and a half because we could not sit up. There was no place to wash and it was too rough to cook anything and dry bread was all we felt like eating anyhow.

We ought to have got into Nome this afternoon, about two days after leaving St. Michael, but another storm came up when we barely made this harbor. There is, of course, no harbor at Nome itself. I am staying in a roadhouse, the only house here, and will let the sailboat take my grips on to Nome while I walk the 12 miles in the other direction to Solomon.



A SURF WASHER ON THE NOME BEACH

The material is dumped from wheelbarrows into the hopper and washed down over riffles and an amalgamating plate by the wave action. In the background is the cableway tower of J. J. Sesson & Co., used for unloading cargoes.



A NOME DRIFT MINE

Operated by John Blake. The hoist house, ginpole, cableway, carrier, sluice, bin, etc., constitute a typical layout for underground placer work.

Expect to start tomorrow morning as soon as the storm goes down enough to let the ferry take me across the stream. I am sore from the planks and dizzy from the twisting of the little boat, but otherwise feeling fine. Winter is setting in, the low hills to the north are already white with snow, and I shall have to get out to Seattle in short order.

NOME—SEPT. 25

From Port Safety to Solomon the road was washed out in the big storm of October, 1913. I had to make the 12 miles over yielding beach sand along the edge of the sea. There were two ferries which I crossed at 25c. per. Solomon itself was entirely washed away by the same storm. Even the beach was gone. A dismal place! The wreckage stretched back from the shore for a mile or two—sides and roofs of houses, bales of hay, wheelbarrows, timbers, ties, railroad tracks, etc.—not a stick of the town left standing. A mile back from the old site is Dickson, consisting of roadhouse, store and postoffice.

The first dredge is six miles from Solomon. Then there are four dredges in the next stretch of six miles and two dredges about two miles up Shovel Creek. Finally, there are three dredges 10 to 20 miles beyond East Fork, but two of these are already shut down. There is a railroad, but this is closed, and a man pulls a push car with horses and charges $2 to ride 12 miles to East Fork roadhouse. I happened to catch a car and rode one way.

There is a stage from Solomon to Council City, 31 miles away, which runs on Wednesdays and returns on Thursdays, charging $10 each way. I couldn't wait for a stage so decided to walk it.

I walked the 20 miles from East Fork roadhouse to Hatch's. Hatch and one man were shoveling gravel into a sluice box. I stayed all night in his canvas house and had a fine meal of ptarmigan—much better than chicken. Hatch, besides working 10 hr., does all his own cooking. The next morning I got up early and walked the remaining 11 miles to Council. I heard a bell and thought it must be school beginning, but found out that the bell was in the Eskimo church and someone told me it was Sunday. However, only the Eskimos go to church in Council City, so I visited a hydraulic mine. The next day I hired a horse for only $7 and rode 30 or more miles, visiting four dredges and one hydraulic mine; and the day after that I walked back the 31 miles to East Fork. Started at seven in the morning and got in at five-thirty in the afternoon. Then the next day the horse car didn't show up, so I walked on back to Solomon, 12 miles, with a side trip of two miles to see a hydraulic plant. The boat didn't run to Nome that day—there weren't enough passengers; but the next day, the 24th, I made it all right. The boat is a small gasoline and sailing boat combination called the "Flyer." It cost $5 for the 35 miles. There used to be a boat called the "Flyer," the pride of Puget Sound. Believe me, this is no relation.

NOME—SEPT. 26

There are several districts which can be visited from Nome, although I didn't go. You can get out to the Kougarok over a railroad by means of a dogmobile; Mr. Matson has leased the right-of-way of the railroad, which is not operating, and will take you 60 miles on a push car pulled by dogs. I believe that there is a roadhouse at Kougarok.

You reach Teller and York by means of a boat which is supposed to leave three times a month, but is irregular. The trip is stormy and bad. There is a dredge and a mine or two near each of these towns, but several miles out over bad trails. There are no roadhouses; you carry your own grub and bedding and sleep out.

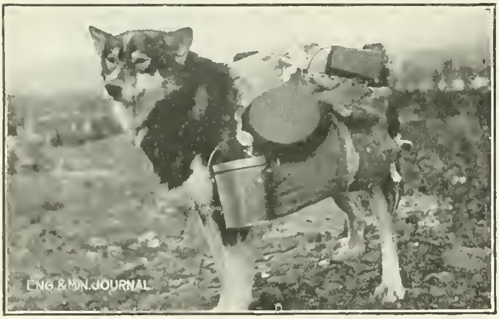
The Deering-Candle district is reached either by water or by land. By water it is 275 miles and by land 180. The trails are bad and you have to take off your clothes and wade waist-deep in ice water to cross two rivers. There are no roadhouses along the route, except along the 60 miles of the railroad out to Shelton on which the

the push cars are pulled by the dogs. The "Silver Wave," a mail boat, is supposed to make three trips a month to the district.

Miscellaneous Information

I left Nome for Seattle on the next to the last boat, without having seen all the operations thereabouts. A good many of them were closing down for the winter and it did not seem worth while to pay the excess fare charged on the last boat for the sake of seeing one or two more dredges. Perhaps some information on fares and prices and other miscellaneous points may be of interest.

It must be remembered that it takes at least all summer to go through the interior. The ice goes out of the Yukon River at Tanana between May 6 and May 18. The first boat from Dawson to Fairbanks leaves about May 22. The ice leaves Lake Labarge June 1 to 10. The first boat from White Horse to Dawson leaves between June 1 and 10. The first boat to Nome leaves between June 10 and June 20. Here are some fares: Fairbanks to Skagway, $105; Skagway to Fairbanks, $100; Fairbanks to Seattle, via Skagway, $135; Fairbanks to Seattle, via Nome, $120. It costs more to go up the river than it does to go down because it takes twice as long. In general, you can get better rates everywhere if you buy your entire ticket in Seattle. From Skagway to Dawson, to St. Michael, to Nome, to Seattle, $195; excess after Sept. 15, $50. The side trip to the Atlin district costs $15; to Fairbanks, $20; to Dikeman, $40. The single fare from Seattle to Skagway is $30. The local fare between St. Michael and Nome is $20; from Nome to Seattle is $100.



An Alaskan Burro

At Ruby stop at the Williams Hotel; in Fairbanks at the Shaw House. At Dawson, the Royal Alexander is the best hotel; the Regina is more reasonable, and the Rochester is fair. The rooms in Dawson run from $1.50 to $2; meals, from 75c. to $1. A newspaper costs 25c. and magazines, 25c, 50c and 75c. A hair cut is 75c., a shave 25c., a shine, 25c. A horse costs $1 a day and $1 for each feed. Here are some prices at Fairbanks: Hotel rooms, $1 to $2; meals, 75c. to $1.50; bath, 50c.; hair cut, 75c. At roadhouses on the creeks: Bunk, $1; meals, $1. At the Arcade Café, a T bone steak costs $2; coffee and hot cakes, 50c. But the braised caribou with mushrooms is only 75c.; a small moose steak with new potatoes and cream is only $1; and young moose with dressing is only 75c. Did you ever eat moose? It can't be beat. The ice cream is made of condensed milk. It is much better than the cornstarch stuff they sell in the first-class Eastern hotels. The smallest coin used is a quarter.

A word about clothing may not be amiss. My advice is to take summer clothes and winter underwear, with sweater jacket and a raincoat and a waterproof hat. The foot gear should be heavy.

Boat and railway agents are polite and obliging and are fine fellows, but look out for them. See that your ticket when you buy it is marked "includes meals and berth" and also "stop-overs allowed."

Copper Exports and Imports

The Bureau of Commerce has made public the exports of copper from the United States in October and in November, the latter month lacking two days. The figures are as follows, in pounds, the more important items being stated separately:

Destination:	October	Nov. 1-28	Total
Great Britain	23,113,426	17,356,000	40,469,426
Italy	22,166,413	4,852,000	27,018,413
France	5,874,394	14,361,000	20,235,394
Sweden	5,342,340	6,119,000	11,461,340
Norway	7,453,411	1,590,000	9,043,411
Denmark	358,547	....	358,547
Other countries	623,730	903,000	1,526,730
Total	64,932,261	45,181,000	110,113,261
Total, 1913			146,104,698

This is metallic copper in various forms. The exports in ore and matte are not given, but are usually small in proportion to the metal.

Imports of copper for October and November into the United States are reported as follows:

	October	Nov. 1-28	Total
Metallic copper	8,873,123	18,375,846	27,248,969
In ore and matte	8,060,489	677,426	8,737,915
Total	16,933,612	19,053,272	35,986,884

In October the larger imports of metallic copper were 2,927,680 lb. from Australia; 2,434,886 lb. from Peru; 1,294,692 lb. from Chile; 1,011,771 lb. from Canada; 721,892 lb. from Japan. The larger imports of copper in ore and matte were 3,128,095 lb. from Chile; 3,120,435 lb. from Cuba; 1,076,089 lb. from Canada; 380,484 lb. from Spain. The imports for November are only partially divided.

The Schneider-Creusot Works

These famous works in France, which have been brought into more than usual prominence by the war, are situated in the district of Saone et Loire, to the west of the town of Chalons-sûr-Saone, which has a population of 40,000 inhabitants, says the *Iron & Coal Trades Review*. The works had their beginning toward the end of the 18th century in a small iron foundry, which was reconstructed and extended in 1835 by Eugen Schneider, who was a native of Lorraine. Apart from the main works at Le Creusot, the present firm of Schneider & Co. is owner of a shipbuilding yard and arsenal at Chalons-sûr-Saone; also of coal mines at Devize and Montchanin, and of iron mines in Spain as well as in Lorraine. It has also a turbodynamo works in Champagne, artillery workshops and practice grounds at Le Havre, Harfleur and Toulon, and finally a manufactory for fireproof products at Perreuil. The situation of the main works is not exactly ideal, because the coal mines in the neighborhood can supply only about 25% of the quantity required, and the supplies of iron ore must be drawn either from Lorraine or from abroad.

Combined Cyanide and Other Processes--II*

By Herbert A. Megraw

SYNOPSIS—Concentration is not an expensive process when crushing and grinding costs are not charged against it. Other stage processes may include water crushing, oxidation treatment, desulphurization, and ammonia treatment. Amalgamation has been very widely used. Its disadvantages are the cost of mercury lost and expensive labor required. The ultimate profit is the object of all processes and must not be lost sight of.

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Sulphides other than pure pyrites are often encountered in precious-metal ores, as are also deleterious minerals which may not be sulphides at all. These compounds may contain other metals than the precious ones, and it may sometimes be an object worth taking some trouble to attain to save these metals as completely as possible, separately from the precious ones. Base metals, such as lead and zinc, may occur in small quantities, and often do occur in silver-bearing ores, but it has usually been considered bad practice to treat them together, that is, to allow the base metals to go through the cyanide treatment with the silver. The undesirability of so doing is due to one or more conditions. The base metals may be in such condition that they will dissolve readily in cyanide solutions, thus resulting in a high cyanide consumption and throwing the base metals into the precipitate, making a base mixture which is hard to melt and which is subject to heavy refining costs. In addition, there is no profit obtained from the base metals. On the contrary, should these have been separated by proper concentration methods before reaching the cyanide treatment, they might have been saved in such condition as to be valuable in themselves in addition to being removed from the cyanide-treatment system, where they would have entailed a high expense for cyanide consumption.

Handling Base Metals in Ores

When the precious and base metals occur in chemical combination they are very likely to be difficult or impossible to dissolve in cyanide solutions. In such cases there are two courses which may be pursued. Concentration may be used to separate the insoluble or difficultly soluble portions, allowing the remainder to go to cyanide treatment. The rebellious material is reserved for special treatment, either smelting or some other process especially fitted to its needs. An admirable example of a problem of this kind is that presented by the ores of the Nipissing Mining Co., at Cobalt, Ont. Here the operators were confronted with the problem of its low-grade ore containing rebellious silver minerals which were deemed to be only difficultly, if at all, soluble in cyanide treatment solutions. The problem then was whether to build a concentrating plant and separate the difficultly soluble portions, or to build a direct-cyaniding plant and at the same time subject the material to some preliminary treatment which would allow extraction of a satisfactory percentage of the metals by cyanide.

The Nipissing Treatment Problem

This question was given a great deal of study by the Nipissing company, and James Johnson, in an article in *Bull. of A. I. M. E.*, January, 1914, outlines the reasons for the process which has been worked out and followed. Briefly, it was found that the cost of a mill to treat by cyanide alone 200 tons per day, with an assured extraction of about 90% at an expense of $3 per ton, was estimated at $250,000. The probable comparison between such a mill and a concentrating mill, such as has been generally or usually used in that district, is shown in the accompanying table.

CONCENTRATING VS. CYANIDING MILLS

Assay of mill feed, 32.09 oz. Ag.

Concentration mill to give 80% extraction, approximate cost, $160,000.		
80% × 32.0902 = 25.67 oz. @ $0.52 =		$13.35
Working costs	$1.25	
Marketing concentrates, 10%	1.33	
Difference between corrected and commercial assays on concentrates	0.27	
		2.85
Profit per ton		$10.50
Cyanide mill to give 90% extraction, approximate cost		$250,000
90% × 32.0902 = 28.88 oz. @ 0.52 + 0.3c. increased price in marketing		$15.16
Working costs	$3.00	
Excess in bullion	0.07	
		3.07
Profit per ton		$12.09
Difference in favor of cyanide mill, per ton milled		$1.59

Based on these figures, it was found that the cyanide mill would return its extra cost after having treated 56,600 tons, a run of 283 days, provided expectations calculated upon were realized. As a matter of fact, regular operation has shown that they were somewhat exceeded, since the mill cost $254,839; the extraction of 26-oz. ore was 92 to 93%; the milling cost under $3 per ton, and the tons treated averaged 244 per day.

As a matter of fact, this process as used at the Nipissing is distinctly a two-stage, or rather a two-process combination treatment. The ore is crushed in water and given the aluminum desulphurizing treatment, which breaks down the rebellious sulphide combinations and reduces the silver to a native condition in such fine form that it is readily dissolved by the cyanide solution. This is certainly a two-process combination, and it has been proved to be quite an advantageous one over concentration alone or in combination, since by the former process the tailings would have been of such low value that they might not have paid to cyanide separately, and direct cyanidation of the whole might not have been altogether satisfactory as regards extraction.

Clevenger's Discussion of Nipissing Methods

Upon the latter point, however, there seems to have been some difference of opinion. G. H. Clevenger, in *Bull. of A. I. M. E.*, July, 1914, discusses the matter at great length. The crux of Clevenger's discussion is the question: "Is the highest possible recovery of silver made at the lowest cost per ounce recovered?"

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*This is the eighteenth of a second series of articles by Mr. Megraw. It deals with the comparative details of cyanide practice, discussing points of possible improvements. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, 1913; Jan. 31, Mar. 7, Mar. 21, Apr. 25, May 23, June 20, July 25, Aug. 29, Sept. 12, Oct. 17, Oct. 31 and Dec. 5, 1914. The next article will deal with "Labor Employed in Cyanide Plants," and will appear in the issue of Feb. 13, 1915.

He points out that the mill showing the greatest recovery does not necessarily give the highest ultimate profit, a fact that is perfectly evident, since by operations in the laboratory one can recover 100% of the metal, and the same method could be carried out on a commercial scale if it were not for the factor of expense. Clevenger further points out that some of the combined cyaniding and concentrating mills at Cobalt previous to this time did not make any greater, or in some cases, not so great an ultimate profit from their treatment as was earned by some of the purely concentrating mills, which, while they recovered a much lower percentage of metal, did it at a much less cost. He does not, however, support this statement by noting the examples considered, and his statement, while certainly possible, would be stronger if more facts and figures went with it. Clevenger shows that it may be possible that, due to the brittleness of the minerals within the ores, they are naturally brought to a very fine state of subdivision without any great expense or without any particular pains. The latter point is quite true, and it is also true that were these minerals as tough as the gangue it might not pay to go to the trouble of grinding them so fine. As a matter of actual fact, however, silver-bearing minerals, particularly sulphides, are seldom tough, and almost always brittle. The commonly occurring forms of silver cannot be said to be difficult of subdivision, except in the case of native silver itself, which exists plentifully in the Cobalt ores, but at the Nipissing is mostly separated and treated at the high-grade mill.

COST OF CONCENTRATING

The cost of concentrating varies with the ore to be treated and with the object to be gained by concentration. In cases where a complete and careful extraction of certain portions is required, it may be necessary to accomplish concentration in two or more steps, the first one being more or less a roughing-off system, followed by classification of the pulp and reconcentration. In other cases, however, where the ore justifies the practice, the main object is to remove the coarser pyrite, or metal-bearing sulphides, leaving the finer portions to be treated along with the rest of the ore. In this case, complicated methods are not necessary, and concentration may be comparatively inexpensive.

In a mill built for concentrating alone, the entire cost of crushing and grinding must be charged to that process. In a mill designed for the operation of several processes, the crushing and grinding is usually not charged to either of the processes in use, but made into a separate department and its charges segregated. Thus, in calculating the probable treatment cost of a concentrating mill to treat the ores of the Nipissing Mining Co., at Cobalt, Ont., the operators considered the cost of operations in the mills of the camp and decided that a figure of $1.25 per ton would cover the cost. Since this estimate was carefully arrived at, it may be accepted as a very close figure to the actual expenditure necessary. Such a plant would, of course, provide for careful concentration, probably in several steps. The cost includes crushing and grinding and all mill operating, but does not include marketing of the product. On the other hand, concentrating in mills which use other processes, and in which the concentration is charged with its own expenses only, the figures are very much lower. For instance, at the Montana-Tonopah, the concentration cost 4.1c. per ton of ore milled. At the Goldfield Consolidated, where concentration is a carefully designed and carried out process, its cost is 6.3c. per ton. At the Hollinger mill the cost is given as 6.8c. per ton. At the West End Consolidated, Tonopah, the cost is noted at 11.3c. per ton. At the Liberty Bell mill the cost of concentration is 6.75c. per ton. At the Nevada Hills mill the cost is given as 11.9c. per ton. At the North Star, in California, cost is given as 13.1c. per ton.

It may readily be seen from these figures that the cost of concentration depends altogether upon the character of the ore, and consequently the system of concentration used. If the system is one merely intended to remove the bulk of the sulphides, or the rebellious minerals, from the ore pulp, its cost is small indeed, while if more careful concentration is required the cost is naturally somewhat increased. It must be remembered, however, that careful concentration may in some cases prove to be the critical factor which will permit the economical handling of an ore which otherwise could not be successfully treated. An ore which may contain sulphide of zinc, copper, lead, or other combinations may be concentrated in such a way as to remove the rebellious elements entirely or sufficiently to permit the balance of the pulp to be successfully cyanided at a low cost. Of course, every ore is a problem in itself, and must be handled as such, the solution being worked out having in view not only the ore characteristics, but local conditions of every kind.

OTHER SEPARATE PROCESSES

Coming within the rôle of separate processes is the preliminary treatment in water or other chemicals, which is often given to ores before they are sent to the department of cyanidation. Crushing in water alone is often given as a necessary and advantageous system, even where amalgamation is not practiced. The reason for this is that in some cases where cyanide solution is used in the batteries or crushing machines, even in those cases where protective alkalinity is carried, there seems to be a development of acidity which, while only momentary and promptly overcome by the lime carried in solution, is nevertheless sufficient to allow the destruction of an appreciable quantity of cyanide during the moment in which the acidity is locally predominant. By crushing in water, this cyanide consumption is avoided and the acidity either neutralized by lime or washed away before entrance into the cyaniding circuit. This alternative adds somewhat to the cost of treatment, of course, but the expense is less than that of the cyanide destroyed if it is not used. The principal objection to the scheme is that it puts the ore into the cyanide circuit containing a certain percentage of water, and this water has to be got rid of in some way or the cyanide solution in the cyanide-treatment circuit will accumulate until it reaches such a point that some of it will have to be thrown away. Water, of course, is always taken into any cyanide circuit, but in such cases it is taken in the wrong place. All water entering cyanide circuits should be taken in with the tailings, where it is used to displace cyanide solution in the final pulp. Water has to be used at that point in any case, no matter how much comes in before, so the problem is to get rid of this water without discarding any appreciable quantity of cyanide solution containing valuable cyanide.

OXIDATION OF PULP

Another procedure somewhat similar, and partly the same in effect, is the oxidizing of a pulp before it goes to the cyanide-treatment circuit. In cases where accumulated tailings are to be treated, they often contain organic matter or other reducing agents which are active cyanicides, and these must be oxidized or removed from the pulp, or they will occasion a high cyanide consumption. This may be accomplished by using lime or calcium hypochlorite, bleaching powder, in a water solution previous to cyaniding. Before proceeding to the cyaniding circuits, pulps which have been treated by water, or by water with oxidizing agents, are carefully thickened to remove as much as possible of the moisture, or in some cases are filtered so that the pulp entering the cyanide circuit will contain about the same quantity of moisture as that issuing from it after the cyanide treatment has been completed.

Ores which contain small quantities of soluble copper may be and often are treated by an ammonia solution before being sent to the cyaniding circuit. The ammonia takes the copper into solution as a hydrate, and the pulp may be washed by decantation or by filtering, and then sent to the cyaniding circuit, where the precious metals may be recovered without high consumption of cyanide due to the copper. Sometimes pulps are treated by ammonia and cyanide together, both in the same solution, but this treatment has not reached a high stage of perfection at present, although it has sufficient promise so that it is by no means impossible of application upon an ore which indicates the necessity for such handling. All of these processes are somewhat similar, and have for their object the removal of cyanide-consuming elements before the ore undergoes cyanide treatment. The necessity for these schemes depends, naturally, upon the cost to accomplish them compared with the cost in cyanide loss in cases where they are omitted.

Amalgamating as a Combined Process

Amalgamating gold ores before sending them to cyanide treatment is a system which has been in existence since the origination of the application of cyaniding to such ores. As a matter of fact, amalgamation existed as a treatment system before cyanidation came into existence, and cyaniding was considered, in its first application to such ores, as merely an assistant to gather up the gold left in the ores which the amalgamation process could not recover. After exhibiting its efficiency in recovering fine gold, cyaniding became more and more prominent as a process, and amalgamation less so, finally being left in operation simply to recover the coarse gold which could not be dissolved by the cyanide solution in a reasonable length of time. It is an undoubted fact that in the great majority of milling-grade gold ores there is little or no coarse gold to be recovered, and it seems natural to suppose that the use of a single system, if it is efficient, is better than the use of two systems to recover the metal. Consequently, many of the plants which formerly used amalgamation have done away with it and depend entirely upon the cyanide process to recover all the economical value in the ore. The strength of amalgamation, however, as a well known and simple process for recovering gold, has led to its maintenance in many plants where it could probably be well dispensed with. The old axiom that the gold should be recovered as soon as possible has led to its continued existence, since it is believed that money is saved by recovering the gold promptly. As a matter of fact, the advocates of this system seldom calculate upon the losses of mercury and the cost of the system. Mercury losses are considerably more than have been acknowledged or believed, the proof of this statement being shown by the experiments made by the Nipissing Mining Co. in laying out the plan for their new low-grade mill. They came to the conclusion that it was a money-saving proposition to avoid the use of mercury wherever possible Their handling of mercury in large quantities in the high-grade mill gave them a large amount of extremely valuable experience and data in regard to mercury handling and its cost. A percentage which would probably not be noticeable on the small amount of mercury used in the plate-and-mortar amalgamation of gold ores stands out in high relief when applied to the huge quantities of mercury used in the amalgamation of those high-grade silver ores. Therefore, a much closer approximation of its actual cost and the actual losses involved can be obtained.

Amalgamation costs a definite sum of money, just as concentration or any other process does, and where it can be omitted as a factor in the ore treatment it should be done. It must also be considered, however, that where amalgamation is necessary it is a feature of just as vital importance as concentration or any of the other auxiliary processes which have been heretofore mentioned. All factors must be united to produce a concordant and economical system of ore extraction. Where coarse gold exists, amalgamation is thoroughly justified. Where it does not, and where it can be avoided, it is better not to use it. At the Liberty Bell mill, amalgamation was figured to cost 6.5c. per ton. At the Mother Lode mill. Sheep Creek, B. C., its cost was 8c. per ton. Many other mills using amalgamation ahead of cyanidation figure at costs harmonizing with those given, and varying with the size of the plant and the system of amalgamation carried out. It may be clearly seen, therefore, that if amalgamation can be avoided and the gold can be obtained in another process—that is, in the cyanidation circuit—money will be saved by following that course, notwithstanding the fact that it costs something to recover it in the cyanide circuit.

The crucial test of any combination of processes is, of course, their ability to produce the highest possible recovery at the least possible cost. Cyanide metallurgists are fortunate in having at their disposal such a variety of other processes which may be combined with their own to reach an economical maximum.

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German Iron Ore

The total iron ore mined in Germany in 1913 was 35,941,285 metric tons, of which Luxemburg supplied 7,333,282 tons. The ore mined outside of Luxemburg is classed as below:

Kind of Ore—	Tons	Av. % Iron
Minette ore, Lorraine	21,136,265	31.66
Brown ore, less than 12% Mn	3,005,970	34.14
Brown ore, 12.30% Mn.	330,037	22.86
Red iron ore	1,102,067	42.73
Spathic iron ore	2,860,811	33.54
Miscellaneous	172,753	....
Total	28,607,903	32.49

The production in part by districts was as follows: Luxemburg minette, 7,333,382 tons or 20.4%; Lorraine minette, 21,136,265 tons, or 58.8%; Berg and Siegerland, 2,729,341 tons, or 7.6%; Nassau-Oberhessen, 1,102,503 tons or 3.1%. Only 11% of the ores mined came within the bessemer limit of 0.05% phosphorus.

Men and Machinery of the Comstock--Pioneer Hoisting Works

By G. W. Dickie

SYNOPSIS—Some idea of the huge mechanical problems which were presented to the engineers of 40 years ago, and solved by them, can be had from the details of the hoisting engines given in this article. It must also be remembered that there were not only no precedents to follow, but also that few present-day facilities existed for machining large work. Hoists with flat steel ropes, which weighed over 25 tons and lifted 1800 tons a distance of 1700 ft. every 24 hr., are not common even today. Though many still cling to the hope of a bonanza at the Comstock, the romance of the '70s will never return.

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Before taking up the actual hoisting works as built for the mines on the Comstock, I will give a hurried description of the hoisting machines that had to be installed to handle the pit work, some of those being very heavy. The best example that I know of is one designed by myself and built by the Risdon Iron Works to handle the heavy work installed in the shaft and hydraulic pumping station at the Chollar, Norcross and Savage combination shaft.

Fig. 1 is a side elevation and plan of this pumping compartment hoist, which at that time was the most powerful of its kind that had ever been built for any mine, and for all I know may still be the biggest of its class. The pit head pulley was 20 ft. diameter, and from it the rope passed over the tops of the cylinders of the beam pumping engine to another pulley mounted on cast-iron columns behind the engine, and thence descended to the hoist. Fig. 1 is very clear, so that little description is needed to make it understood. It is taken from a lithograph I made from my original drawing in 1876. Each of the two side frames was cast in one piece; they carry the bearings for all the shafts and the engines.

The two engines had cylinders 14 in. diameter and 20 in. stroke. The cranks were set at right angles, and the disks carrying the pins were made large to serve as brake wheels. The engine shaft, as will be seen, carried two pinions, one being keyed fast to the shaft and the other fitted with a sliding clutch. The first pinion geared with a spur wheel 10 ft. diameter on the intermediate shaft; the face was 10 in. wide, with teeth pitched 2½ in. The other pinion geared with the main spur wheel. The intermediate shaft also carried a spur pinion fitted with a sliding clutch which geared with the main spur wheel. On each end of the intermediate shaft there was a winch end or gypsy head, to which the hauling part of a tackle could be taken for lifting heavy pieces in the engine house. The hub of the main spur wheel was made 56 in. diameter and formed the reel center. The diameter of this spur wheel was 15 ft. 8 in., and the reel arms extended to its outer circumference and wound 3000 ft. of 7½x¾-in. steel rope.

This hoisting machine could be run in either double or single gear, and in double gear with the reel full of rope could handle a load of 20 tons, and with the rope all out could lift 50 tons. The working platform was placed 9 ft. above the floor, and from it all the movements of the machine were controlled. This was an excellent arrangement of pump hoisting machine, and did well all the work for which it was built; without it, we could never have installed the huge hydraulic pumps and all the heavy pipe work in the short time in which it was done. The fact that such a machine was built at all shows the character of the men who were carrying on the work of trying to wrest from its rock matrix the secret wealth of the Comstock.

Hoisting 1800 Tons a Day

On the Comstock mines, with one or two exceptions, the hoisting works were built for flat ropes, and with one exception, that on the Consolidated Virginia and California combination shaft, were all geared. These hoisting works were much alike except in size; the illustration on p. 519, Sept. 19, showing the pumping and hoisting plants at the Silver Hill, Dayton, Caledonia, New York and Ophir mines, shows these geared arrangements at their best. They were seldom run balanced, as in most of the mines one compartment of the shaft might be working from a level several hundred feet higher or lower than the other. In the case of the Consolidated Virginia and California, there was the great Bonanza orebody to be exhausted as rapidly as possible, with a fixed loading station below and a fixed landing platform above, which were new conditions on the Comstock. The proposition was to install hoisting works that would deliver from the 1700-ft. level 1800 tons of ore each 24 hr., which was a capacity beyond anything hitherto required.

The order for these hoisting works was placed with the Union Iron Works. The designing was done by I. M. Scott and W. R. Eckart. I would have liked to have sesured an accurate description of this great hoisting plant from Mr. Eckart, but he is too feeble to do anything of that kind now. He was one of the noted engineers of the Comstock, and his great ability and untiring energy impressed themselves on the character of the machinery produced in San Francisco during the '70s for the Comstock mines. He and I were usually opposed to each other, being leaders in hostile camps, but we were good friends for all that, and have remained so during all the years since those truly stirring days.

Mr. Scott and Mr. Eckart wisely adopted for these works flat rope reels with engines direct-connected to the reel shaft. The diameter of the cylinders was 36 in. and the stroke 96 in. The valves were of the double-beat type, actuated by eccentrics, and had a variable cutoff worked from the reversing gear, so that one lever controlled the engine, leaving the operator with one hand free to work the control valve of the brake gear. The brake wheel was 15 ft. diameter, with a 12-in. face. The post brakes were operated by a hydraulic cylinder controlled by a differential valve-gear, the control for which was at the operator's left hand. The crank disks were 12 ft. diameter and polished all over; this was one of the show engines of the Comstock, not altogether because of its appearance, but because each day's work it did brought to the surface $180,000 worth of Bonanza ore. It was an impressive machine when at its full speed of 74 revolutions. The piston speed of 1184 ft. per min. was far beyond anything known at that time.

Vibration of Connecting-Rods

Only one trouble developed in its working; about two months after it was started, one of the connecting-rods broke close to the crank disk end; fortunately, this was discovered before it actually parted, so that it did no damage. It was considered to be a case of defective forging. These connecting-rods were 24 ft. long between centers, 12 in. diameter at the middle and 8 in. in the necks. A new one was made without change.

Mr. Eckart, however, was not satisfied, and when the new rod was in place, he determined to find out if a suspicion he had was correct. He thought that the accident had been caused by vibration in the rods, so he made a block of stiff clay and set it on a good foundation under the middle of the connecting-rod at half-stroke, carefully adjusting it so that when the engine was just turning over, the middle of the connecting-rod barely touched the clay. Then the engine was started and very slowly brought to its full speeed. Up to 40 revolutions, there was little change. but above that the connecting-rod began to beat down the clay, and at the full speed of 74 revolutions, the clay had gone down 1¼ in., due to the vibration of the connecting-rod; the rods were thereupon braced, and no further trouble occurred.

From the date of these engines up to the present time, hoisting works on important shafts have been built with the engines direct-connected to the reel shaft where flat ropes are used, but this one has never been equaled in size.

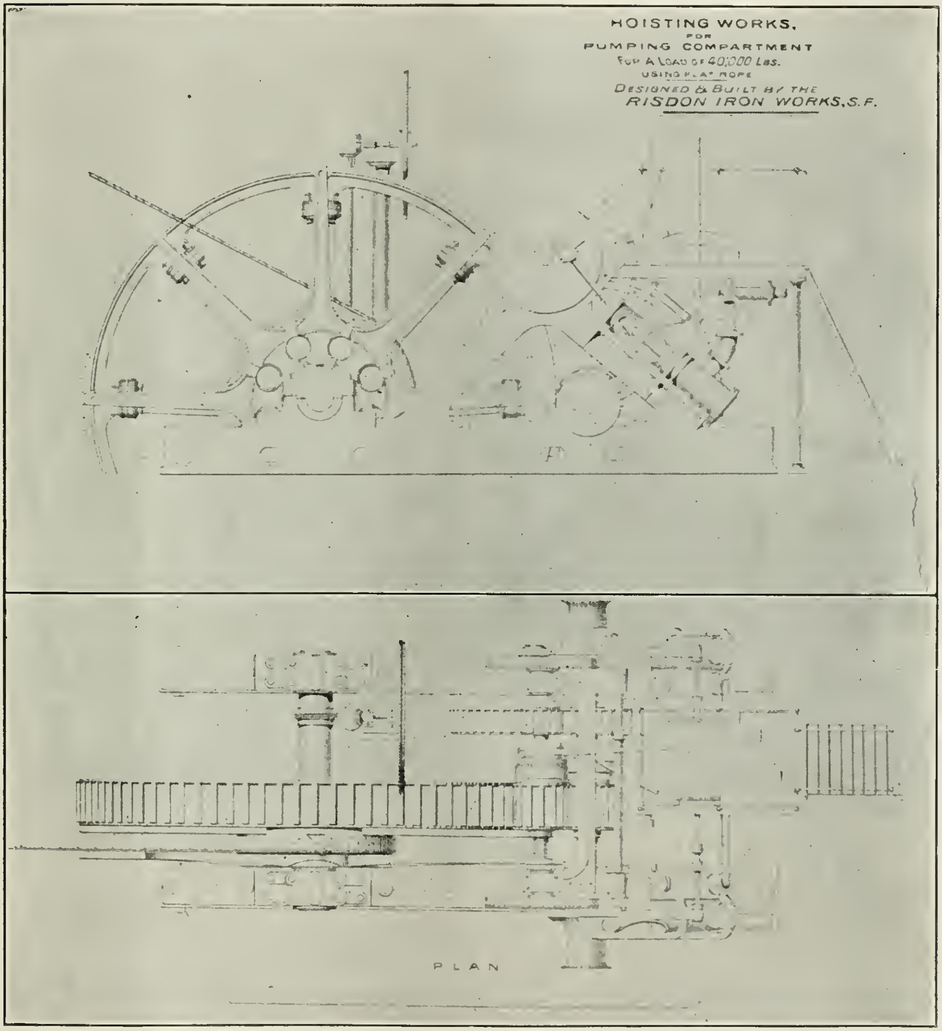

Fig. 1. Hoist for the Chollar, Norcross and Savage Mines

I have already stated that in vertical shafts, flat ropes were all but universally used, and while the system of working each reel independently was adhered to, flat rope had the advantage, as the machinery was more simple and compact, which meant that it was also cheaper, than for round rope. The rope winding on itself gives the reel an ever-changing diameter, the engine thereby gaining leverage as the load increases. To work a shaft of, say 2500 ft., by round rope requires winding drums of large diameter to get the width within working limits; this made gearing necessary, and if the ropes had to run independently of each other, the great weight of the winding drums made starting through a clutch a serious matter. But the short time that a flat rope lasted and the constant repairing it required during its useful life led to a strong desire among mining superintendents for hoisting works using round ropes which would have all the other advantages possessed by those using flat ropes. That desire was never quite satisfied.

Braking with Engine Cylinder

In most of the geared hoists—and the round-rope ones were all geared—the engine cylinders were used as a kind of air brake. In lowering, the reversing link was notched up or set for running the other way, air was drawn into the cylinder through the exhaust and compressed between the piston and the cylinder heads; a spring-loaded relief valve was fitted at each end of the cylinder to prevent dangerous pressures. This brake was effective, but I never could help thinking that the system was, to say the least, crude in itself as well as destructive to the machinery. The brake power required when unbalanced, with a great weight of pendant rope added to that of the cage and car, was very great. The excessive speed of most of the geared hoists on the Comstock was hard both on engines and gears, and only high-class workmanship saved them from running themselves to pieces. I knew of an instance of a hoisting engine with cylinders 20 in. diameter by 36-in. stroke making regularly 175 r.p.m., equivalent to a piston speed of 1050 ft. Both engines and foundations suffered at these speeds.

When it was determined to sink three shafts on the Comstock that ran into an incline between the 900- and 1200-ft. levels, the length of this incline made large hoisting works a necessity. The incline hoisting works of the Crown Point mine was the first of the larger class. I. F. Thompson, consulting engineer to the Crown Point company, determined to use a large winding drum and round rope to work the incline only, but with the hoisting works at the surface. The requirement was that the drum should wind 2100 ft. of 2-in. diameter steel rope. These works were designed by me in 1873; no drawing is extant, but I have notes covering the main points of the arrangement. They were built by the Risdon Iron Works. There were two horizontal steam engines set 22 ft. apart between centers, with their shafts coupled together and cranks set at right angles; the diameter of the cylinders was 20 in. and the stroke 42 in.; they were handled by the Stevenson link and reversing lever. There were two flywheels, one on each side of the winding drum, each 16 ft. diameter and weighing 10 tons. These wheels were turned up true on the rims and fitted with the usual post brakes. The bedplates that carried the drum shaft extended back under the engine shaft and carried the intermediate bearings for it, as in Fig. 2.

The spur pinion keyed to the engine shaft was 55⅜ in. diameter, 6 in. pitch and 19 in. face. The engine shaft was 10 in. diameter and the drum shaft 14 in. The spur wheel to which the drum was secured was built in segments and was 21 ft. 1 in. diameter at the pitch line, 6 in. pitch and 19 in. on the face. The teeth in both the pinion and the spur wheels were cut, and we had to build a special machine for the purpose. On one side of the rim of the spur wheel, a heavy flange was cast to take one side of the drum, and two cast-iron rings carried the outer edge and the center of the drum castings. Hardwood staves were fitted and bolted to the rings and the flange on the spur wheel, the drum castings grooved for the rope being fitted to the wood. The whole was turned up true by fitting a tool rest and slide on the bedplates, then driving the drum by the spur pinion worked by a wormwheel on the engine shaft, using a small engine to drive the worm. In those days, we had to do big things with small jobs. The drums when finished to receive the rope were 6 ft. 1½ in. wide, 21 ft. diameter at the center line of the rope, and took 33 turns of the rope.

These hoisting works did very well as far as working goes, but a slight increase in engine power would have been an advantage in starting the load. As to economy in working, this arrangement left much to be accomplished. The hoisting works being on the surface, there was a dead load of rope equal to 7000 lb. always hanging in the shaft besides the weight of cars and rope in the incline unbalanced, making the actual work done a small part of the power used. In other words, the brake friction in lowering absorbed about as much power as the engines developed in hoisting.

The other two large hoisting works of this class on the Comstock, those of the Savage and the Ophir mining companies, for which Mr. Thompson was consulting engineer, were designed by me and built in the beginning of 1875. The Savage works were built by the Union Iron Works, except that we cut the gears for them at the Risdon Iron Works, which built the works for the Ophir. These two sets of hoisting works were in their main features alike; the slight difference in the style of engines was only the result of a difference in taste in the design of details in the two shops. The Ophir Works, however, possessed one distinct feature in a hydraulic balance for the weight of rope in the vertical shaft and the weight of the car in the incline. Outside of this balancing arrangement, the description I am about to give of these works applies either to the Savage or the Ophir.

Engines with Corliss Frames

The illustration, Fig. 2, is from a lithograph made 40 years ago, when I presented my design. The winding drums were placed about 120 ft. back from the pit head sheaves, which were 14 ft. diameter, with wrought-iron arms. This distance was necessary owing to the width of the drum, which required the rope to deflect 7 ft. each side of the center line. The illustration is a side elevation and plan of the Ophir works and gives a clear idea of the general arrangement. The engine power consisted of two horizontal noncondensing engines having cylinders 24 in. diameter, 48 in. stroke, and link reversing gear. The valves were double-beat miter valves, with Cross' variable cutoff. The engines rested on feet cast to the cylinder and the main pillow block, these two points being connected by a frame which formed the guide for the crosshead. This style of frame having been adopted by Mr. Corliss for his horizontal engines, it is sometimes called the Corliss frame.

The engines stood about 30 ft. apart, with the shafts coupled near the center pillow block, as shown. The cranks were set at right angles. There were two flywheels, one near the main bearing of each engine; these were 16 ft. diameter and weighed 25,000 lb. each. The main bedplate that carried the bearings for the winding drum extended under the shaft and carried bearings for it outside the flywheels, which with the center bearing made five bearings for the engine shafts. The spur pinion was the same as that of the Crown Point hoisting works, being 55⅜ in. diameter, 6 in. pitch and 19 in. face. The engine shaft to which this pinion was keyed was 11 in. diameter. The spur wheel was also from the same pattern as that for the Crown Point, being 252.1 in. diameter to the pitch line, 6 in. pitch and 19 in. face. The drum shaft was 15 in. diameter and 17 ft. long between bearings. The drum was built tapering, as shown, having diameters of 23 ft. at the large end and 11 ft. 3 in. at the small end. It was 14 ft. 6 in. in width and was able to wind 4000 ft. of 2¼-in. diameter round steel wire rope. The large end of the drum was carried on a cast-iron ring, which was bolted to flanges cast on the segments of the spur wheel; the rest of the drum was carried on three cast-iron rings, one at the small end and two intermediate. These rings were supported by wrought-iron arms bolted to cast-iron centers keyed to the shaft. The outside of the drum was built of white mahogany staves 6 in. thick, outside of which was the covering of cast-iron plates grooved for the rope. The same tools were used for cutting the gears as for the Crown Point job, and the drum was turned up in the same way. The drum complete, with shaft and spur gear, weighed 131 tons and was a great piece of work, considering the tools we had to make it with.

Hydraulic Balance for Hoist

The hydraulic balance consisted, as will be seen in Fig. 2, of two hydraulic engines applied directly to the drum shaft. This was applied only at the Ophir shaft, where there was a length of 1500 ft. of rope in the vertical shaft, making the need of some such appliance more apparent. Instead of taking the weight of descending rope and the cages on the brakes in lowering, it was taken by the hydraulic cylinders. These for the time were acting the part of pumps forcing water from a tank in the engine house through a line of 10-in. pipe up the side of Mount Davidson at the back of the works to a reservoir constructed at a height of 500 ft. above the floor of the engine house. When the motion of the drums was reversed for hoisting, these pumps became hydraulic engines, and the power that was stored up in lowering was used to help the steam engines in hoisting, or it might be used for other purposes, as I will show further on.

On each end of the drum shaft, a large cast-iron crank disk was securely placed. These crank plates were 91 in. diameter, and each had four crankpin holes bored so that the crankpin would fit either of them; this admitted of the stroke of the rams being either 54 in., 60 in., 66 in. or 72 in., according to the amount of dead load to be balanced. The crankpins were 9 in. diameter and 15 in. length of bearing. The ram heads took hold of the pins directly. The rams were 18 in. diameter and of sufficient length for a stroke of 6 ft. The cylinders were carried by trunnions in the center of their length. These trunnions were 14 in. diameter and had a bearing 16 in. long. The water was introduced and dis-

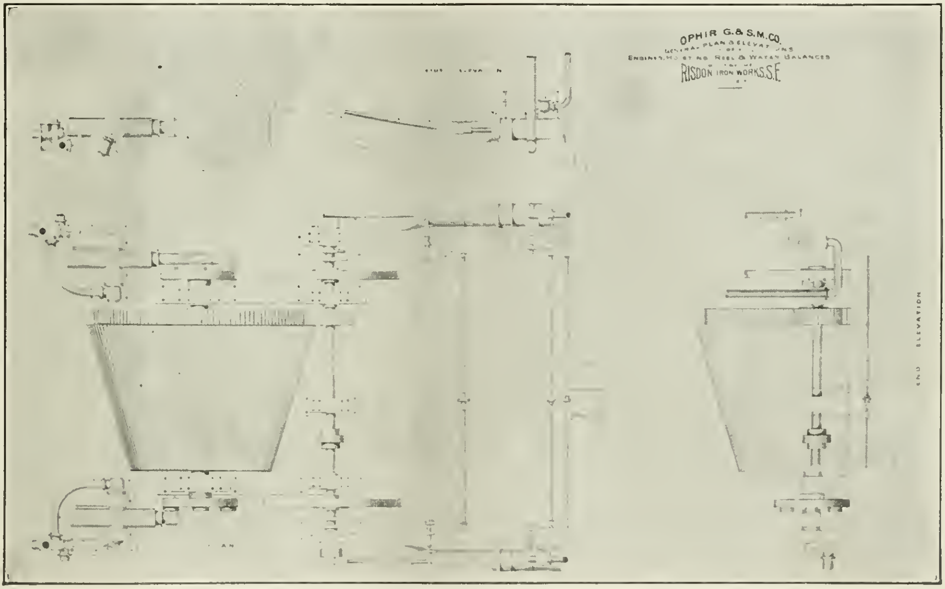
OPHIR G.&S.M.CO.
GENERAL PLAN & ELEVATIONS
ENGINES, HOISTING REEL & WATER BALANCES
RISDON IRON WORKS S.F.
END ELEVATION

Fig. 2. Hoisting Engines for the Ophir Mines—Built in 1875

charged through one of the trunnions. The valves were operated by a pin on a sliding plate that was fitted to the other trunnion. This sliding plate was attached to the ram of a small hydraulic cylinder by which the engineer could at once from his platform slide the pin to the center of the trunnion and so throw off the hydraulic balance. The bedplates, which were massive castings, had the trunnion blocks cast upon them. The valve arrangements differed little from that used by Sir William Armstrong in his largest hydraulic engines. The whole work was set on massive foundations and was without doubt the finest incline hoisting works in existence in 1875.

Utilizing Braking Power

I stated that the power used in lowering might be used for other purposes besides assisting the hoisting. The ore extracted from the Ophir mines was sent by rail to the mills, and as the railroad reached the Ophir at an elevation of about 40 ft. above the works, so that the ore had to be raised about 56 ft. to the bins, whence it was loaded into cars for the mill, a hydraulic elevator was designed by me and built by the Risdon Iron Works to do this work. It had two balanced rams working two balanced cages, which elevated the cars from the level of the shaft neck to the bins. The working of this machine was perfect, and it used but a small part of the water pumped up by the balance rams on the incline hoisting works.

It will be observed that the position of the Ophir works was very favorable to the working of a hydraulic balance. It was a great opportunity, and the results were satisfactory in every way.

Before closing this, the last of this series of articles, I would like to say a few things about two of the men who were an important part of life at the mines. Anything about the Comstock would be incomplete unless it recalled to memory Sam Curtis, the genial superintendent at the Ophir mine. Large in person and generous of habit, he had big ideas of what the equipment of surface work should be for the comfort of those who had to do business in the hot, damp lower drifts of the Comstock. He had splendidly equipped bath and rest rooms; one of his special equipments was a needle bath which discharged a fine spray of alcohol for use after the warm bath to contract the skin so it would fit, for it was surprising how loose the skin got after a couple of hours in the mines. There was also a nip or two of Sam's best Scotch near-by to enable the stomach to do justice to the dinner that he had awaiting the friend.

Then there was Hank Smith, of the Belcher, the handsomest fellow, and the best dressed on the Comstock, very popular and urbane, a delightful man to meet, who always left a memory of good cheer and hospitality freely offered to his friends and business associates. There are but few of them left. Sometimes I meet one of them still holding on to life and hope, still renewing his spirit and the buoyancy of youth at the mention of what we did in the '70s, what manner of men we were, and how our deeds, though done in the dark depths of the mines, were not to be ashamed of. Many people still cling to the hope of another Bonanza at the Comstock, and that hope is not without a good foundation. But the romance, the wildness, the glory of the '70s will not return even with the discovery of rich lodes. The great machines we built then will be supplanted by the compact devices made available by the process of engineering science. Electric transmission applied to great motor-driven three-stage centrifugal pumps will do with ease what we found so hard to accomplish.

Pyrite Smelting

By E. D. Peters*

In 1893 the condition of the Mt. Lyell company was about as follows: The great body of pyrites in the northwest corner of Tasmania, known as the Mt. Lyell mine, was owned (or was under option, and subsequently was purchased) by the company. After considerable development by the company, during 1891 and 1892, the property was examined by Dr. Peters in 1892-93. His report was favorable, and he recommended treatment of the ore by blast-furnace smelting.

Coke was very expensive at the mine, and Peters, of course, recognized the suitability of this massive ore for pyrite smelting and the great saving that would be effected if the ore could be used as the main fuel supply, but feared to advocate beginning work with this process which, at that time, had failed commercially at the three places at which it had been tried; viz., Toston and Boulder, Mont., and Kokomo, Colo. Peters, therefore, advised the Mt. Lyell company to begin with ordinary stall-roasting and smelting, as most of the ore then in sight would average 4 to 5% copper, with fair amounts of gold and silver, and should yield a good profit in spite of the high cost of coke. He advised the company, after the first metallurgical difficulties had been surmounted and the enterprise had reached a paying basis, to change over one of the coke-burning furnaces to the pyrite process, and, if this should prove successful, to change over the entire plant in the same manner. He also recommended the engagement of an American metallurgist who had had experience in pyrite work.

The company, which was in excellent financial condition, owing to the opportune discovery of an extraordinarily valuable body of secondary ore on the footwall, decided to engage Robert Sticht to erect and manage the smelting works, feeling that his experience at Boulder and Kokomo fitted him peculiarly for the Mt. Lyell problem.

Sticht, in his address, told us that his work in pyrite smelting in the United States was based originally upon ideas gleaned from Balling's "Metallurgische Chemie" and from Holloway's admirable monograph on the bessemerizing smelting of the Rio Tinto ore, and supported by Austin's work at Toston, Mont. The trouble both at Boulder and at Kokomo was that the originators of those enterprises undertook to do pyrite smelting with ores that contained but little pyrite and were extremely siliceous. Whenever a reasonable proportion of good pyrite could be kept on the furnace charge Sticht found no difficulty in running the process pyritically.

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*Professor of metallurgy, Harvard University, Cambridge, Mass.

NOTE—The November meeting of the Boston section of the American Institute of Mining Engineers was of particular interest to many of the members present. The speaker was Robert Sticht, general manager of the Mt. Lyell Mining & Railway Co. August H. Eustis, secretary of the section, persuaded Dr. Peters to write these notes of the meeting, which are based on an abstract from memory of Mr. Sticht's remarks, to which Dr. Peters added a few words of his own to indicate certain important advances in the process of pyrite smelting, which appeared to him to have been the direct outcome of Mr. Sticht's early practice at Mt. Lyell.

As soon, therefore, as he saw the apparently unlimited supply of massive cupriferous pyrite offered by the Mt. Lyell orebody, he determined to omit the inaugural roasting-smelting stage proposed by Peters, and to erect a plant at once for pyrite smelting. His confidence and evident grasp of the situation thus induced the directors of the Mt. Lyell company to adopt his views and to base their metallurgical future upon a comparatively new method that had never yet been commercially successful.

The results almost at once justified this decision. Although having only one experienced assistant, and without any workmen accustomed to the management of copper blast furnaces, the starting of the new plant proceeded with little difficulty, the only serious delay being caused by an insufficiency of slag pots, and the consequent necessity of arranging to granulate the slag by water.

The furnace was run with what was considered at that time a large volume of air and with hot blast, and selected for itself, under these conditions, a slag that had a silicate degree of about 4 : 3, being thus somewhat more basic than a bisilicate. As the main purpose of the Mt. Lyell smelting operation was to flux the maximum quantity of iron with the minimum amount of (barren) silica, this slag was too siliceous for the most economical work. The ratio of concentration was between 6 : 1 and 7 : 1, and the resulting matte contained below 25% copper, thus requiring a second pyritic fusion to make it fit for the converters.

After long and careful study and experimentation, Sticht discarded the hot blast, heightened his ore column, doubled the volume of air, and at once brought his slag to the condition of a monosilicate, containing only about 30% silica. Over 90% of the iron in the charge was scorified at a single operation, the ratio of concentration established itself at about 20 : 1, and the grade of the matte rose to 40-45% copper. About 1% of coke was used.

This characteristic pyritic smelting was continued unbroken until changing conditions demanded some slight modification of practice. The Mt. Lyell pyrite has dropped to about 0.5% copper, but the grade of the furnace mixture has been kept up to its normal standard of nearly 2.5% copper by substituting the 7% quartzose copper ore of the North Lyell mine for the barren silica formerly used. The low-grade massive pyrite ore of the old Mt. Lyell mine thus plays the rôle of flux and fuel, the profit being derived from the North Lyell ore. Owing to an increase of earthy constituents in the furnace mixture, the coke has been increased to about 3 per cent.

Sticht's work and investigations at Mt. Lyell have, in my opinion, enriched our practical knowledge of pyrite smelting by two important contributions; I might indeed say by three, for it is certainly an important contribution to any doubtful process to demonstrate that it can be used permanently on a large scale with successful commercial results, and I know of no one previous to Sticht who had demonstrated this fact to the satisfaction of miners, metallurgists and owners.

Sticht's two striking contributions, to which I refer, are: (1) That the increased furnace activity produced by an increased volume of air (with corresponding heightening of the ore column), rather than a heated blast, is the essential feature in bringing about the conditions necessary for the production of a more highly ferruginous slag—the slagging of the maximum amount of iron with the minimum amount of silica being the great desideratum in pyrite smelting.

(2) That *true* pyrite smelting is a bessemerizing operation, presenting but little analogy to roasting; that, in normal running, the process of oxidation, from the oxygen of the blast, occurs in a circumscribed area that extends only a comparatively short distance above the tuyeres; and that, consequently, above this zone the gases contain free oxygen only in negligible quantity.

Doubt having been expressed as to the correctness of Sticht's series of analyses of his furnace gases from the fact that he made use of iron pipes which might have absorbed the free oxygen that was contained in the hot gases, he has had the experiments repeated lately by a skilled observer, and with the use of a water-cooled pipe for the withdrawal of the hot gases from the furnace shaft. The record of these analyses is now before me, and I find that the results agree closely with the original determinations.

Manganese in South Carolina

By Claud Hafer*

An interesting deposit of manganese occurs at McCormick, S. C., at the old Dorn mine. The Dorn was originally worked as a gold property, and produced some remarkably rich ore; it is stated on good authority that more than a million dollars was taken out. The owner, Dorn, is said to have worked the manganese deposit also, grinding the ore fine and hauling it by wagon to Augusta, Ga., whence it was shipped via the Savannah River.

The veins are in schist and parallel, the manganese vein being about 300 ft. to the southeast of the gold vein. Their trend is northeast-southwest and they dip steeply to the northwest, conforming more or less to the planes of schistosity of the country rock.

The manganese vein is from 8 to 25 ft. in width and has been located for three-fourths of a mile by shallow shafts 20 to 80 ft. in depth, and by numerous pits. Development is said to reveal solid manganese oxide in the center of the vein nearly 4 ft. in width; leaner ore on each side will require crushing and jigging to make a shipping product. In 1911 and 1912, some development was done on the property and four carloads of ore averaging 41% Mn was shipped. Last summer the property was worked by the Eureka Manganese Co., which shipped 18 cars. The work has been carried on in an extremely small way, and all of the old dumps of ore taken out previously were picked and shipped. No work is being done, but the prospect deserves further exploration.

Across the Savannah River, in Georgia, there are outcrops of manganese ore at the Magruder mine. These occur near a deposit of copper, under nearly the same conditions as the McCormick deposit, but as yet they are unexplored.

Arizona Eighty-Per Cent. Law

A case to test the constitutionality of the Arizona 80% American-labor law was filed at Tucson in the Federal court on Dec. 15. Michael Riach, a cook, asked for an order restraining his employer from discharging him on the ground of violating the spirit of the Fourteenth Amendment and Section 1979 of the Federal statutes.

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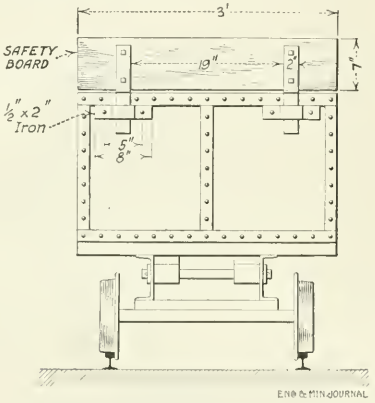
*Mining engineer, Candor, N. C.

Details of Practical Mining

Safety Boards for Tram Cars

By H. H. Hodgkinson*

In loading cars from chutes, chunks frequently roll off the top of the car, especially when the car is almost full or when there is a sudden rush of muck through the chute. It is at this time that the man loading the cars receives a badly injured foot, or in an effort to protect his feet, he tries to hold the chunks on the car and the result is a badly bruised hand.



Loading Board for Tram Cars

The safety boards shown in the accompanying sketch prevent the chunks from rolling off the cars and injuring the men, and can be easily removed when the car is full.

Record Tunnel Driving

The Canadian-Pacific is driving a tunnel under the Selkirk Mountains on its through line. The work is being carried on in novel fashion, inasmuch as instead of confining the advance to two headings or obtaining additional working faces by sinking shafts, small pioneer tunnels are being driven on one side of the main-tunnel line, and from these crosscuts are being run over to the tunnel line and thus a number of working points established, says a communication from the Ingersoll-Rand company.

Some fast work is being done on the pioneer tunnels, and during November progress was made on the tunnel from the west which is believed to be the record for a month's work on tunnels of this size in North America. For the 30 days' work, Nov. 1 to 30, inclusive, the advance was 817 ft., while for 31 days' work, Nov. 1 to Dec. 1, inclusive, the advance was 852 ft. The tunnel is 7½x10 ft. in section, and the rock traversed during the month was slate containing quartz stringers. The work was performed with three Leyner machines, mounted on a 9-ft. 6-in. crossbar. The gang consisted of three machinemen, two helpers, eight muckers, one trackman, one pumpman and one walking foreman for two headings. The tunnel is being driven down a 1% grade, and a pump had to be placed in the face before dropping the bar to drill the lifters. The muck is hauled out by mules. The bar was set up above the muck pile in the usual fashion for drilling the top holes, and after these were finished, dropped to drill the lifters.

The average advance per day for the 30 days was 27.84 ft. The best day's work was that of Nov. 27, when 37 ft. was made. The best week's work was Nov. 23 to Nov. 29, when 220 ft. was driven. The fastest round drilled occupied 3 hr. 40 min. on Nov. 28. Four, five and even six rounds per day were shot. At the beginning of the month the portal was in 2285 ft., and at the end of the 31 days, 3137 ft. The work is being done under contract by Foley Bros., Welch & Stewart. The best previous month's record known in America was that made on the Mount Royal tunnel in Montreal by McKenzie, Mann & Co.

Resoiling Dredged Areas in Victoria

Much attention has been directed in Australia to the resoiling of dredged areas. Of the areas dredged during the last 14 years, 7028 acres, about 200 acres have been classified as agricultural. The land usually dredged is confined to river and creek beds, beaches, low-lying flats, old worked mining ground and other land of poor quality. As a rule, the owners of private land held under mining lease have received satisfactory compensation for same. In the recently issued report for the State of Victoria, the engineer in charge, D. B. Sellars, discusses this matter at some length, as follows:

"The question of preservation from injury of land actually used for mining purposes has not been given force of law by enactment. Resoiling, however, is provided for in covenants of the amended form of lease now in use. Leases issued in the early days of dredge mining did not provide for resoiling. The first lease issued containing any such provision was in January, 1907. Some of the present dredges (five) are still working under those old leases, while 10 others have been thus operating until recently.

"It should be remembered that the introduction of dredging plants as an aid to mining, 14 years ago, was a departure from methods then in use. Comparatively little was known about them and it was a difficult matter to lay down precise regulations and conditions for the proper and satisfactory working of same. For instance, as a result of the type of plant then used, such being provided with an elevator for the stacking of tailings, the dredged ground was left in a most objectionable state, as exemplified by the early workings of the Ovens Valley dredge at Porepunkah, and by the original Maori Queen plant at Freeburgh. Continuous efforts, however, were made by the Departmental officers to get rid of the elevating appliances installed on seven of the pioneer plants, and eventually they were discarded in favor of the sluice box. The last one disappeared in 1904. By the use of a sluice box, the coarse refuse matter is well leveled off instead of being left in high, stony, detached ridges and pinnacles, and thereby a great improvement was effected. In the same year, 1904, further advance was made by the introduction of silt distributors, whereby a large proportion of the fine material from the working face is deposited to a useful depth and spread in an even layer on top of the dredged ground.

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*Mining engineer, Franklin Furnace, N. J.

"In view of the improvements that had been effected in the working of the bucket dredges, it was decided in 1906, as a matter of policy, that dredging leases over good agricultural ground should not be issued unless the lessees were prepared to replace on their gravel tailings a substantial thickness of the original surface soil. A covenant was therefore inserted in each dredging lease providing for advance stripping and resoiling when the earthy overburden reached a certain thickness. The distances specified to which the advanced stripping must extend, viz., 'to any depth that may be found to 7 ft. below the surface,' is no doubt a reasonable thing in the case of deep rich fertile soils, but it is questionable whether or not the fulfillment of this stipulation is desirable when the earthly overburden comprises only a few inches in depth of sandy loam overlying deep beds of clay and inferior earthy matter. Indeed, it is on record that some of the land holders about Porepunkah strongly object to the putting back of this clayey and inferior material on top of the dredged ground. They much prefer a useful layer of the fine stuff deposited by the silt chutes, on which wattles and other useful forms of vegetation can, and do, grow luxuriantly.

"The most satisfactory and effective way to conduct resoiling operations is by the use of belt conveyors, but for these appliances the pontoons must be specially constructed. A majority of the plants now working, having been built before the resoiling clause came into force, are too small and otherwise unsuitable to sustain the extra weight and working strains of a belt conveyor. Many of them, however, have been working in ground where the depth of earthy overburden was not such as to necessitate, under the resoiling covenant, advance stripping. Some others have been working in areas in which detached patches of earthy overburden exceeding the prescribed depth were occasionally met with. In these places most of the dredges were specially equipped with soil chutes, whereby—provided the depth of earthy matter was not less than about 3 ft., and the water level in the operating pond could be raised up to or above the surface of ground—a good layer of such earthy material as might be found could be deposited and evenly spread over the dredged ground. A difficulty, however, in this connection was due to the varying thickness of the stratum of overburden. In places such thickness fluctuated erratically from a few inches to some feet. This, of course, prejudicially affected the resoiling work by chute, besides giving it a patchy, uneven and unattractive appearance.

"The Briseis dredges Nos. 1, 2 and 3 have all been built since the resoiling regulations came into force, and in each case advance-stripping has been done. The ground dealt with is a creek bed and low-lying swampy flats adjacent thereto. Nos. 2 and 3 are the most uptodate bucket dredge-mining plants in the state and probably there is nothing equal to them, for the purpose intended, outside of Victoria. With these plants, the company is advance-stripping and resoiling in conformity with the lease covenant, but much of the replaced overburden has yet to be leveled off. This is now being done; meantime, the material, having been brought up from a depth of several feet below the surface, is undergoing improvement by exposure to atmospheric action. Briseis No. 4 is also an uptodate plant designed to work an area which comprises creek bed and old worked mining ground, consequently it has no resoiling appliance. Possibly there may be some small isolated patches of soiled ground left among the old-time workings, but it was never intended that the resoiling covenant should apply in cases of that kind.

"Since the beginning of 1909, as a further provision to safeguard agricultural interests, the practice has been to refuse mining leases over all ground valued by the dredging inspector at more than £3 per acre."

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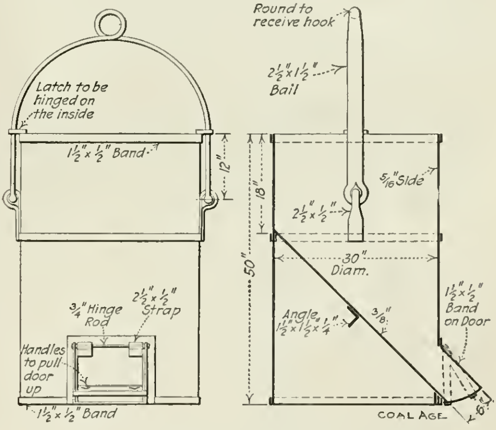
Shaft-Concreting Bucket

The Bunsen Coal Co., of Danville, Ill., recently sank two shallow, rectangular shafts and, after completing sinking, lined them from the bottom up with concrete (*Coal Age*, Nov. 7, 1914). For pouring this the bucket here illustrated was used. The inclined partition reduced its capacity somewhat, but made it much more convenient.



SPECIAL BUCKET EMPLOYED FOR LOWERING CONCRETE INTO THE SHAFTS

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Repair Jobs with Iron Cement

The following examples of the use of Smooth-On for repair work are given by F. E. Meredith in *Power*.

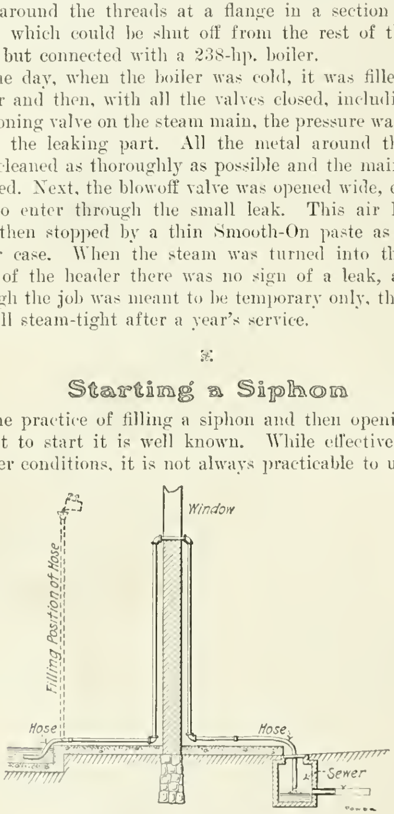
A West Indies power plant was operated condensing and had a rather antiquated rotative dry-vacuum pump for a spare unit. One day the air piston rod broke at the crosshead, the piston being driven back against the cylinder head. The force of the blow was not sufficient to break the head on the air-cylinder side, but it cracked the water jackets of the head on the outside. The cracks were radial from the center of the head and caused the cooling water to leak considerably. In making the repair, first all the paint was scraped from along the cracks to get the metal clean. Then the water inlet of the head was piped to the vacuum line from another pump and the other outlets covered with pieces of heavy sheet packing. Air was drawn in through the cracks in the head; these were covered with a fairly thin mixture of Smooth-On cement which was quickly drawn into the breaks and sealed the cracks after being allowed to harden. The pump has been operated regularly for three years and the water jacket does not leak.

The same general method was used to stop a leak in an 8-in. steam line, carrying 125 lb. pressure. This leak was around the threads at a flange in a section of the main which could be shut off from the rest of the system, but connected with a 238-hp. boiler.

One day, when the boiler was cold, it was filled with water and then, with all the valves closed, including the sectioning valve on the steam main, the pressure was taken from the leaking part. All the metal around the leak was cleaned as thoroughly as possible and the main valve opened. Next, the blowoff valve was opened wide, causing air to enter through the small leak. This air leakage was then stopped by a thin Smooth-On paste as in the other case. When the steam was turned into this section of the header there was no sign of a leak, and although the job was meant to be temporary only, the place is still steam-tight after a year's service.

Starting a Siphon

The practice of filling a siphon and then opening the outlet to start it is well known. While effective under proper conditions, it is not always practicable to use this method, says A. P. Connor, in *Power*. The manner of starting here described and illustrated is efficient under most conditions and it permits the pipe line for the siphon to be arranged to best advantage before the siphon action is started.



Siphon Filled from Inlet End

Place the hose or pipe line in position, with its outlet end a few feet or so below the water level to be acted upon. Raise the inlet end above the highest level of the head to be overcome. The inlet is filled until the water begins to flow from the outlet. As soon as the flow occurs, the inlet end is closed and lowered into the water and reopened; this last operation will take but little time and it will not break the flow of the siphon.

While a hose is most desirable, it is not essential in all cases. Pipe may be used, it being necessary only to have it swing easily from a vertical to a horizontal position in order to change the inlet end from the filling to the drawing position.

Large-Scale Sampling

At a recent meeting of the New York section of the Mining & Metallurgical Society of America, Sidney J. Jennings described some unusual sampling expedients found necessary by the U. S. Smelting, Refining & Mining Exploration Co. in its work on the Ebner property, near Juneau, Alaska, which it has under option. His description follows:

The ore was supposed to carry $2 in gold, from which a profit of 75c. per ton was expected. An error of 25c. per ton in sampling might cut 33⅓% from our profits. The question was, were we taking specimens or samples? We were cutting channels 6 in. wide by 2 to 3 in. deep, 5 ft. apart in the crosscuts; and while one might suppose that if there were enough crosscuts the law of averages would hold and errors would balance themselves, we found that successive 5-ft. samples would assay from a trace to $12 or even higher per ton; hence, it seemed unwise to depend on averages, when the total number of samples would necessarily be small.

We therefore took samples over a strip 2½ ft. wide along the crosscuts for the full height, getting 30-ton samples for each 12-ft. crosscut. These we ran through a five-stamp mill. At first 30-mesh screens were used, but finally a slotted screen equivalent to 60 mesh. The pulp from the stamp was run into a 12-in. launder and the stream was cut at periodic intervals, taking out 1¾% as a sample. This sample was amalgamated, and the tailings from the amalgamating barrel were sampled, which could be done with accuracy to within 4c. per ton.

Yet we were never satisfied that the gold recovered in the amalgamating barrel was the right proportion of that in the original ore. Suppose you took 32 samples of ¾ lb. each from the same ore, crushed to 40 mesh. If you crushed each sample to 100 mesh and split it, the halves would vary by, say, 4c. But if you took another of the original 32 samples, the variance between it and the first might be from $1.50 upward, showing that even with 40-mesh material individual pieces of gold would go through the quartering process and not be proportionately distributed. Our millman finally put in a Wilfley table to concentrate the original 30 tons. We concentrated out about 1½% of the original, which carried all the free gold, the pyrite, galena, etc. The tailings from this table could be sampled accurately. The concentrates were amalgamated in a barrel, the tailings from which could also be sampled. In order to ascertain the value of the original sample of 30 tons we had the following factors: Net dry weight of ore crushed; weight of concentrates recovered; total amount of gold recovered in the amalgamating barrel; assay of the tailings from the barrel; assay of the tailings from the Wilfley table; total amount of gold remaining in the sand around the dies in the battery. This plan has been working three to four months and we really have secured results that check.

Details of Milling and Smelting

Settling-Pond Sludge Box

A simple but efficient device is in use at the settling pond of the North Unity mill, in the Platteville district of Wisconsin. The North Unity mine and mill are owned by the Vinegar Hill Zinc Co., and are situated about 1½ miles from Day's Siding, in turn about 20 miles from Platteville. The mill uses about 700 gal. of water per min., and because the mine does not supply this amount regularly, it is necessary to return the water for further use. A settling pond is provided for this purpose, into which the water and sludge from the mill ordinarily would flow. This pond is adjacent to the mine and mill and is circular, 80 ft. diameter and 6 ft. deep.

With the water flowing directly into these ponds, experience has shown that the rapid deposition of the sludge soon fills them, necessitating cleaning out every week. This condition was unsatisfactory because the work had to be done on Sunday when the rest of the plant was not operating. The work was hard and dirty, and it was difficult to get men to do it. In fact the cost of cleaning has run up to $25 per week.

Settling-Pond Sludge Box

The sludge box shown in the accompanying illustrations was designed and installed to overcome this frequent cleaning, and has worked successfully. It is believed now that under ordinary circumstances it will be necessary to clean the pond only twice a year. The box is rectangular, 4 ft. wide, 32 ft. long and 9 ft. deep, made of concrete, with walls 12 in. thick. The edges of the box, on the end which projects beyond the pond embankment, are raised somewhat above the edges of the opposite end. The launder leading from the mill discharges into the end outside the embankment. The overflow from the box is at the other end and into the pond. The box readily provides additional settling capacity, the sludge settling in the box instead of in the pond. The latter has sufficient capacity so that no water flows out of the pond during the day. At the end of each shift, the sludge is flushed out of the box and down the creek. The flushing is accomplished through 6-in. pipes set in the concrete ends of the box, near the bottom. The outlets through these pipes are controlled by valves operated by stems extending above the top level of the box.

Leaching Experiments on the Ajo Ores*

The various conditions under which Mr. Croasdale's experiments were run, and the types of ore at Ajo have already been given in previous excerpts from his paper. Some of the sections on the leaching experiments themselves follow.

Laboratory Experiments

It should be noted that on a 2 per cent. ore, a variation of 0.01% in the percentage of copper in the tailings makes a difference of 0.5% in the percentage of extraction. This must be kept in mind when comparing the results of these experiments, for several hundredths of 1% may be within the limits of error in sampling and chemical analyses.

They were made on raw oxidized ores only, with acid from 3 to 10%, ore crushed to from 8 to 2 mesh. These experiments showed that circulating the lixiviant increased the extraction of copper without seriously increasing the consumption of acid; that crushing to 8 mesh increased the consumption of acid without materially increasing the extraction of copper; and that increasing the strength of the lixiviant increased the extraction of copper and also the consumption of acid when the lixiviant was circulated through the ore. The fine ore produced in crushing to 8 mesh seriously interfered with the percolation of solutions.

Analyses of the lixiviant from a number of leaching experiments showed that a certain amount of iron passed into solution simultaneously with the copper. This averaged from one-third to one-half of the amount of copper in solution, or from 0.8 to 1.1% of the solution. Sometimes, with high iron and much kaolinized ores, it amounted to more than this. The iron was about equally divided as ferric and ferrous sulphates. Using 10% acid, the lixiviant passing from a charge of leached ore contained from 4 to 6% free acid in addition to the copper, iron, alumina, etc.

This combination of circumstances enabled me to use the partly neutralized lixiviant from a leached charge of ore for the first lixiviant on a new charge of ore and thereby not only neutralize the free acid in the lixiviant and at the same time enrich it in copper, but have a solvent for the cuprite (or metallic copper if formed) in the form of ferric sulphate. Since ferric sulphate was always present and the lixiviants were always circulated, it is scarcely possible that any cuprite could escape solution. As sooon as the first lixiviant was neutral, it was sent to the precipitating vats. If it was left on the ore beyond the neutral point, some of the copper was reprecipitated in the ore. A new 10% acid lixiviant followed the first and finished leaching the ore, which in turn was neutralized on a new charge of ore.

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*Excerpts from a paper by Stuart Croasdale, presented at the Salt Lake meeting of the American Institute of Mining Engineers.

Experimental Plant Tests

A pipe 10 in. in diameter and 18½ ft. in length was used for an experimental percolation vat. For convenience in testing the various columns of ore, it was made in sections. The lower end of this vat was closed with a plate in which there was a 3-in. opening which served as a discharge gate for the ore and also for pipe connections to measure the flow of solution. This could also be attached to a centrifugal pump for circulating the solutions to the top of the vat if desired and in this way the working conditions of a commercial plant could be produced. Aside from a small screen to protect the valves, no filter was used in the vat. The ore itself corresponded to the gravel filter that was expected to be used in practice.

The height of any ore column in this vat was the same as that used in any commercial plant. The filtering area was 78.54 sq.in., or 0.545 sq.ft., which corresponded to the same section of a full-sized vat. The area of any commercial vat divided by this area and the result multiplied by the number of gallons per minute flowing through a given column of ore would give the approximate amount of solution that would have to be handled by circulating pumps in a large plant.

The ore absorbed 6% of its weight or 14.4 gal. of water per ton. To cover the 4-mesh ore required 27.7% of its weight or 66.5 gal. per ton.

Experiments were run on various heights of column, on charging ore into water and into dry tanks, and with upward and downward percolation.

It was decided that with both 2- and 4-mesh ore that height or ore column has no retarding effect on the rate of percolation, unless the ore is much disintegrated and produces a good deal of lime. If anything, the rate is increased with increased height. Vats can therefore be constructed with any convenient depth, but will probably not be practicable beyond 10 or 15 ft., depending, of course, upon the character of ore and method of crushing. The ore should be charged dry or only moist.

Lixiviants can be introduced best from the bottom of the vat or down one side of the vat from the top of the ore. This allows the free escape of air and carbon dioxide gas and permits a rapid saturation of the ore and filling of the vat. After the ore is covered, the percolation of the lixiviant through the ore should be downward. This permits better control of solutions and the washing of the ore with the minimum quantity of water. By keeping the ore covered with solution and having the pumping or circulating capacity a little above the rate of percolation, channels through the ore can be detected and remedied.

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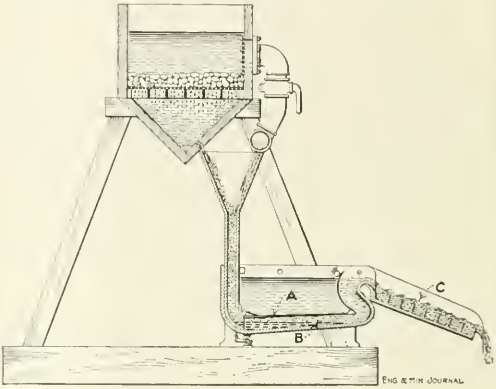
A Combined Smelting and Sulphur-Recovery Process has been patented by J. A. and W. R. Heslewood, of Oakland, Calif., the patents being assigned to the Hydro Vacuum Smelting Co. They propose to smelt sulphide ore and to recover sulphur in elemental form. By means of an aspirator, atomized fuel oil and air are to be drawn into a furnace at the focus, and steam is introduced in the shaft with the idea of breaking up the metallic sulphides, H_2S and SO_2 reacting to produce elemental sulphur. The charges are to be introduced through an air-tight chamber so as to avoid interference with the suction "blast." Settling tanks are suggested for the collection of the reduced sulphur.

The Thibault Amalgamator

This device is an addition to the already large field of claimants for the honor of most effectively recovering free gold. Its operation is simple, depending upon the pressure developed by slight head to force the pulp stream between a copper plate *A*, amalgamated on the under side, and a bed of quicksilver *B* in the bottom of the receptacle. A riffle *C* is provided as a precautionary measure to avert loss of quicksilver or amalgam. The device was invented by Eugene E. Thibault, 166B Case St., San Francisco, Calif., and is made and sold by him.



The Thibault Amalgamator

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Briquetting of Iron-Furnace Dust

A process for the agglomeration of flue dust from iron blast furnaces is patented by William Cooper of Denver, Colo. (U. S. pat. 1,103,100.) In his process the flue dust is piled in heaps, and a pipe with a number of small holes in it (like a well point) is driven down into it. A very thin emulsion of cement or milk of lime is then pumped through the pipe until the bottom layer is saturated; the pipe is then raised a little and the process repeated; and so on until the pile in that part is saturated to the top.

The pipe is then driven to the bottom of the pile in another place and the process repeated, and so on until the entire pile has been treated. The mass is then allowed to set, after which it is broken up into chunks for smelting.

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A New Flue-Gas Scrubber

What appears to be a new idea in flue-gas scrubbers is patented by Ernest L. Gagnon of Billings, Mont. (U. S. pat. 1,116,053.) The gas is conveyed through steel pipes which run vertically down into a water bath of constant depth. Co-axial with and below the tube or tubes discharging gas into the scrubber is placed a cone with its vertex up. The device is supposed to spread the gas out, and prevent its coming through in large, unwashed bubbles, as it does in most of this type of scrubbers.

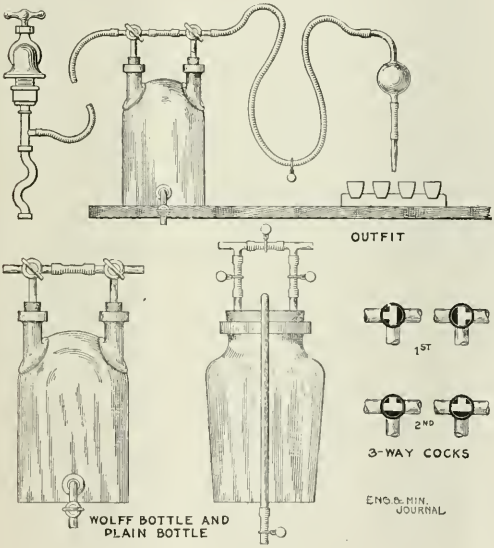
The Assayer and Chemist

A Rapid Method for Washing Gold Beads

By William Spence Black[*]

The process of hand decantation in the washing of gold beads is always slow, and is at best not a cleanly procedure. To avoid the necessity of handling each individual parting cup, and also to eliminate the possibility of spilling silver nitrate, I suggest the following method, which consists in drawing off the acid and wash water by means of a small suction pump with a connection of flexible rubber tubing ending in a glass tip.

For a suction pump the small laboratory type, known as Richards' suction pump, is suitable. It works on the principle of an ejector, and if not already in the laboratory equipment it will be found to be well worth its small cost, both for this work and for assisting in slow filtrations. It may be attached to the water-supply line and works well even under low heads.



Apparatus for Washing Gold Beads

In operating, a piece of light rubber tubing about 3 ft. long is attached to a suction bottle and this, in turn, is connected with the pump. Light rubber tubing is more satisfactory than the heavy kind, which is ordinarily used. The tendency of the light rubber tubing to collapse under suction is of little consequence, as only a moderate suction is used; furthermore, the flexibility of the light tubing will be found an asset.

A pinch-cock with a good, stiff spring is attached to the tubing. The tip is made from $1/4$-in. glass tubing, and is so designed that if a gold bead should be drawn up, it will not get beyond the tip. These tips consist of pieces of glass tubing from 6 to 10 in. long, in which have been blown one or two spherical or cylindrical bulbs. If a bead should be drawn up, it will be caught in the bulbs, and after cutting off the suction by releasing the pinch-cock, it may be forced back into its cup by a little pressure on the tubing. With proper manipulation, this is a rare occurrence.

One end of the tip should be drawn to a jet with a smooth opening of about $\frac{1}{16}$ in. in diameter. At the other end, which is connected to the rubber tubing, a smooth right-angle bend should be made. The purpose of this is to prevent the rubber tubing from kinking, which it is apt to do with a straight connection. A short piece of rubber tubing should be slipped on the tip for a grip, otherwise it will become uncomfortably warm when drawing off hot acid.

The suction bottle serves to save the silver nitrate and also to prevent corroding the pump. The most suitable style of bottle is the Wolff, which has two necks and an outlet at the bottom. If a bottle of this type is not available, an equally satisfactory substitute can be made from any wide-mouthed bottle for which a cork stopper can be obtained.

The connections to the suction bottle are made through two 3-way stop-cocks. The purpose of these stop-cocks is to divert the acid and silver nitrate into the bottle and to bypass the wash water directly to the pump. Connections for both styles of suction bottle are shown in the cut and should require no further explanation. The outlet at the bottom of the Wolff bottle serves to draw off the accumulated silver nitrate without disturbing the other connections. In the plain bottle, this result is secured by a siphon, and when using it the pinch-cock on the tip should be opened to admit air.

In manipulating, the operator turns on the suction and then, having the parting cups in a tray or rack before him, he opens the pinch-cock and allows the suction to start, at the same time bringing the tip just to the level of the acid in the first cup. This will cause a mixture of acid and air to be drawn up. The operator should gradually lower the tip, so that it stays just at the surface until the last of the acid is drawn off. The purpose of keeping the tip at the surface in this way is to prevent any currents being set up which would tend to disturb the bead. It will generally be found that the bead lies well to one side of the bottom of the cup, and as the last of the acid is being drawn off, the cup should be tipped slightly so as to leave the bead on the high side, at the same time applying the tip at the lowest part of the cup, directly opposite the bead. In this way there is little danger of disturbing the bead and it gives a thorough decantation. When all the cups have been treated in this manner, the wash water should be added from an overhead water supply through a piece of rubber tubing, the flow being controlled by a pinch-cock.

The wash water is drawn off in the same way as the acid.

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[*] Aurora Consolidated Mines Co., Aurora, Nevada.

except that the three-way stop-cocks are set so as to bypass the water directly to the pump and not into the suction bottle. Two applications of wash water will be found ample in most cases, as the decantations are thorough.

Care should be taken as to the strength of the dilute parting acid, for if too strong acid is used, the gold will break up and cause difficulty in decanting. A parting acid made from one part concentrated nitric acid and six, or even better, seven parts distilled water, will give satisfactory results.

When the assayer has obtained a little experience in the manipulation of this device, he will be astonished to find how rapidly and how cleanly he can cover this stage of fire-assay determinations. As each individual parting does not have to be handled, and as the decantations are made successively, and likewise the additions of wash water, the general efficiency is apparent.

Substitute for the Blast Lamp

A substitute for the blast lamp, suggested by Paul J. Fox (*Journ. Ind. Eng. Chem.*, November, 1914), consists of an ordinary assayer's crucible of convenient dimensions, of which the bottom has been ground or sawed off, forming a jacket of truncated conical shape, open at both ends. Thus prepared, the jacket is placed over the crucible or dish to be ignited, with the larger end down. The top is partly closed by a porcelain crucible cover which can be easily adjusted to secure the maximum amount of heat without unduly impeding the draft. Using a Tirrill burner of ordinary laboratory size, it is possible to convert even large amounts of calcium carbonate to the oxide. The crucibles in which the ignitions take place should be covered, but with the lid partly placed to one side to leave a small opening. Besides doing away with the necessity of compressed air, this method of ignition also avoids the strong air current of a blast lamp by which small amounts of light precipitates may be lost. A platinum crucible, also, appears to be less attacked than when a blast lamp is used.

A convenient size of assayer's crucible is the Denver Fire Clay No. 9, which measures 3 in. in diameter and 5½ in. high. If a clay ring piece of the same diameter as the assayer's crucible is available, it may be advantageously used as a rest for the triangle that carries the platinum or porcelain crucible containing the sample. This has the effect of extending the jacket below the triangle.

Volumetric Method for Lead in Ores

A new volumetric method for lead in ores is given by Alder and Coolbaugh (*Journ. Ind. Eng. Chem.*, p. 398, 1914; abstr. *Journ. Soc. Chem. Ind.*). From 0.5 to 1 gram of ore is treated with nitric acid and, if necessary, with hydrochloric acid, and evaporated with a few cubic centimeters of concentrated sulphuric acid. The residue is treated with 100 c.c. of water, boiled vigorously, 10 to 15 c.c. of alcohol added, and the lead sulphate filtered off, washed with a mixture of 1% sulphuric acid and 10% alcohol and then with alcohol, and dissolved in 10 to 15 c.c. of a hot 10% solution of sodium hydroxide, the filter being washed successively with hot water, hot water acidulated with nitric acid, and water containing a little sodium hydroxide. The solution is treated with a few drops of phenolphthalein and a slight excess of potassium iodate, heated, and a slight excess (15 to 29 drops) of nitric acid of sp.gr. 1.2 added. The whole is heated to boiling, cooled slightly, treated with 15 to 20 c.c. of alcohol, cooled, filtered, and the filter washed with dilute alcohol (1:3) until the wash water gives no test for iodate when treated with hydrochloric acid, ammonium thiocyanate, and chloroform. The filter and precipitate are transferred to a flask, treated with 40 to 50 c.c. of dilute hydrochloric acid (1:1.5) and 3 to 5 c.c. of chloroform, and titrated with ammonium-thiocyanate solution (2.5 grams per liter), until the chloroform is colored violet. With ores rich in lead, 10 to 15 c.c. of hydrochloric acid of sp.gr. 1.1 should be added before the end point is reached. The equations given are:

$$3Pb(IO_3)_2 + 4\ NH_4CNS + 16\ HCl = 6\ ICl + 3\ PbCl_2 + 4\ NH_4Cl + 4\ H_2SO_4 + 4\ HCN + 2\ H_2O;$$

$$6\ ICl + NH_4CNS + 4\ H_2O = 6\ I + NH_4Cl + H_2SO_4 + 5\ HCl + HCN.$$

The Pearce Assay for Tin

The Pearce assay for tin consists essentially of a fusion with sodium peroxide in an iron or nickel crucible; solution of the melt in water; acidulation with HCL; reduction by nickel; and titration with standard iodine. E. A. Wraight and P. Litherland Teed offer some interesting observations on manipulation, interferences, etc., in this method (*Bull.* I. M. M. No. 113).

The ore must be at least 100 mesh. Nickel crucibles are superior to iron, as the reduction period is shortened. With tailings, iron should not be used, as the large amount of iron in solution, as compared with the tin, will give high results. There should be about 125 c.c. of HCl present, and the bulk of the solution before reduction should be about 400 c.c.

The temperature of the solution at titration should not be over 70° F., and the standard solution should not contain over 11 grams of iodine and 20 grams of potassium iodide per liter, nor less than one-third this amount. The calcite put in the flask to secure a neutral atmosphere should entirely dissolve before titration.

If titanium is present, the ore should be given a preliminary fusion with four or five grams of potassium bisulphate, the melt dissolved by heating with about 60 c.c. water and 7 or 8 c.c. of sulphuric acid, and the insoluble residue fused with sodium peroxide as usual.

Tungsten can be removed by filtering off the blue precipitate after reduction, washing the residue thoroughly, then reduce the solution again, to overcome atmospheric oxidation during filtering and washing, and titrate as usual. Bismuth is eliminated in the same manner, being reduced to metal during reduction. Copper in quantity may interfere. It can be washed out by a preliminary treatment with nitric acid. Iron in quantity will interfere, therefore nickel crucibles are preferable to iron, and nickel should always be used for reduction.

In the discussion (*Bull.* I. M. M. No. 116), it was pointed out that the cost of nickel crucibles per assay amounts to about 15c., nevertheless the authors hold the opinion that it is preferable to use the nickel for all operations, and essential when dealing with low-grade material, such as tailings. In *Bull.* I. M. M. 119, Arthur Jarman recommends a sodium-hydrate fusion in an iron crucible as being equal to the peroxide fusion. The hydrate is melted and the tin ore added to it.

The New Home of the Engineering and Mining Journal

The accompanying pictures show the Hill Building, at the corner of 36th Street and 10th Avenue, New York, which is the new home of The Engineering and Mining Journal and its four sister engineering journals. This building has been erected by the Hill Publishing Co., owning these publications, and was especially designed for their purposes. The ground area is 100x175 ft. There are 12 stories, each one 14 ft. in the clear, an unusually great height. The 12th story, where are the offices, is of double height, having a gallery along two sides. About 3900 tons of steel were used in this building, the steel framing being heavier than in any other building of its height in New York City. The permissible floor load is 300 lb. per sq.ft. The side walls are largely of glass, being approximately 70% of the total wall surface; otherwise the exterior of the building is covered with white tiling. The steel columns of the framework are protected by cement poured in from the top, 31,000 bbl. of cement being used.

The New Home of the Engineering and Mining Journal

The ventilation of the building is artificial. In the basement there are three blowers capable of delivering 47,000 cu. ft. of air per min. each. These draw the air through three air-washing machines, which remove the dust and give the proper degree of moisture to the air before it is forced through the building. On the roof there are two exhaust fans, each with a capacity of 67,000 cu.ft. of air per min. There are a number of small auxiliary fans. In summer the air can be cooled, and in winter it is heated somewhat before being forced to the floors, but the main heating of the building is done by means of a hot-water circulating system.

The supply of drinking water for the building is drawn from the city mains through large filters. It is cooled in a refrigerating plant having a capacity equivalent to three to five tons of ice per 24 hours. The filtered and cooled water is distributed to sanitary fountains.

The power plant comprises three 250-kw. direct-current generators. The coal for the steam boilers is delivered to hopper bins, whence it is taken mechanically to the automatic stokers that fire the boilers. The ashes also are removed mechanically. Mechanical conveyances are to be found throughout the building for other purposes wherever necessary. Thus, between the offices and the composing room, which is on the eleventh floor, there is a pneumatic-carrier system. From the bindery, on the 10th floor, the mail bags going to the post office are dispatched to the truck on the ground floor via a spiral chute. This chute might also serve as an auxiliary fire escape in case of emergency, although the need for it is hardly conceivable.

Probably no other building was ever so thoroughly safeguarded against fire. The building itself is chiefly of steel and cement. The furniture and fittings are of steel. The building is equipped with a sprinkling system throughout. There are two main stairways at opposite corners of the building. Each of these is isolated in an independent shaft, communication with the several floors being through doors that are closed when not actually in use. Besides these provisions there is an adequate fire-alarm system.

The lighting of the editorial rooms and general offices is done by the indirect system. The floors are covered with interlocking rubber tiling, which is both noiseless and durable. A noiseless typewriter also is used. With these aids toward the abolition of noise, the sounds in this large office, which is occupied by 225 persons, are scarcely more than those of a reading room in a public library.

The composing room and electrotyping department are on the 11th floor. The printing and binding department are on the 10th floor. All of these departments are equipped with the most uptodate machinery and methods, and are supposed to exemplify the last word in printing-house-construction equipment. There are seven linotype composing machines and three monotypes. The pressroom contains nine presses for the regular runs on the several papers. The regular weekly editions of the JOURNAL, *Engineering News, American Machinist, Power* and *Coal Age* amount to 100,000 copies and the output of printed paper weighs 11 tons. The handling of this from the time the white paper is received in rolls to the time when the printed papers, wrapped, addressed and sorted into mail bags, are taken by automobile truck to the general post-office is as thoroughly mechanical as can be.

GENERAL VIEW OF OFFICE, SHOWING STEEL FURNITURE, MEZZANINE FLOOR AND INDIRECT LIGHTING

PRESSROOM AND BINDERY FLOOR, SHOWING WEB, TWO-COLOR AND ROTARY PRESSES

The floors of the Hill Building that are not occupied by the company are rented to concerns in similar or allied lines of work. Thus the floor immediately under the pressroom is occupied by the engraver who does the work for the Hill Publishing Co. The supply of paper is obtained from the ground floor. With its power plant in the basement and a restaurant for employees on the roof, this printing building is about as thoroughly equipped as anything of the kind can be. The design and construction throughout reflect the mature experience of John A. Hill, the president of the company.

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The Number of Byproduct Coke Ovens in the United States at the close of 1913 was 5688, according to the U. S. Geological Survey; in addition there were 504 new ovens under construction. The coke made in byproduct ovens in 1913 was 12,714,700 short tons, or 27.5% of the total production of coke. The total value of byproducts from coke ovens was $16,925,941; the figures including gas not used or consumed in the coking process.

Copper Creek District of Arizona

By Claud Hafer*

The Copper Creek district lies west of Prescott, in the St. Cloud mountains, in Yavapai County, Arizona. It is about 27 miles west of Hillside, and along Copper Creek, which is the main drainage channel of the district. In general the country is granite, and it is this mineralized granite, or porphyry as it is locally called, that is the source of the copper ore that has been exploited by the Arizona-Nevada Copper Co. and others who own claims in that section. The granite exposures in the district vary from normal, coarse granite, through the finer grained, altered granite porphyry, to rock resembling altered rhyolite.

Surrounding the granite on nearly all sides are more basic rocks, such as diorites and schists. North of Copper Creek the granite is capped with basalt, forming high, flat mesas, while to the south, basalt is not present, as the country is much rougher and deeply scored by numerous streams.

The property of the Arizona-Nevada Copper Co. lies along Copper Creek and comprises some 3000 acres. Of these, about 10 acres have been prospected with hand drills, and much ore has been disclosed by adits driven into the hillside. There are said to be several million tons of commercial ore developed, and it is estimated that there are about 200 acres of ground on which the prospect for finding ore as good as that already developed is favorable.

Copper Creek Camp, Ariz.

The great bulk of the ore is simply the porphyry that has been impregnated with solutions of copper, and which is now found as the mineral chalcocite. It is said to lie in a comparatively horizontal series of lenses and also planes of ore-bearing zones that dip at small angles. The country is traversed by a series of faults, some being east and west and others north and south. The most profound faults are the east and west ones, and one in particular passes through the best portion of the property. The ore beds are from 100 to 150 ft. in thickness, and there is a barren capping varying in thickness with the topography from 100 to 300 ft.

There is much pyrite in the oxidized surface rock, from which it is inferred that the concentration of the copper was done by nearly neutral solutions which attacked the copper more readily than the iron. In some of the tunnels there are small veins and quartz stringers containing softer minerals with molybdenite as an accessory, and in some of the fissures native copper occurs. In the conglomerate bodies copper occurs in the cement.

Of the holdings of the Arizona-Nevada Copper Co., about 1300 acres are patented, and when the patent was applied for in 1911 it was the largest in the history of Arizona. The company also owns dam and mill sites on Burro Creek, into which Copper Creek empties. The railroad connection with smelting and refining works, and the market, will be at Yucca or Seligman, on the main line of the Santa Fé.

The camp has an elevation of 3200 ft. Several other properties are near it, of which the Mammoth, to the west, and in similar country, is developed by tunnels and shafts. The development shows the formation to be impregnated with chalcocite.

At the King mine on Alum Creek the shaft, 350 ft. deep, was full of water. An opencut revealed a mineralized zone 15 ft. or more in width, containing blende and calamine, iron pyrite and copper carbonate. Alum Creek is so named on account of the stringency of its waters. About eight miles to the north, in the Hillside mine, there have been developed some interesting veins, the valuable contents of which are gold, silver, lead and zinc. T. A. Rickard in Vol. XXVI, *Trans. A. I. M. E.*, says: "The lode occupies a strong fissure cutting almost vertically through the horizontal layers of a quartz schist." This schist appears to be siliceous and serecitic such as is common in Arizona and the Southern states, and was until a few years ago called talcose schist.

Shannon Copper Co.

Report of the Shannon Copper Co. for the third quarter of 1914 shows that 60,713 tons of ore were treated, 49.254 tons being Shannon ore and the rest from the company's outside properties. From it 2.964.764 lb. of copper, 412 oz. of gold and 18,449 oz. of silver were produced. Average cost of copper was 11.396c. per lb. August and September production, 1,996,500 lb., was stored, there being no open market.

Net smelting profit for the quarter was $25.536, based on 13.223c. received for copper sold and 11.5c. for copper stored. Railway earnings were $1026. A large part of the stored copper was sold after the end of the quarter at an average of 12.242c., increasing the earnings about $13.000. Operations were suspended in September. Financial statement shows the company to be in excellent condition.

Mineral Output of Prussia in 1913

The output of mineral products in Prussia during 1913 and 1912 is officially reported as below, in metric tons. Statistics of labor relate to 1913 only.

	1912	1913	Workmen 1913
Bituminous coal	165,302,784	179,861,015	639,094
Lignite	65,803,959	70,051,871	59,866
Asphalt	21,241	17,795	44
Petroleum	87,443	71,178	1,004
Ores of:			
Iron	5,331,240	5,461,670	21,773
Zinc	647,081	649,695	13,920
Lead	140,158	143,799	7,608
Copper	967,785	941,402	14,290
Nickel	12,091	13,538	196
Manganese	92,474	(b)	....
Arsenic	4,870	5,008	229
Pyrites	233,397	228,405	749
Salt (a)	8,071,114	8,610,541	26,023

(a) Rock salt, carnallite, kainit, sylvanite, etc.
(b) Included in "Iron Ore."

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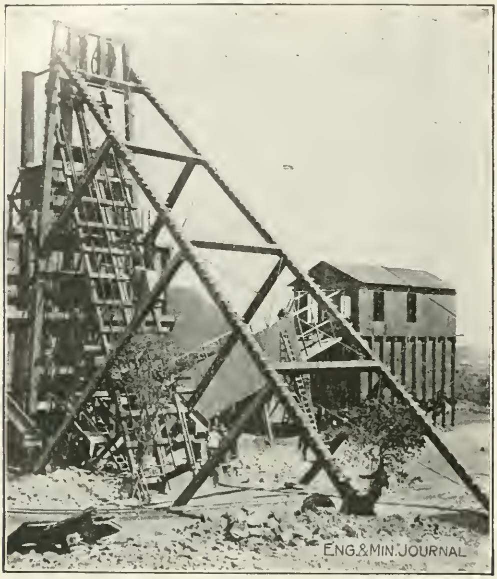
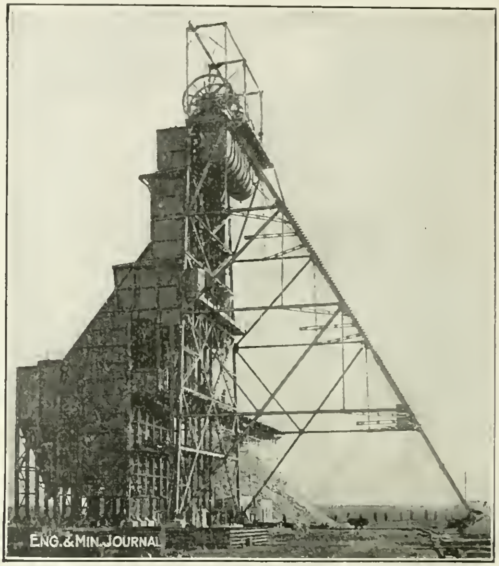
*Mining engineer, Candor, N. C.

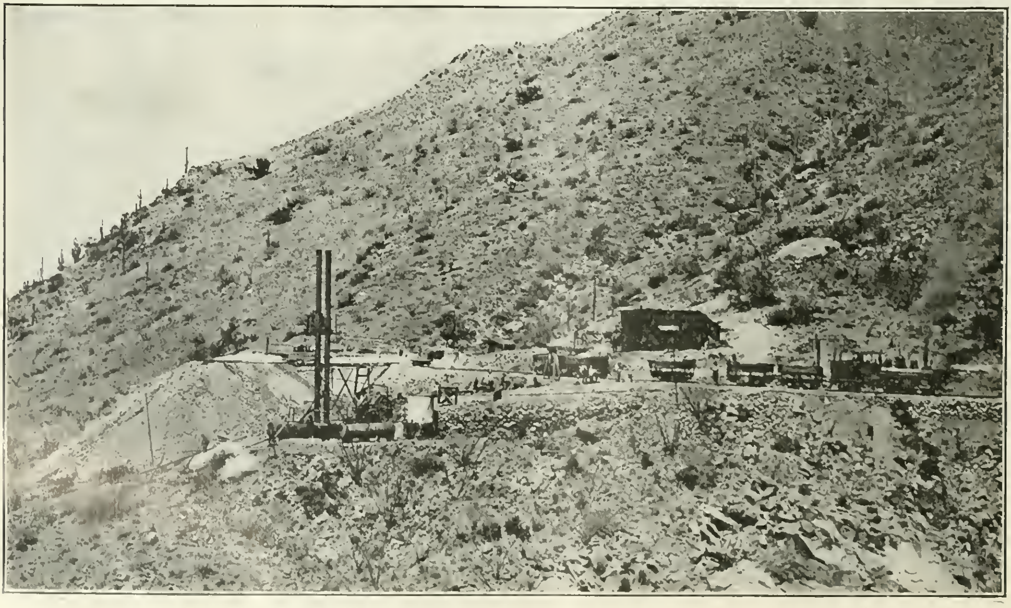
Photographs from the Field



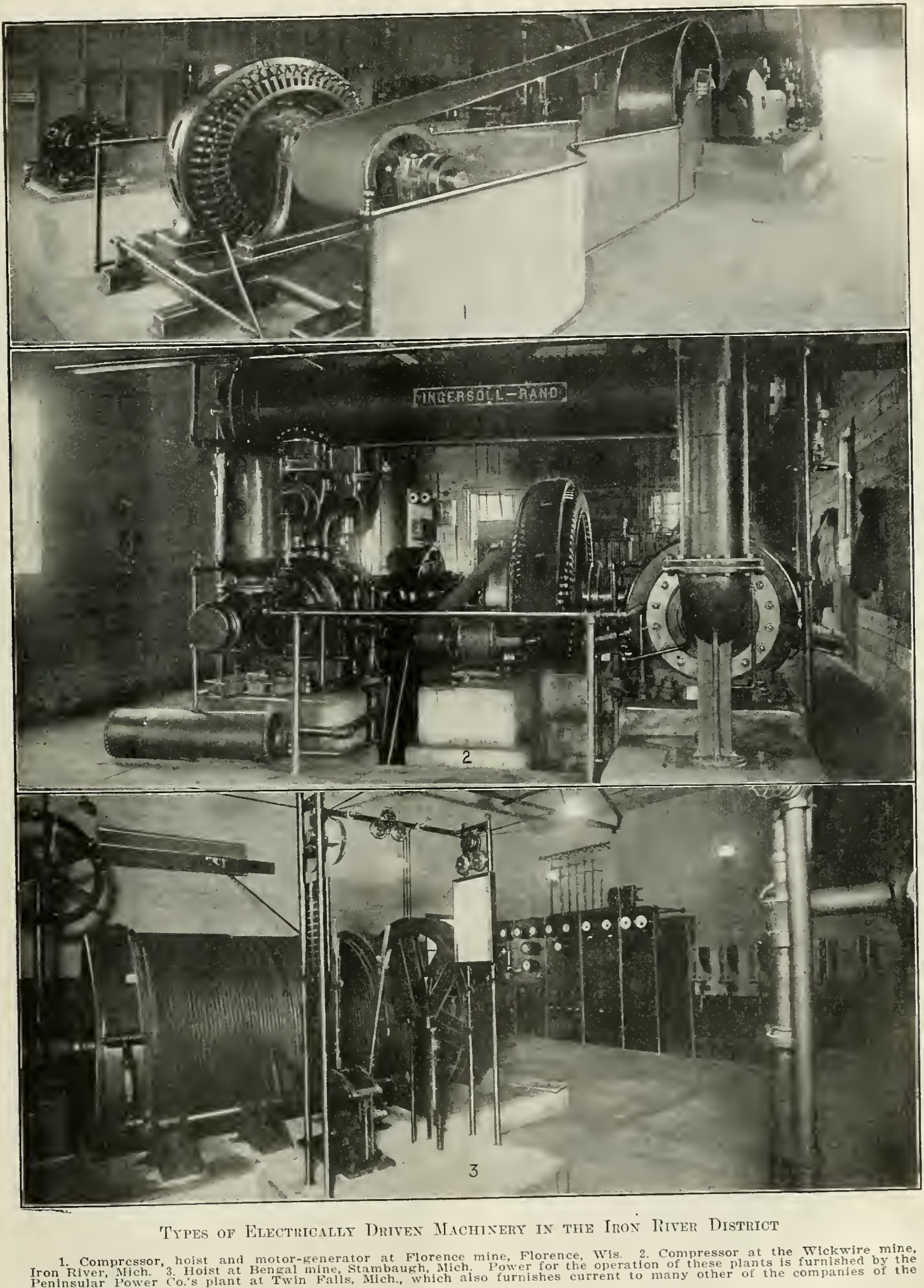
Calumet-Sonora Headframe, Cananea, Mex.
Noteworthy because of long timbers used. It was erected in one night by Mexican labor.



The Cinderella Headframe, on the Rand
Steel construction over 4440-ft. shaft, which cuts a vein averaging 9 dwt. over 42 in.



Development Equipment at Copper Creek, Ariz.
Preliminary operations at what is expected to be a large copper mine. The locomotive had to be hauled in by team.



Types of Electrically Driven Machinery in the Iron River District

1. Compressor, hoist and motor-generator at Florence mine, Florence, Wis. 2. Compressor at the Wickwire mine, Iron River, Mich. 3. Hoist at Bengal mine, Stambaugh, Mich. Power for the operation of these plants is furnished by the Peninsular Power Co.'s plant at Twin Falls, Mich., which also furnishes current to many other of the companies of the iron-mining district.

Correspondence and Discussion

The "Joiner"

Misther Editor:

'Tis a foine thing to be a mimber av an organizayshun. It gives a felly a feelin' av importance and a sinse av his obligayshuns to his profissional brithren. Whin I was a kid I used to carry drills in wan av the big copper mines up in Michigan. There was a felly there named Tim Dillon, stopin' on a contract an' savin' out money enough to get an edicayshun.

About tin years later I was down in Arizony, bossin' a gang av Mexicans that were condescendin' to shovel concentrates whin they wasn't too busy rollin' corn-husk cigareets or discussin' the chances av the re-iliction av Porfirio Diaz in the land av their fore-mothers. Along comes a foine-lookin' felly dressed in brand-new khaki clothes, wearin' gold-rimmed glasses an' a nice pointed beard like wan av these here osteopath docthors.

"Hello, Bill," sez he. "Hello, Bill, yerself," I rayesponds, "are ye an Elk?" "Sure thing," he grins, "but aren't ye raymimberin' me?"

"How much is it I owe ye," sez I, thinkin' he might be the felly that fixed me up the time av me last celebrayshun down in Tucson.

"Ye owe me nothin' but the pleasure av yer company at dinner tonight, to talk over owld times." And with that he hands me his card:

Cable Address All codes.
"Dilmont, Newyork" Phone Hanover 4711

T. MONTMORENCY DILLON
Consulting Civil and Mining Engineer
Member A. I. M. E., A. C. S.,
A. S. C. E., A. A. A. S., 23 Broad St.
Can. Min. Inst., etc. New York City

Well, if it wasn't me owld frind Tim, av the Osceola. Whin he finished his corryspondince coorse he got a job as surveyor's helper an' j'ined a minin'-engineers' society as associate. Wan av the full members he met at the Lake Superior meetin' tuk a fancy to the boy an' hired him to be his sampler. Tim kept on j'inin' more societies an' makin' more friends an' more money.

Whin we got to the p'int av drinkin' the little tay-cups av coffee an' smokin' the big 50-cint seegars that Tim insisted on havin', he confided to me that he was now rich an' indipindent; the secret av his rise bein' the joodishus workin' av the privileges afforded him by the twinty-siven societies he had managed to j'ine.

Durin' the time I spint on the hard rock work in the subways av New York, I tried siveral times to find Tim in his foine office. The first time, the little stinnygrafter says, "it's too bad, but he's out in Dinver at the annual meetin' av the American Minin' Congress." Next time he was on his way to Japan on a pleasure jaunt with the American Institute av Minin' Engineers.

Another time he was an hon'ry mimber av a commission av Civil Engineers to go and take a luk at the Pannyma Canal and swap opinions about how much sooner the ships might be runnin' through if the individool mimbers av the commission had only been consulted in time.

Wan day I asks the sweet little lady whin wud be a good time to find Tim. She studies a little red book and then says, "he'll have to be in the city next month, on account av the coort calendar; his case for the collection av the fees for his last profissional work comin' up after two years' delay."

Well, to make a long story short, I have a contract for extindin' some av the subways over in Brooklyn; an' this mornin' whin I tuk a luk at the long line av applycants for jobs, to me surprise there was me owld frind Tim Dillon. I called him into me private shack, and whin we were all alone I sez to him, "Well, Mr. T. Montmorency Dillon, an' is it investigatin' fer graft ividence ye're up to now?"

"Fer God's sake, Bill," sez he, "don't joke with me, for I'm up against it hard. 'Tis plain honest work I'm lookin' for, with a payday ivery Saturday."

"An' cud yer societies give ye nothin' rayspictable for a gintleman to do," sez I, lightin' me favorite pipe an' motionin' him to me only chair.

"Societies—hell, Bill," sez Tim. "I overplayed me hand on that game. Whin the money was comin' it was foine and grand, an' I attinded all the meetin's, convintions, congresses an' the pleasure trips, broadenin' me mind an' extendin' me social acquaintance. But the Mexican rivolutions cut off the best part av me income an' I cud not pay the dues for all av thim societies, much less pay railroad fare to the meetin's. For the last three years I've been droppin' out av wan after the other, for I cud not honestly feel that there was still anny particular merit or profit in the mimbership."

"But," sez I, reachin' for another match, "ye're still a mimber av the first wan, are ye not? 'Twas that wan that put ye on yer feet an' showed ye the way to success."

"No, Bill," sez he, bitin' the ind off av wan av me Porto Rico big-smokes, "that was the first wan I dropped. I've paid dues to that wan for so manny years that I began to grudge them the money. But 'tis no use to talk av that now. The sheriff closed me out last week, and now I'm ready to get me hands on a drill again."

Tim starts work tomorry, but I'm goin' to stake him to re-iliction in wan av his societies, provided he'll choose the wan where he belongs. An' I think I'll j'ine it mesilf, if I'm iligible. But wan will be a plenty.

BILL MCGINTY.

New York, Dec. 8, 1914.

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Finding Fault with the "Faultless Faultfinder"

In the JOURNAL of Nov. 14, Messrs. Weeks and Huntington accuse me of having unjustly designated as unreliable certain charts prepared by them.

The truth is that at the time of studying their paper I did not deem it necessary to check, personally, the readings which they offered as correct solutions obtained from their own charts. Quite naturally, I assumed that the authors would be extremely anxious to advertise the faultlessness of their charts by showing that they permitted of correct and faultless readings rather than to demonstrate the reverse. Thus I felt justified in taking it for granted that these readings coming from the authors themselves were the best the charts permitted. Being, however, anything but faultless and differing in one instance by 2½° in angle and by as much as 100 ft. in distance from a correct solution, I felt quite safe in pronouncing the charts unreliable.

The authors now explain that they gave these faulty readings to simplify exposition, but that the charts themselves were correct. Without having recourse to the reproductions published in the Aug. 15 number of the Journal, I am quite willing to accept the authors' explanation and wish to apologize to them for any rash statement made by me regarding the accuracy of their charts, a statement which obviously resulted from my total failure to grasp their conception of simplified exposition.

Theodore Simons.

Butte, Mont., Nov. 24, 1914.

Electric Smelting for Southeastern Alaska

It may be of interest to the mining fraternity to know that the Ketchikan mining district of Southeastern Alaska affords an excellent field for the installation of an electric smelting plant. Such a plant should be primarily for the purpose of smelting the copper-bearing magnetites of this district. By this means a large tonnage of iron ore could be profitably converted into electric steel instead of being thrown over the slag dumps as waste. Abundant hydro-electric power and suitable charcoal may be obtained at a comparatively low figure, and the smelting of copper concentrates and other ore should also be found practicable by this means. By utilizing instead of wasting the magnetite ores of this district a material factor would be introduced, making for the reduction of iron and steel prices on the Pacific Coast.

An effort will be made to have such a plant installed and operated by the Government under the Bureau of Mines. Inasmuch as this will make for the popularization rather than the monopolization of the mining industry, it is to be hoped that the plan will have the approval of the mining press and profession generally.

Under the circumstances existing in this district an electric smelting plant operated under the direction of the Bureau of Mines should yield the Government a substantial revenue, to which it is entitled as a return for the sums expended in geological and topographical work. It would also stimulate and assist mining and development to a greater extent than has so far been done by the Geological Survey, and would, therefore, bring greater returns on the money invested.

A plant of this kind with its accompanying laboratory would have the advantage of immediate contact with actual conditions in a developing mining district, so that new processes and discoveries and the utilization of natural resources could be developed under real conditions and be made of practical use and benefit to the industry, as well as a source of direct revenue to the Government.

The nearest smelting works on the American side are over 600 miles distant so that it cannot be said that the field is now occupied by any American enterprise.

As further justification for a Government smelting plant I can say from ten years' mining experience in this district that since the smelting of Alaska ores is either done or controlled by but one company, its policy is now to ruin the independent producer, eliminate him from the business, and at leisure secure his property for a trifle. During the last three years I have satisfied myself by repeated appeals to smelting officials for justice and honest returns that all such efforts are a mere waste of time and energy. The fullest advantage has been taken of the wreck of the copper market to bleed the independent producer to death.

U. S. Rush.

Rush & Brown Mine, Kasaan, Prince of Wales Island, Alaska, Nov. 27, 1914.

[The manner in which the Government runs the postoffice, the greatest single piece of business in the United States, and a monopoly at that, is a soul-satisfying exhibition of bureaucratic, or governmental, mismanagement. We do not want to have Washington run the railways of the country, or the telegraphs, or the smelting works. However, those experiments may, perhaps, be tried. For the smelting experiment Alaska would be as good a place as any other, but as to electric copper-smelting we must remark that at present it is an unknown art.—Editor.]

Utilization of Tin Scrap

A subscriber inquires: I would like to know if there is a process, and will it pay, to remelt tin scrap such as buckets, cans, and similar material in large quantities just for the solder and tin? Is there enough of the metal to justify the expense of an outlay? Where can a market for the products be found?

[We do not know of any working on a large scale of a process of desoldering and detinning by melting. This used to be done by Chinamen, and is yet, around mining camps and some Western city dumps, but their scale of living permits them to do what is not feasible for Americans.

However, the business is growing increasingly precarious, even for the Chinamen, because of the much smaller quantities of tin and solder on the modern machine-made can, as compared with the can of even 15 years ago. Old buckets give no returns whatever, the tin does not melt off, it merely oxidizes. The ordinary can for food carries a little over 2% of tin, as this minimum is fixed by some governments as the lowest permissible. A recent test on some gasoline cans gave only 0.27% Sn. This is exclusive of that in the soldered joints.

Bright tin scrap from a can or bucket factory can be profitably used in the East for electrolytic detinning. This is done by the Goldschmidt Detinning Co., Chrome, N. J., and the Vulcan Detinning Co., of Sewaren, N. J., and Streator, Ill.

We think that neither in this country nor Germany has detinning of dirty scrap, "swill cans," etc., been successful. Certainly the only present buyers of dirty scrap in the East are the sash-weight makers. The tin in the melted pig makes it cold-short and it can only be used in sash-weights, bed-plates, and other castings where weight and little strength are required.—Editor.]

Editorials

Some War Notes

The progress of the war has caused some revision of ideas respecting the effects upon the world's finances. In spite of the enormous expenditures, we are seeing easy money in all the great financial centers. Apparently too much attention has heretofore been fixed upon expenditures expressed in terms of gold, and not enough upon the expenditures in the form of material, which, of course, are the real expenditures. Thus, the stock of gold held by the Imperial Bank of Germany has been increasing, but, of course, the wealth of Germany has not been increasing at all; quite the contrary.

It is held by some economists that the hypothesis that the result of the war will be determined by the side whose financial resources last longest is a fallacy. It is pointed out that Germany is practically independent of any such consideration, and that in her case the determinative factors will be the loss of life. In other words, Germany is practically a completely integrated entity, supplying within her own borders about all the things she needs. In her case, therefore, it is a question of how many men she can keep in the field and what proportion of her population she must retain engaged in production at home, in order to keep things going. With England, France and Russia, the situation is different, for the reason that they do not, themselves, supply so large a proportion of the things they need, either because of deficiency in their natural resources, or the less perfect organization of their industry and domestic affairs as compared with the German organization.

If this hypothesis be correct, a nation like Germany ought to be able to carry on war for a very long time if it can obtain enough prisoners from the enemy to make good the loss of life in the field and put them at work producing; but, of course, the conditions could hardly be permitted to arise where all the Germans would be in the field and all of the men at home would be Russians, French, Britishers, etc. Obviously, also, this plan assumes that there will be no friction among the people of Germany over the division of wealth and that everybody will be satisfied with paper money in exchange for their goods, which is hardly to be expected to continue to be the case.

We have several times referred to the use of captives in the practice of modern warfare. But little has been told of how the Germans are handling theirs, but it may be imagined that some of them have been converted into hewers of wood and tillers of the soil. An interesting report comes from Russia, where large numbers of Germans and Austrians, especially the latter, are held. The problem of caring for these is said to be becoming acute, and as the number increases the government will welcome any plan which will enable them to be self-supporting. A large number have been sent to Semipalatinsk in Siberia. This is in that part of Siberia through which Mr. Knox traveled, as related in the remarkably interesting article published in a recent issue of the JOURNAL. A good deal of important mining development is going on in that region. Having transported its prisoners thither, Russia lets them loose, knowing that they cannot get away. Their freedom is complete, even to the extent of finding work among the mining companies of the region. Thus, the mining companies are pleased to obtain a bountiful supply of labor by unexpected immigration, the captives also are pleased in finding work, and the government is relieved. This is a very pleasant part of Siberia and one that is destined to become of great importance in the world's affairs. It would not be surprising if many of the Austrian prisoners transported thither involuntarily, should elect to remain there after the war, and send for their families to join them.

Arthur Hunter, an eminent life-insurance actuary, has pointed out another economic result that may happen. At a life-insurance convention a few days ago he said that if Russia can enforce the prohibition ukase, the saving in human life will in 10 years make good the loss of 500,000 men that may be suffered in the war. Thus, by prisoners and prohibition together, Russia actually may come out ahead in the matter of producers.

Selling Copper to Europe

John D. Ryan, in the current number of *The Americas*, reverts to the theorem that the copper producers of the United States have heretofore been at a disadvantage in selling copper to Europe because of their highly competitive method of doing business on the one hand and the organization of Europe's buying on the other. "Repeatedly," says Mr. Ryan, "the dealers and consumers of Europe have entered into agreements by which they forced American producers to unload at concessions." This has reference, of course, to those operations toward the bottom of a declining market, when buyers by their abstention have caused stocks to accumulate in the producers' hands, and finally have relieved them by taking over blocks at low terms. Just how much collusion there has been in this and how much is due to the natural difference between the European and American methods of doing business is perhaps not quite easy to determine.

American consumers buy, each for himself, according to their manufacturing requirements. They are seldom disposed to buy when copper is low unless they are covering orders already on their books. The European manufacturer probably figures in the same way, but in Europe there are great financial and speculative houses which step in when copper is low and may not exert themselves unduly in swinging a block of 50 million pounds, which they plan to turn over to consumers at a profit, and often no doubt so do. Mr. Ryan implies that large consumers may participate in these operations, and figures that during the 10 years ending with 1913 Europe got its copper from America for about 5/6c. per lb. less than American consumers did. He argues that this has been an immense handicap in the development of our export trade in copper manufactures. This looks rational. Why should we export wirebars, cakes and ingots, and not wire rods, sheets and brass? The entire cost of drawing wire is but a trifle more than $\frac{5}{6}$c. per lb.

Mr. Ryan's remedy is to permit agreements among the producers for handling the export business, which would compel Europe to pay our terms for copper instead of our having to accept hers. He doubts if the Sherman law were ever intended to apply to the export trade or in fact does, but in order to make sure he proposes amendatory legislation specifically exempting it. We fancy that a measure of this sort will be introduced in Congress before long. The general desire to help the copper industry in its adversity may give this a chance.

Mining in the Caucasus

In previous articles we have mentioned the direct effect of the war upon the mining and metallurgical industries of Belgium and Poland. Now come reports of disturbances on another frontier, this time the Turko-Russian, where cable dispatches last week reported the wounding by the Turks of R. T. White, a well known American engineer, who is the general manager of the Caucasus Copper Co. There have been no reports of the Turkish troops having entered Russia, and from mail advices of a previous date we are disposed to think that the trouble came from Kurds, not Turks. However, that there has been interference with mining in this part of Russia is certain.

Petrograd had news as early as Nov. 23 that the Caucasus and Kedabeg companies had been obliged to close down on account of their proximity to the scene of military operations and especially because of the disorders created by Kurd brigands, who took advantage of the situation. These mines produce normally about 20% of the copper of Russia.

The war between Russia and Turkey has also about put an end to manganese mining in this region. It is likely, moreover, that the production of petroleum will be materially curtailed. All of these industries are conducted near the frontier, and besides, commerce on the Black Sea has been stopped.

The Railway Rate Decision

The Interstate Commerce Commission signalized last week by granting the application of the Eastern railways for an increase of 5% in freight rates. This will do much toward rehabilitating the railways in the eyes of investors, will enable them to float their bonds, and sooner or later will make them purchasers of material, including metals, which will increase domestic consumption. It was an absurd idea that everyone might raise rates except the railways, which had to torment themselves while the Rip Van Winkles of the Interstate Commerce Commission slept.

The increase in railway rates is, however, another revolution in the vicious circle. The employees get increases, then the railways, and next the employees will be threatening once more and after that the railways begging again, all on the ground of the increased cost of living. What the great middle class wants is something that will produce a decrease in the cost of living.

It is possible that the railways, having got their increase in freight rates, will stop raising passenger fares. Also they may continue to save money by cutting off unnecessary trains, and perhaps the legislatures of some states will permit them to dispense with the salaried passengers that some of the railways now have to carry.

Steel Balls vs. Flint Pebbles

The star of the flint pebble in certain kinds of tube-mill work seems to be about to wane, even if it be not going to set, unless we err in drawing too sweeping conclusions from reports of mill men that reach us. The tube mill was developed from the ball mill, in which the crushing media were a steel lining and a set of steel balls. The consumption of steel per ton of material crushed was always high, although both balls and lining were made of manganese steel, in some cases at least, from an early date. For this reason chiefly flint pebbles were early substituted in the tube mills of metallurgical practice, and various expedients were adopted to reduce the wear of steel on the linings.

Lately, however, some enterprising mill men have reverted to the use of balls of manganese steel or chrome steel, which may be of superior hardness to what were used in the early days of the ball mills; as to this we do not know. Anyway, it is found that with a given mill, the capacity is greatly increased by the use of steel balls, so much so in certain cases that two mills are able to do the work for which three were previously required.

In the previous paragraphs we have had reference especially to the use of the tube mills in connection with processes of mechanical concentration. In connection with hydrometallurgical processes there may be other considerations. While cost and service may be paramount in many cases, there still remain to be considered those instances where metallurgical effect must be regarded. It is possible that by adding finely ground iron to a pulp destined for cyanidation, an excessive cyanide consumption would result. Should this happen, the steel balls could not be used in cyanide plants. If they are hard enough to avert that difficulty, however, there is no apparent reason why they should not be used.

Copper Buying Halts

The little recession in the copper market this week is no cause for alarm. Since about the beginning of November there was rather steady buying during which contracts for a very large quantity of the metal were made. Business could not be expected to maintain itself on such a scale without interruption. On the other hand, the desire of some sellers to dispose of stocks, which without any doubt are large, was bound to cause some reaction whenever a lull in the demand should transpire.

We think that a little recession is good for the market, which otherwise might have led people to forget that the industry is on a 50% basis. There would be a danger then that some producers might be tempted to increase production. Nothing could be more unfortunate just now. It is gratifying to observe that the leading interests recognize this and exhibit no disposition to try any experiment. Most of the producers are better off in selling 50% of their normal output at 13c. than 100% at 11 or 10c.

Indeed, they are far better off than two months ago they had any reason to expect. As things are now copper stockholders may expect some dividend. If their metal were to be sacrificed they would not get any. The copper that is being left in the ground is not evaporating and some day will be marketed at fine profit if owners have patience.

* * *

The supplies of which Germany is most desperately in need seem to be copper, rubber and nitrate of soda, all of which are of direct military requirement, the nitrate being needed for making nitric acid, which is essential in the manufacture of explosives. German newspapers report that all of the nitrate in the Empire has been requisitioned by the Government, while an edict has lately been published prohibiting the sale of automobile tires, either new or repaired, by anybody, which will lay up all private automobiles and taxicabs in order that the military motor cars may be kept running. There is also some wonder about what Germany is doing for gasoline.

BY THE WAY

The Chamber of Mines and Oil of Los Angeles has begun the publication to a new monthly, the *Oil and Mining Bulletin,* as a means of boosting the interests of the Los Angeles region.

* * *

Our German correspondent in a letter dated Nov. 4 (which we received on Dec. 3) said: "Heretofore, it has been impossible to send any letter by post abroad, written in any other language but German. For this reason I have been unable to communicate with you since the outbreak of the war. Yesterday I learned, however, that this military order has been modified lately so that now open letters and post cards may be written in certain foreign languages. The regular time consumed by mail matter in reaching here from New York is between 21 and 24 days."

* * *

According to a dispatch from London, dated Dec. 15, the classification of copper as contraband of war is not new, but really 120 years old. The dispatch says:

> It has been discovered here that copper, which is the most disputed point in the controversy about the British interpretation of what is and what is not contraband of war, was specifically mentioned in the Anglo-American treaty of 1794. In Article XVIII of that treaty there is a list of contraband articles. Sheet copper is one of them. The copper which is now being shipped is not sheet copper, which in those days was used for shipbuilding, but is in other forms. The fact, however, that copper was then considered contraband is now regarded as bearing on the present case. England declares copper absolute contraband, although it is now being used for different purposes than was the case when the ancient treaty was made.

In 1794 the United States bought its copper from Europe. Now it is entirely the other way.

* * *

Coal Rates to Philadelphia

The Pennsylvania Public Utilities Commission has entered a decision on the application of several business associations in Philadelphia, ordering a cut of 40c. per ton in rates on anthracite coal to that city. The base rates on Schuylkill coal by the Reading road to Philadelphia have been $1.70 per ton on prepared sizes; $1.40 on pea and $1.25 on smaller sizes. The new rates will be $1.30, $1 and $1, respectively. The reductions apply also to the other roads, Lehigh being cut from $1.86 to $1.46: Wyoming from $2.10 to $1.70; and Pennsylvania R.R. coals from $1.80 to $1.40 on prepared sizes, with the usual differentials on small coal. The haul to Philadelphia being entirely within the State of Pennsylvania, these rates could not be revised by the Interstate Commission.

By way of comparison it may be noted that the rate on Lehigh coal for New York is $1.55 to Perth Amboy and $1.60 to Jersey City. To these figures it is necessary to add the barge rate across the Hudson. The companies will contest the order.

* * *

The Zinc Corporation's Plans

In an editorial not long ago we outlined an important coming change in the zinc-smelting business whereby the Zinc Corporation and other Broken Hill ore-producing companies were to unite with the American Smelting & Refining Co. in the construction of new smelting works for the treatment of the Australian ore. Representatives of the A. S. & R. Co. had gone to London to execute the contracts, when injunction proceedings were inaugurated on the ground that the contracts with certain German houses had not been abrogated as was supposed, and the negotiations were thus interrupted. Further moves are thus chronicled by the London *Financial Times,* of Dec. 8:

> In a full Court of Appeal, Dec. 7, the Lord Chief Justice, the Master of the Rolls and Lords Justices Buckley, Kennedy, Phillimore and Pickford, the appeal of the defendants against the decision of Mr. Justice Sargant, given last Friday, in a motion by the Zinc Corporation against Skipworth and others, was heard. The Zinc Corporation has a contract with Aaron Hirsch & Sohn, of Germany, by which the latter are to take the whole of the zinc concentrate output of the corporation at Broken Hill, Australia, up to 1919. The war having intervened, the directors proposed, on the assumption that the contract was abrogated, (1) to enter into a new contract with an American concern or (2) to erect a plant at a cost of over £1,000,000 to treat the concentrates themselves. One of the large shareholders of the company sought an injunction restraining the directors from acting in this way, and Mr. Justice Sargant granted the injunction, holding that the contract was not abrogated by the war.
>
> The Lord Chief Justice said the court was asked to decide this case in a friendly suit. Both the plaintiffs and the defendants wished to have the case decided, and the point as to the third party was not raised in the interlocutory proceedings. They were now faced with this difficulty, whatever decision they gave would be in the absence of one of the parties to the contract. Although it was true that Messrs. Hirsch would not technically be bound by the decision of the House of Lords, their position would have been prejudiced. It appeared to him that such an action did not lie. The court must take care in these times that it did not do an injustice to parties who were not before the court. The appeal ought, therefore, to be allowed and the order for the interlocutory injunction discharged. The other Lords Justices concurred.

The meaning of this involved legal phraseology appears to be that the directors of the Zinc Corporation are released from the injunction and are free to go ahead, but may be subject to a suit for violation of contract by Aron Hirsch & Sohn, which has not been directly a party in the hearings up to this time.

* * *

The Lehigh Valley Decision

The United States Circuit Court has decided in favor of the Lehigh Valley R.R. Co. in the suit brought against it by the Government. The court holds that the arrangements with the Lehigh Valley Coal Co. and the Lehigh Valley Coal Sales Co. do not constitute a violation of the Sherman law.

PERSONALS

B. B Thayer has returned from Butte.

C. A. H. de Saulles is back from a month's trip to England.

William H. Hampton, of the firm of Florence & Hampton left New York on Dec. 19 for Alaska.

W. DeL. Benedict has gone to California and may be absent from New York two months or more.

S. K. Dahl has just accepted the position of mill superintendent with the Messina Development Co. of the Transvaal.

C. E. Dickens has been appointed superintendent of the Eldorado copper mine in Montgomery County, N. C., in place of George F. Cant.

Albert M. Daniels, manager of the Lumsden mine, is captain of the volunteer company raised in Cobalt, Ont., for service in the British army.

Cutler B. Whitwell, mining engineer, has returned to Nevada City, Calif., having been engaged during the past three months examining the Gold Bank Mine at Forbestown.

H. H. Knox, who has examined the Ridder and other mines in Siberia, is back in London. He reports considerable interest in London in new mining enterprises in spite of the war.

Theodore Dengler, superintendent of the Wolverine and Mohawk mines in the Lake Superior copper country, was in Chicago during the week of Dec. 14, to attend the road show and convention.

Cecil H. Cropper has given up his position as mining engineer and joined Lord Kitchener's army, taking a commission in the Northumberland Fusiliers, which is composed mostly of Northumberland miners.

Ledyard Heckscher, blast furnace manager of the Alan Wood Iron & Steel Co., has been chosen president of the Eastern Pig Iron Association. W. S. Pilling, of Pilling & Crane, Philadelphia, was reëlected secretary.

Robert M. Catlin, manager of the Franklin mine of the New Jersey Zinc Co., was chairman at the afternoon session, Dec. 16, of the Safety and Sanitation Conference held in New York in connection with America's Second Exposition of Safety and Sanitation under the auspices of the American Museum of Safety.

J. H. Polhemus, who has been manager of mines for the American Zinc, Lead & Smelting Co. during the last five years, in which position he has achieved an enviable record, has resigned that position, and on Jan. 1 will become assistant general manager of mines with the New Jersey Zinc Co., making his headquarters at 55 Wall St., New York. Mr. Polhemus will succeed W. A. Pomeroy.

H. A. Guess, general manager of the Federal Lead Co. and consulting mining engineer for the American Smelting & Refining Co., was the subject of an attempt at blackmail last week by a person who gave Mr. Guess the choice between death and paying $1740. Mr. Guess reported the matter to police headquarters and the attempting blackmailer, who is supposed to be a discharged employee, was apprehended.

R. T. White, manager of the Caucasus Copper Co., of Dzansoul, Russia, which is near Batum, is reported by the newspapers to have been wounded by the Turks. According to a dispatch by telegraph from Tiflis, the Turks took possession of the property, and in addition to wounding Mr. White took two members of his staff prisoners; one of these, an American, was later released. Our mail from Petrograd, dated Nov. 23, indicates that the troubles in the Caucasus are due not to Turks, but to Kurd brigands, who are taking advantage of the situation.

OBITUARY

John M. Scrafford died at Republic, Wash., Dec. 11. He had been a miner for many years and was well known all through Washington, Oregon and Idaho

Henry K. Preston died at his home in Germantown, Philadelphia, Dec. 17, aged 51 years. His death was caused by cyanide poisoning. He had lived in Philadelphia two years, going there from Georgia, where he was interested in coal mining. In Philadelphia he was known as a mining engineer and promoter, interested in Southern coal and gold mines.

John Pym Neville, manager of the white lead department of the Selby Smelting & Lead Co., died in Oakland, Calif., Dec. 8. Death, it was believed, resulted from injuries received some time ago in an automobile accident. He was 60 years old, born in London. He came to America at the age of 21 and found his first employment with the Collier White Lead Co., in St. Louis, and later became president of the company. He resigned that position about nine years ago and took a position with the National Lead Co.; he was then engaged to construct and install the white-lead plant for the Selby, and he became manager of the operating department after the works were completed.

Hon. Robert Jaffray, of Toronto, Ont., a financier connected with many industrial undertakings and a member of the Canadian Senate, died on Dec. 16 in his 83d year. He was born in Scotland and went to Toronto when quite young. He was for many years engaged in the grocery trade, but gave up that business in 1883 to devote his attention to financial affairs in which he achieved great success He became prominently identified with many industrial and commercial enterprices. Mr. Jaffray at the time of his death was a director of the Nova Scotia Steel & Coal Co., the Canadian General Electric Co., the Canada Foundry and several others. He was also president of the Globe Printing Co. and the Imperial Bank. He took an active part in the organization of the Crows Nest Pass Coal Co., of British Columbia, in 1897, and was vice-president of the company until a few years since. He was appointed a member of the Canadian Senate in 1906. Two sons and two daughters survive him.

SOCIETIES

Engineering Society of Queen's University—The annual dinner was held at Kingston, Ont., Dec. 15, at which G. G. S. Lindsey, president of the Canadian Mining Institute, delivered an address on "The Business Ethics of the Engineer." Other speakers were Dean Adams, of McGill University, J. W. L. Forster, of Toronto, and Dr. Willet G. Miller. Prof. Wm. Nicol, head of the Mineralogy department, was presented by his former students from all parts of the continent with an oil portrait of himself.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ROASTING—Metallurgical Furnace. Utley Wedge, Ardmore, Penn. (U. S. No. 1,115,263; Oct. 27, 1914; and 1,119,483; Dec. 1, 1914.)

ROASTING-FURNACE SHAFT. Harry H. Stout, New York, N. Y., assignor to General Chemical Co., New York. N. Y. (U. S. No. 1,119,325; Dec. 1, 1914.)

SCREEN or Separator. Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. No. 1,116,512; Nov. 10, 1914.)

SEPARATION—A New or Improved Method of and Means for Separating Metalliferous Materials or Metals from Their Ores or Other Matter Carrying the Same. J. D. Wolf, London, Eng. (Brit. No. 18,351 of 1913.)

SINTERING—Mechanism for Oxidizing, Reducing, or Otherwise Treating Ores and Other Materials. Felix von Schlippenbach, Stolberg, Binsfeldhammer, Germany, assignor, by mesne assignments, to Dwight & Lloyd Sintering Co., Inc., New York, N. Y. (U. S. No. 1,119,459; Dec. 1, 1914.)

SIZING—Process of and Apparatus for Sizing Comminuted Material. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Tex. (U. S. No. 1,119,662; Dec. 1, 1914.)

SLAG—Apparatus for Granulating Molten Slag. Robert Donaldson, Cleveland, Ohio. (U. S. No. 1,117,644; Nov. 17, 1914.)

SLAG CEMENT—Method of Producing Cement from Molten Blast-Furnace Slag. Wilhelm Lessing, Menzenberg, near Honnef, Germany, assignor to Mittelrheinische Cement-Industrie G. M. B. H., Cologne, Germany. (U. S. No. 1,115,321; Oct. 27, 1914.)

SLIME SEPARATOR. Charles Allen, El Paso, Tex. (U. S. No. 1,118,614; Nov. 24, 1914.)

SLUICE BOX. Henry Wilber Fry, Denny, Calif. (U. S. No. 1,117,828; Nov. 17, 1914.)

SMELTER GASES—Bag-Cleaning Apparatus. Willard E. Playter, Collinsville, Ill. (U. S. No. 1,118,044; Nov. 24, 1914.)

SMELTING—Process of Generating Heat in Fusion Furnaces. Bradley Stoughton, New York, N. Y. (U. S. No. 1,117,274; Nov. 17, 1914.)

SMOKE AND FUME FILTER. Ernest H. Gagnon, Billings, Mont. (U. S. No. 1,116,053; Nov. 3, 1914.)

STAMP MILL—Ore Stamp Mill. Peter N. Nissen, Los Angeles, Calif. (U. S. No. 1,119,308; Dec. 1, 1914.)

TIN—Improvements in the Treatment of Tin Ores and Slags Containing Tin. Billiton Maatschappij, Hague, Holland. (Brit. No. 18,422 of 1913.)

Editorial Correspondence

SAN FRANCISCO—Dec. 16

The International Hotel in Virginia City, Nev., was burned to the ground Dec. 12. This marks the end of one of the most famous hotels connected with the mining industry. The International was a massive brick structure, completed in 1876, to replace an old wooden building of the same name burned in 1875. It was six stories high and had 160 rooms. The furnishings were the most elaborate and costly obtainable at the time. The hotel was associated with all the stirring events and the great mining men that made the Comstock famous. Its fortunes followed those of the mines and of late days its deserted and funereal aspect gave slight indication of its exciting past.

The Potash Deposits of Searles Lake, it is reported, will again be the cause for an attack upon the American Trona Co. The leader of the men who claim these deposits is Henry Lee, of San Francisco. It is stated that he has already started for Searles Lake with men for the purpose of doing the annual assessment work before Jan. 1. The American Trona Co. is reported to have the land well guarded. A year ago similar effort was made and it was reported that a battle with guns had taken place on the desert between Randsburg and Trona. It is likely that the daily newspapers will again take advantage of the opportunity to publish sensational stories, all of which in a way is an advertisement of the existence of potash in California, although it is not a desirable mode of advertising.

The Alta Silver Mining Co. has removed its head office to the headquarters of the Yellow Jacket, Belcher and Crown, in the Mills Building, San Francisco. Thus the four corporations controlled by the Sturges interests in the Gold Hill section of the Comstock have been brought together. The change was effected at the annual meeting of the Alta stockholders, Dec. 10; 68,829 shares out of 82,183 shares of outstanding stock were represented; 25,817 shares are in the treasury of the company. The retiring officers and directors were reëlected as follows: George S. Sturges, Edward B. Sturges, Edward S. Spring, William Bannan and J. B. Shaw. George S. Sturges will continue to act as agent for the company in Nevada. Immediately following the reëlection, William Bannan and J. B. Shaw tendered their resignations as directors and R. B. Worthington and Charles H. Sooy were elected to fill the vacancies. J. B. Shaw resigned as secretary and Edward S. Spring was elected to that position. The changes made in both the office headquarters and in the official board indicate that interesting work is in contemplation in the Alta property. The shaft and machinery and other equipment are in good condition and ready for almost immediate resumption of operations down to the 1050-ft. level. Since Feb. 1, 1912, a total of only 8c. per share assessments has been levied. In that period repairs have been kept up and connection has been made with the south lateral branch of the Sutro tunnel, and after all expenses have been paid there is a balance of $1700 in the treasury.

A Preliminary Injunction against the Butte Creek Consolidated Gold Dredging Co., operating on Butte Creek, has been granted by the superior court at Chico. The application was made by the trustees of Stanford University. The applicants contend that property owned by the university, situated down stream, will be damaged by tailings carried down stream and deposited on the land. The company affirms that the dredge is being moved and is not operating within 50 ft. of the present channel of the stream. The injunction applies not only to the present channel but to the flood channel, and all dredging operation is ordered stopped until a hearing is had on the application for permanent injunction. A bond of $3000 was required of the university trustees to idemnify the dredging company. Dredging has been carried on along Butte Creek, east of Chico, for several years. The Butte Creek Consolidated was the first company to operate there and was followed by John Ross Wade, and within the present year by Guggenheim interests, making three dredges in all that have operated in this district. The Butte Creek Consolidated in its early operations installed and operated a bucket-elevator dredge of 11-cu.ft. capacity, and equipped with tail sluices which distributed the tailings in such manner as to leave the ground in approximately the same condition, if not better condition, than before the gravel was turned over. When John Ross Wade began operations about three years ago he operated with a 4-cu.ft. bucket-elevator dredge equipped with a belt conveyor and stacked the tailings along the creek banks in such manner as to serve as retaining walls to prevent overflow of the creek upon the adjacent agricultural lands. About two years ago the Butte Creek Consolidated remodeled its dredge, installed a new bucket line of smaller capacity and equipped the dredge with a conveyer belt stacker. It should be possible to dredge any ground along this creek and prevent the tailings from doing damage to adjacent or nearby agricultural lands.

This subject of depositing sand and gravel on the agricultural lands in the vicinity of dredges, stamp mills and hydraulic mines has long been a bone of contention between the miners and the farmers. The hydraulic mines have been regulated by coöperation of the state with the Federal Government. The hydraulic miners complained a good deal in the early period of the enforcement of the rules of the Government commission; but now they are endeavoring to conduct hydraulic operations by such methods as will provide for taking care of the tailings without damage to agriculturists. In the last session of the state legislature a strong effort was made to interfere with dredge operations in the state because it was claimed by the proponents of the measure that valuable agricultural land was being destroyed by the dredges. That bill was not allowed passage but the disposition is still prevalent to interfere with dredging by an act in the next legislature. This is a matter that should be taken under consideration by the California Metal Producers' Association. The interests of the dredge operators could be protected by a concerted action of this representative body of mine owners and managers and representatives in the legislature interested in the mining industry. There is no doubt that in some instances the agricultural lands have been damaged by the operation of dredges just as they have been damaged by the operation of stamp mills and formerly by the hydraulic mines. But there is no good reason why the whole matter should not be satisfactorily arranged and proper legal provision made for protection of the dredging companies as well as for the protection of the farmers. The trouble in the past has resulted from the lack of concerted action on the part of the mining men, but that can no longer be an excuse since the producers of metal have organized into one of the solidest associations in the state.

BUTTE—Dec. 17

Of Anaconda's Plans for future activity renewed announcements are made. John D. Ryan and B. B. Thayer state that improvements costing from $6,000,000 to $7,000,000 will be carried out at Great Falls and Anaconda in the near future. Decision was reached after a conference with the heads of departments with whom they have been consulting since their arrival in the state recently. At the Great Falls plant an electrolytic refinery with a capacity of 10,000,000 lb. per month, together with a complete new furnace refinery will be installed. All concentrating of ore will be done at Anaconda, and concentrates sufficient for the operations of Great Falls will be shipped there for smelting. At Anaconda the changes decided upon will enable the company to mine at a profit ore of a lower grade than is possible under present methods, thereby increasing the available tonnage and extending the life of the mines. In this program of reconstruction at the reduction works, the company will take care of some of the employees who were thrown out of work at the time of curtailment.

Labor Unions—In a petition addressed by Butte Miners' Union No. 1 to all other locals of the Western Federation, scathing charges are made against Charles H. Moyer, John C. Lowney and Guy E. Miller, heads of the Federation; the locals are asked to demand the removal from office of these officials. It is stated that in its 36 years of existence, the local union expended over $2,000,000 on behalf of its members, aided every struggling union in the country and answered every appeal for assistance; that between Jan. 1 and June 13, 1914, the union transmitted to the officers of the W. F. of M. more than $160,000 for the Michigan strike funds; that the irregularities in handling these funds caused general dissatisfaction among the Butte miners, leading up to the riots, the destruction of the union hall and the formation of an independent union; that upon return of normal conditions, Moyer sent Lowney and Miller to Butte for the sole purpose of further disrupting the organization of the petitioners and confiscating funds and other property; that Moyer, Lowney and Miller are so thoroughly hated and despised by all persons and especially by the Butte miners, that the petitioners feel that it will be impossible ever to build up the organization so long as the men named are directing the affairs of the Federation; that by their conduct Moyer, Lowney and Miller are traitors and are a curse to organized labor. Miller replied in a letter denouncing the charges as false and making countercharges against the officers of the Butte local. According to statements made at union headquarters, local officers are still in possession of the union's property and are resolved to keep it in spite of the attempts of Miller to wrest it from the union. An organization was to be formed Dec. 19, consisting of one delegate from each union represented in the Silver Bow Trades & Labor Council, to inquire into the factional troubles of the miners of the Butte district, and to consider ways to heal the breach. William Winchester, one of the men arrested for kidnapping and deporting Richard O'Brien, a miner, during the labor disturbances last June, was tried, convicted and sentenced to two years' hard labor in the state penitentiary. There are a number of other men still in jail awaiting trial for the same offense.

SALT LAKE CITY—Dec. 17

The State Land Board through the attorney general, A. R. Barnes, has protested to the Department of the Interior against the taking over of school lands in Utah by the Government on the ground that they contain coal deposits. Utah acquired title to the lands under the enabling act. It contends that should the lands be reserved on account of possible mineral deposits, metalliferous deposits only should be considered, and not coal deposits. The question as to whether the department has jurisdiction in passing upon the character of school lands and reserving any such because of mineral deposits was argued recently before the First Assistant Secretary of the Interior, the Commissioner of the General Land Office, and a special board of three members, in Washington. Under section 6 of the enabling act state school lands granted by the Government in Utah comprise sections 2, 16, 32 and 36 in each township. It is argued that the title to the land reverted to the state and that the department, therefore, has no right or jurisdiction over them, and cannot withdraw them. Utah further contends that if there is any question as to the right of the state to such lands, it should properly be determined by the Federal courts and not by the department. Efforts will be made to bring the case before the United States Supreme Court as soon as possible. New Mexico will take similar action. The idea is to have a test case to determine the following points: "Are mineral lands in the school grants reserved by the Federal Government, and if they are, does the term 'mineral lands' include lands containing coal deposits"?

SEATTLE—Dec. 16

The Ore Wharf burned at Skagway, Alaska, Dec. 12. The Moore wharf with all its warehouse buildings, ore bunkers and chutes was completely destroyed and the loss is estimated at $210,000, of which $150,000 was represented by ore and the contents of the warehouse. The wharf handled all the shipping at Skagway, including freight destined for the interior over the White Pass road and the Yukon River.

WALLACE—Dec. 17

The Montana Power Co. has 75 men at work on the construction of electric transmission lines from its new power plant at Thompson Falls, Mont., to Burke and Mullan. It is reported that contracts have been made by this company to supply power to the Hercules, Tamarack-Custer and Federal mining companies. The entrance of this company into the Coeur d'Alene district in competition with the Washington Water Power Co., which now supplies all of the electric power used, will cause a reduction of rates. At the expiration of existing contracts other mines will be supplied with power by the Montana company.

ORACLE, ARIZ.—Dec. 10

In the Mammoth district there are at present no properties operating. The Calumet & Copper Creek suspended operations last summer on account of a shortage of capital. Efforts are being made to reorganize and secure additional funds. The Calumet & Arizona did several thousand feet of drilling during the year on the company's holdings in the Copper Creek region in an attempt to develop the orebodies further, but no results have been given out. The E. J. Longyear Co. did this drilling. At Schultz, Young Bros., of Clinton, Iowa, have been developing the old Mammoth mine, but suspended operations in September awaiting more favorable financial conditions. Not enough has been done to prove the merits of the property. Robert Boykin and associates have taken a lease on the tailings produced by former operations on this property by the old English company and are shipping a small amount of wulfenite.

JEROME, ARIZ.—Dec. 16

The Jerome District is feeling the effect of the recent strike in the United Verde Extension. During the year the Edith shaft of the Extension was completed to the 1200-ft. level, and crosscutting was started toward the bottom of the old Fisher winze. This winze had been sunk from the 800-ft. level of the old Daisy shaft. Before the crosscut reached the winze, and in fact while several hundred feet from it, it encountered and passed through a 20-ft. formation consisting of mixed oxides, iron-stained slate carrying native copper and some sulphides. A drift to the east along this deposit opened up several feet of sulphide ore in place, some of it chalcopyrite and some chalcocite. This orebody was proved continuous on the 1200-ft. level for several hundred feet and was also found at one point on the 800-ft. level. The crosscut was continued through this ore toward the winze, but before reaching it another body of ore was encountered carrying a commercial content of gold, silver and copper. When this ore was proved on the 1200-ft. level the company sank the main Edith shaft again to the 1400-ft. level and began crosscutting towards the same orebody below. New pumps are now being installed and preparations are under way for a large amount of development work.

The United Verde's new smelting plant at Clarkdale should be ready to blow in about the first of the year. It will take care of about 2000 tons of United Verde ore, and about 1500 tons of custom ore. It is expected to be of considerable help in developing smaller mines in the district, inasmuch as it will make a market for siliceous ores heretofore hard to dispose of.

Among Other Properties, the Pittsburgh Jerome continues development with a small force and the Calumet & Jerome recently cut some low-grade copper, which has proved an encouragement for further development. The Copper Chief continues to operate under the same management, although rumors of a sale are frequent; it employs about 5 to 7 men; developments below the 300-ft. level recently discovered a body of enriched sulphides which ought to put the mine on a producing basis. It is only 10 miles by wagon road from the new Clarkdale smelting plant, so that haulage will not be prohibitive as in the past. The Arkansas & Arizona continued its main shaft to the 1650-ft. level this year, but after a little drifting on that level closed down. The Haines Copper Co. reached the 1200-ft. level early in 1914, cut a small station and a short drift and started diamond drilling. Two horizontal holes and one vertical, ranging in depth from 200 to 300 ft., all encountered excessive flows of water under high head; the company deemed it best to abandon the holes and was afterwards forced to pull the pumps and close down the property.

HOUGHTON—Dec. 19

Fairness in Taxation in the Michigan copper district was brought out during a hearing conducted by the state tax commission in Houghton County. It is well known that the mines pay the great proportion of the taxes of this county. In Calumet, for instance, the Calumet & Hecla company pays actually seven-eighths of the total state, county and township tax. In other townships where mines exist personal property escapes with a comparatively small assessment and property other than mining is not heavily assessed. Fixing valuation is a difficult thing because mining values are unstable and all other property values are directly or indirectly dependent upon mining prosperity or the lack of it. Following a thorough investigation of the methods and of the valuations fixed, the state commission expressed the opinion that the mining companies were if anything paying more than their share and that mining superintendents who acted as supervisors in their townships had shown a commendable inclination to see that their properties stood a just proportion of the cost of the maintenance of the government. This fine tribute to the spirit of community interest which actuates mining men is especially important because it came from a disinterested outside body of taxation experts.

Unemployed Workingmen in the Copper Country are not so numerous as in other sections of the country so far as reports indicate. While general industrial conditions are no better than elsewhere, the energy shown by people generally in looking out for the needy, and the well organized efforts that have been made to secure employment for the men let out when curtailment became necessary, have combined to limit the number of cases of actual want to a smaller total than was feared at first. Those seeking to provide ways and means to care for the unemployed are surprised to find that the strike had one unfortunate result in that it made drones of a considerable number of men who formerly were good workers. These men lived on strike benefits for a long period; they loafed until they became accustomed to it. Their limited intellectual capacity figured out that the necessary food and clothing came to them and their families from some source or other and when the strike was over they were content to sit by and let the public look after them and their families. The Associated Charities has found a surprisingly large number of cases where the men of this class refuse work when it is secured for them. These are the same men who were told of the speeches by Secretary Wilson and of his reports advocating government ownership, and who spent their time figuring out which superintendent's job they would accept when the Government took over the mines. Local charity organizations have no objection to looking after their families but would do it with better grace if the men showed some desire to work.

ISHPEMING—Dec. 19

The Michigan Equal Tax Association is the name of an organization which had its birth at Marquette, Dec. 15. The organizers are business men of Upper Michigan whose object is to fight attempts to impose a tonnage-tax. Representatives were in attendance from 12 of the 15 counties of the Peninsula and there was not a man present directly connected with the mining industry. The officers are Thomas Conlin, Crystal Falls, president; W. E. Smith, Mohawk, vice-president; L. T. Sterling, Iron Mountain, secretary-treasurer. The following will act as directors: F. H. Vanderboom, Marquette; Homer A. Guck, Houghton; R. A. Douglas, Ironwood; August Wallin, Ontonagon; J. O. Maxey, L'Anse; W. H. Reade, Escanaba and Chase S. Osborn, Sault Ste. Marie. The press committee, which has been instructed to prepare literature that will let the people of the state know what hardships will be caused if additional taxes are placed against the mining operators, is made up of Geo. A. Newett, Ishpeming; Frank J. Russell, Marquette; Robert Douglas, Ironwood; Tom A. Hanna, Iron Mountain, and Homer Guck, Houghton.

VANCOUVER—Dec. 9

Tonopah-Belmont interests have organized the Belmont Canadian Mines, Ltd., for the purpose of carrying on mining and exploration in British Columbia. The directors are Clyde A. Heller, president; K. Kitto, secretary-treasurer; C. S. Verrill, mining engineer, resident director in Vancouver. Some account of the Surf Inlet property of Tonopah-Belmont was given in the "Journal" of Nov. 14. Operations there are in charge of F. W. Holler, mining engineer, one of the permanent Tonopah-Belmont staff. It is reported that the company expects to spend about $150,000 on development before July 1, 1915, when the option expires. If the bond is then taken up the company is to proceed at once with the construction of a plant capable of treating 500 tons of ore a day. With the installation of hydro-electric power for operating the plant, together with cost of mill and development, a sum of nearly $1,000,000 will be involved. The company acquired its option on the property in April, 1914. Work has been caried on with a force of about 50 men. A wagon road has been constructed into the mine, a power plant for development has been installed consisting of two 50-hp. boilers and 10-hp. compressor plant, with a complete set of buildings consisting of bunk houses, cook house, office and several cottages, with a capacity for 60 men. About July 1 the company began operating machine drills, since which time about 1000 ft. of tunnel and drifting has been accomplished. Up to the time of giving the option, the property had been developed by the Surf Inlet Gold Mining Co., owned and controlled by Vancouver business men under the management of Fred M. Wells. Several hundred feet of tunnels and crosscuts were driven, resulting in proving an orebody to a depth of over 500 ft. The ore on the property is a gold quartz containing iron sulphides, assays about $8 a ton, and is readily treated by cyanide. It is estimated that over 200,000 tons of ore is already developed. The nature of the ground is such that the orebody can be opened by tunnels to a great depth. The tunnel, which will be about 2000 ft. in length and will tap the orebody 400 ft. below the present 500-ft. level, is now advanced about 700 feet.

TORONTO—Dec. 19

McKinley-Darragh's decision to allow its option on the Jupiter propery in Porcupine to lapse, has occasioned a good deal of surprise. McKinley-Darragh took the option last spring and agreed to spend $30,000 in development before October; then if the company was satisfied with the property it was to pay off the outstanding bonds and provide $40,000 additional for working capital and for this it was to receive 51% of the stock. When the time came to take up the bonds McKinley-Darragh asked for an extension to permit further development at greater depth. This was granted and the time was extended till Dec. 17. All reports from the property were favorable, and it was fully expected that the option would be exercised. It is understood that P. A. Robbins, of the Hollinger, formerly manager of McKinley-Darragh, who examined the property for that company, advised that the option be exercised, while R. B. Watson, consulting engineer for the purchasers, was averse to taking up the property under the terms of the option. An alternative proposal was made to the Jupiter directors, but was not acceptable. Other people have since made an offer for the property along the same lines as the McKinley-Darragh option, but no decision has as yet been reached.

NOGALES—Dec. 8

In Sonora there have been relatively few shutdowns on account of the war. The Cerro de Plata mine, operated by Holt Bros., 40 miles south of Nogales, has in operation a 30-ton cyanide plant and is preparing to enlarge it to an all-sliming plant of 60 tons capacity. The mine has blocked out a good body of milling ore, and, during the last three years, produced about 600,000 oz. of silver. Minas Prietas, the largest mine now operating in Sonora, has been steadily turning out gold and silver bullion this year. The old gold-silver mining camp at El Plomo, once a good producer, has been bonded to Harold Whealton, who has in operation an amalgamating and concentrating mill and has been making good during the year. The property lies about 40 miles north of Altar. At La Valedora, D. A. Moreno, of Santa Ana, is cyaniding some old dumps and has made several shipments of silver-gold precipitates. W. C. Laughlin has been operating the San Xavier gold and silver mines in the Yaqui River country. He made regular shipments until about the middle of September, when revolutionary conditions forced him to shut down. Howard Squires took an option on the Candelaria, which belongs to Mr. Geck. He has developed a good tonnage of high-grade milling ore and is now installing a test mill preparatory to making more extensive developments. This property lies about 40 miles south of Caborca. Holt Bros. & Glover shipped some rich gold ore from their prospects about 55 miles southeast of Magdalena. Further development work is planned. John Henderson has been making regular shipments of copper ore from his Caborca mine, although he has a long freight haul to Santa Ana and is handicapped in other ways. In the Altar placer field, Doctor Roberts, John Doan, Reagan Bros., Cal Wright, Ira Bowles, Ben Brey, and others, are operating mines in placer ground in the neighborhood of Boludo and Cienega. There have been installed by them, during the past year, several Quenner machines. Although it is difficult to get in and out of this district, operations are in general successful, and there has been no molestation by Yaquis or revolutionists.

MEXICO CITY—Dec. 10

Mining in this part of the republic is suffering seriously from the effects of the revolution. Pachuca properties are running only three days a week, due to shortage of supplies. El Oro and the Hostotipaquillo district of Jalisco have been cut off from rail communications for three weeks. Guanajuato mines are running in only a half-hearted way in order to make their supply of cyanide and dynamite last as long as possible. More than one company have carload lots of the precious cyanide tied up somewhere between Vera Cruz and Mexico City with no hope of getting it for months. The dynamite factory near Torreon has started work again and is supplying the demand from its own or imported makes as fast as rail communications permit shipment. Optimism exists as to the outcome of the political trouble. Undoubtedly, social, political and economic reforms have been needed and needed badly, and a great many believe that Villa and Zapata will be strong enough and patriotic enough to put their combined platform into effect.

CERRO DE PASCO—Nov. 12

In Cerro there are only two mines operating, to wit, the Cerro de Pasco and La Docena. There are a number of prospects but all are closed, and there are also small rich mines worked without machinery, owned by that peculiar class of individuals who prefer to mine just enough ore to pay them $150 a month, and who see no use in employing machinery. The ore is transported on backs of Indians instead of using hoists, and similar primitive methods are used. Those familiar with Mexico will recall the existence of this class of unenterprising mine owners—natives, of course

The Mining News

JACOB B. ROSS, of Denver, was sued by Samuel Watson, of New York, who charged misrepresentation in the sale of the Esmeralda mine. In the "Journal" of Dec. 5, 1914, it was reported that damages had been awarded Watson in the Federal Court in Denver. This was incorrect. Watson failed to make a case and the jury, which was out only a few minutes, decided in favor of Ross. The decision was erroneously reported by a Denver daily paper and the "Journal" repeated the error, which it regrets.

ALASKA

POORMAN DISTRICT output for season past placed at $125,000. District responding to development in most satisfactory manner; pay streaks being extended.

ROSE CLAIM (Valdez)—From 2200 lb. of ore, $475 taken. Claim on Mineral Creek near Crawford stamp mill. Dr. C. A. Minans and H. L. Jaynes, owners, well satisfied with returns; ore was secured from outcrops; they will open property in spring.

ARIZONA

Gila County

NEW KEYSTONE (Miami)—Stockholders' meeting called for Jan. 6, at 61 Broadway, N. Y., to take action in regard to sale to Inspiration Consolidated of all assets but cash. Sale recommended by J. Parke Channing, vice-president; basis nine shares of Keystone for one of Inspiration.

CALIFORNIA

San Bernardino County

GOLD BRONZE (Barnwell)—Messrs. Porter and Lower, of Los Angeles, have lease on this mine and St. George. Are at present treating Gold Bronze tailings in 50-ton cyanide plant, using L. C. Trent machinery.

FURSMAN VS. PACK—U. S. District Court issued temporary injunction enjoining defendants from asserting any claim or title to property embracing 175 placer claims in what is known as the Searles Lake Borax entry. Temporary injunction will hold until case is heard on its merits. Three other suits involving placer-mining claims in Searles Lake region filed Dec. 12, complainant being Cecil C. Carter, defendant Thomas W. Pack and others. These three suits involve total of 221 claims.

Shasta County

BINDER VS. STOWELL (Redding)—Suit for $500,000 in U. S. district court in San Francisco involving dredging operation of what was kown as "Huron Submarine" mine. Dredge constructed and equipped with Du Bois suction pump. Variously reported that it made money and that it made nothing. Etta Stowell, of Sacramento, is administratrix of Du Bois estate. Binder is son of one of stockholders in enterprise.

Siskiyou County

HEAVY SNOW in all Salmon Mountain region promises plenty of water for mining in western side of county. Hydraulic miners and mill men confident coming season will be a good one for gravel and quartz mining.

Trinity County

LA GRANGE (Weaverville)—Reported number of men reduced and general retrenchment begun. Probably only temporary, pending improvements being made.

IDAHO

TERRIBLE-EDITH (Murray)—Raise started from No. 5 tunnel level to No. 4.

NABOB (Kellogg)—Discovery reported of lead ore 5 ft. in width, 2½ ft. averaging about 50% lead.

NEW INDEPENDENCE (Wallace)—New company organized, has bought property of Independence Mining Co., adjoining Morning mine of the Federal.

HERCULES (Burke)—Haulage capacity of mine increased 50% by installation of new equipment, including two eight-ton General Electric motors. Required temporary shutdown to widen gage to 30 in. in No. 5 tunnel level.

FEDERAL (Wallace)—New features of Frisco mill open for trial run are Callow flotation plant and magnetic separation of zinc from lead concentrate after roasting. Callow flotation plants have also been installed at Morning and Green Hill-Cleveland mills.

MARSH (Burke)—Three-compartment winze now down to 800 level. New station cut with bin capacity of 1000 tons; 300-hp. Nordberg electric hoist being installed to raise 2½ tons at 800 ft. per min. from depth of 2700 ft. maximum. Preparing to sink 275 ft. deeper. Operations to be confined to development until lead price improves.

MICHIGAN

Copper

WHITE PINE (Ontonagon)—Heating plant for stamp mill completed; crushing plant practically so.

CALUMET & HECLA (Calumet)—Understood to have made substantial sales of metal in Germany; copper shipped there before war opened.

NAUMKEAG (Houghton)—Explorations continue to develop occasional evidences of commercial copper. Treasury well able to continue explorations, having $200,000 balance on hand.

VICTORIA (Victoria)—Opened 250 ft. rich ground on 24th level, averaging 40 ft. wide, often 70 ft. Sinking to 28th level under way and lateral openings on 27th under way in fair ground, not up to 24th, however.

KEWEENAW (Calumet)—Management pleased with continuation of good showing in lode in shaft. Sinking continues to 1000 ft. Shaft now below 6th level (900 ft.). Stockpile accumulating better than average commercial rock, including much barrel.

PORCUPINE (Rockland)—Exploration on S. L. Smith property, ten miles south of White Pine, subsidiary of Calumet & Hecla, continues to show good results. Shaft opening Nonesuch formation, same as White Pine has about ready to mill. Commercial copper opening fairly well.

NEW ARCADIAN (Houghton)—Stamp-mill shipments of 2000 tons of mass, barrel and stamp rock accumulated on stockpile to be made within month. Railroad switch to main line completed. Unknown formation opened at 900, 250, 600 and 750 levels shows promising commercial rock. Stoping limited to date. Promising prospect.

QUINCY (Hancock)—Maintenance of dividend record of 54 years without missing did not necessitate cutting into treasury surplus. Mine maintaining regular rock shipments today on two-thirds former working force. Openings ahead keep pace with stopes underground. No. 2 now down to 73d level, No. 6 to 71st and No. 8 to 59th. Sinking continues in all three. Recurrence of mass copper and good mineralization in Allouez conglomerate cut in crosscut from 59th level north of No. 6, two most important physical developments. Latter particularly important in connection with work at Franklin (old Boston) mine, next adjoining on north. Shaft bottoms all better than average.

Iron

CAMBRIA (Negaunee)—About 900 tons of ore being shipped per week to furnaces of Algoma Steel Co., Sault Ste. Marie, Ont.

REPUBLIC (Republic)—Mine shipping 2000 tons per week to Newberry furnace of Lake Superior Iron & Chemical Co. This only charcoal furnace in district in operation but plant at Ashland due to start up shortly.

BALKAN (Alpha)—Shaft sunk to new level to permit installing 150-ton storage bin. Bin will be one of largest in Lake Superior district. Only two mines having larger ones are on Marquette range. Much of ore will be milled; thought better results can be obtained by having large bin, to cause no delay in hoisting.

NEWPORT (Ironwood)—Plans now well under way for new shaft which Newport Mining Co. will sink near present shaft. Latter badly in need of repair; thought advisable to have new outlet and repair old one when new one is ready. New shaft will be as large as old one, now largest in district. Sinking will be started at surface, and raising begun at several levels in mine. Shaft now being used is over 2200 ft. deep, has five compartments and has handled over a million tons of ore in single year. At present only 350 men at work underground; normal force over 1000.

MINNESOTA

Mesabi Range

GRANT (Buhl)—Closed down to permit repairs; will open again middle of January when 60 men will be given employment.

HUDSON (Aurora)—Sinking of new shaft started from bottom of pit. Mine worked as openpit for several years, but considerable ore at depth can be mined only by underground methods.

HIGGINS (Virginia)—Check drilling started at Higgins No. 2 by Oliver company. Further development work to be undertaken. Part of mine worked as openpit and it will soon be determined whether it will pay to sink shaft to get ores at depth.

MISSOURI-KANSAS-OKLAHOMA

PORTIA MINING CO. (Galena, Kan.)—Company recently struck one of best mines brought in for some time, on 32-acre tract south of Galena. First turn-in, two cars zinc ore sold at top price paid in district. A 250-ton mill installed with modern equipment; 25 men employed; more will be given employment as soon as mine is opened up. S. R. Ping superintendent.

MONTANA

Silver Bow County

BUTTE & SUPERIOR (Butte)—After two-months' shutdown, company resumed operations Dec. 15, at Black Rock property, starting with 500 miners, force to be increased in few days to 1200 by addition of surface and mill men.

BUTTE-ALEX SCOTT (Butte)—Manager C. J. Stone left for Duluth, Dec. 11, to consult with officials of company in regard to resuming work. Understood many directors favor resumption at once, since present price of copper will permit mining at profit. Development work below 2000-ft. level showed some promising bodies of ore running better than that from higher levels. Starting of operations will mean adding between 100 and 200 men to payroll at beginning of new year.

BUTTE-DULUTH (Butte)—Capt. A. B. Wolvin, principal owner, announces option given to Anaconda Copper Mining Co. During period covered by option, Anaconda will make thorough examination of property and plant, on results of which will depend whether or not option is exercised. Force of men will be put to work at once with diamond drills to prospect at depth. Company owns about 80 acres of mineral ground in southeastern part of Butte district which contains large tonnage of ore running about 2% copper, extracted by leaching and electrolytic precipitation. Present plant has capacity of 1000 tons per day.

NEVADA

Esmeralda County

GREAT BEND (Goldfield)—Operations will be started soon and capacity of mill increased. Large tonnage of milling-grade ore developed.

ATLANTA (Goldfield)—Three-foot sulphide ore, assaying $40 to $60, opened on 1750-ft. level. Ore carries gold chiefly, some silver and 10% copper. Deepest oreshoot opened in southern Nevada.

MILLTOWN MINING CO. (Goldfield)—Reported George Wingfield sold control to Tonopah and Reno men. Property three patented claims adjoining Golconda claim of Goldfield Consolidated on south.

Humboldt County

NEVADA SHORT LINE completed as far as new Rochester Mines Co. mill in Rochester Cañon and will be extended to upper Rochester. Shay locomotive added to equipment. Expected new mill will be ready to operate in January.

Mineral County

LUCKY BOY CONSOLIDATED (Hawthorne)—Crosscut tunnel now in 5100 ft. First vein cut at 4000 ft.; drifting under way on this and several oreshoots opened. Much water encountered; will be used in milling. Tunnel will be driven 600 ft. further to point under Hubbard shaft.

Nye County

RESCUE-EULA (Tonopah)—Shaft will be sunk 200 ft. deeper.

TONOPAH-BELMONT (Tonopah)—New oreshoot struck in raise from 1000-ft. level.

TONOPAH EXTENSION (Tonopah)—Mill additions and improvements completed; 40 stamps now crushing 250 tons per day. Stated good-grade oreshoot, 7 ft. wide, opened in development work

MANHATTAN CONSOLIDATED (Manhattan) — Repairs needed in Associated mill due to sudden and severe freeze-up all completed; heating system installed, consisting of three big stoves, and mill once more running steadily.

BIG PINE (Manhattan)—New mill about ready to start. Classifier almost installed. At mine, installation of waste-rock stacker will serve to cut down costs. Mushett & Wittenberg operations are going to compete soon with Round Mountain mill and mine costs. When running to capacity, claimed profit will be made on ore averaging not over $1 per ton. Within month new mill will be crushing ore at rate of 200 tons per day.

WHITE CAPS (Manhattan)—Company will soon be in entire charge of Manhattan Milling & Ore Co. 10-stamp mill, sampler and cyanide plant. Mushett & Wittenberg, owners of mill, are vacating it fast as possible, as their tube mill is now ready to turn over on Big Pine. When mill runs entirely on White Caps ores, daily tonnage of over 60 will be handled, with milling cost not over $2.25 per ton, including overhead. Mine now producing ore at total cost of $1.35 per ton; hauling charges 90c.; mill showing average extraction under supervision of Pat Quinn of 90%. This indicates substantial profit on ore in quantity averaging only $6 per ton. Of this grade of ore, there is probably 6000 tons still in upper levels of mine, oxidized material, not considered an asset heretofore, being low-grade.

Ormsby County

ARTICLES OF INCORPORATION of three Goldfield companies filed at office of secretary of state, viz., Goldfield Spearhead Mining & Leasing Co., Goldfield Columbia Co. and Booth Extension Mining Co., each with capitalization of $1,000,000, shares $1 par.

Storey County

COMSTOCK PUMPING ASSOCIATION (Virginia City)—Examination of conditions on deep levels of northern mines made by William E. Sharon, Thomas F. McCormick and Whitman Symmes and report submitted favoring lowering of water from 2500- to 2700-ft. level. Recommended pumps be installed in joint Mexican-Ophir winze. Necessary pumps and other material on hand. Estimated cost, $22,000; time, three months.

NEW MEXICO

Grant County

CHINO COPPER, according to 1914 tax rolls just received by state traveling auditor, pays nearly one-fifth of total taxes of Grant county. Total taxes due $244,388; Chino's share $43,409. Total assessed valuation $20,660,067; of this Chino holdings represent $4,062,252. One-third assessed valuation subject to taxation. Company pays taxes on 12,694 acres of land, principally mineral, valued at $147,770; on improvements valued at $3,479,716; and on "other personal property" valued at $434,766. Property of Santa Rita Store Co., Chino enterprise, included in company's assessment. In 1913 county assessed Chino on $1,000,000 worth of "net products" of mines; protest against this assessment was made to State Board of Equalization, company contending assessment of mine products as well as mineral land was double taxation, and that under state constitution no authority for such assessment existed. County contended authority for assessment and taxation of mine products was given by territorial enactments, and that as these did not conflict with any provisions of state constitution they were not affected by its adoption. On showing that approximately $700,000 of returns from mines had been invested in improvements, Board of Equalization reduced assessment to $476,904. However, company refused to pay taxes on this, and assistant district attorney, acting for county commissioners, is now preparing to bring suit. It will be test of state's right to tax mine products.

NORTH CAROLINA

IOLA (Candor)—No. 1 shaft being retimbered to 255 ft., where ground is solid. When finished development will be undertaken below present deep levels of mine. Some ore of good grade now being developed and mined in new shaft that struck Iola oreshoot at 90 ft. depth. Owing to caving stopes this ore left when work was carried on in this part of mine 10 or 12 years ago.

SADBURY—Hammer and Hooper, of High Point will begin work at this property near Onvil west of Candor. Will erect five-stamp mill to be operated by kerosene engine. Prospect discovered about seven years ago. Number of exceedingly narrow quartz stringers carry high values in gold. An 80-ft. shaft sunk and dump accumulated. Present plan to mill dump.

UWARRA (Candor)—During past few months substantial changes made in methods and equipment of mill described in "Journal," Oct. 31. First change is that of cutting out second pair of 10x24-in. rolls and passing feed direct from first set to tube mill. Ore being delivered to mill with considerably less of country schist than formerly; found that clean ore is far more easily crushed than mixture, and that mill capacity is not decreased by cutting out second set of rolls, while coal bills are. Steam no longer used for heating pulp while being agitated, and two of agitating tanks discarded. Third stripped of all mechanical agitating devices and used as simple air-lift agitator; from this, pulp is run into pulp-storage tank, and there further agitated by compressed air. Precipitates not melted on ground now, but sent to A. S. & R. Co. at Maurer, N. J. Changes have increased profits of mill by economies in consumption of power and of materials.

SOUTH DAKOTA

ANACONDA (Roubaix)—Removal of hoisting plant to site on Box Elder Creek side of property completed and sinking in progress. Shaft now 50 ft. deep.

ECHO (Maitland)—Machinery for mining plant, consisting of 25-hp. Vulcan hoist and 8x8-in. Bury compressor, delivered. Both electric-driven machines. Western hammer drills also received.

GOLDEN REWARD (Deadwood)—Mill employees will be paid weekly; heretofore paid on 16th of month following. Move in response to request of Deadwood merchants who are endeavoring to place business on cash basis.

HOMESTAKE (Lead)—Electric pumps will replace steam pumps at Hanna, where large portion of water supply is pumped from Spearfish Creek over 382-ft. divide. Power transmission line completed; pumps ordered and expected soon. Commodious new hospital will be erected next year on East Main St., Lead, at cost of about $25,000. At meeting of trustees of Grier memorial fund, voted to receive subscriptions in any amount, from societies and individuals. Dollar contributions from employees now amount to over $1800. Homestake Veterans' Association subscribed $100; other fraternal organizations contributing. Site and design not decided upon; matters will be postponed until all sculptors invited have submitted designs.

UTAH

Salt Lake County

MONTANA-BINGHAM (Bingham) — Statement to stockholders shows No. 3 or transportation tunnel to be in 3460 ft., with 700 ft. more to go to reach Congor vein, immediate destination. During past two years work paid for by monthly contributions from chief stockholders. Two largest stockholders in Bingham Congor Copper Co. for 10 months previous to outbreak of war advanced $1000 monthly; these offer $3000 more and others an additional $2000, provided funds to complete tunnel to Congor vein are provided by Montana-Bingham. With this in view assessment of 1c. has been levied. When Congor vein is reached, contract with Bingham Amalgamated will be complete and Montana-Bingham will receive 125,000 shares of Amalgamated stock, and 10% of net proceeds from that property.

WASHINGTON

LUCKY KNOCK (Tonasket)—Stated that new furnace will be installed at this antimony mine, near Whitestone Mountain. With increased price mine may be worked with profit. Said to be large antimony deposit. Situated near railroad and can be worked at minimum cost. Several efforts made in the past to produce and treat ore were without success.

CANADA

Ontario

BEAVER (Cobalt)—Stockholders notified company is holding silver for better prices, has 99,125 oz. bullion in New York, 23,159 oz. at smelting plants, and 100,000 oz. at mine. In driving on 460-ft. level toward rich shoot found on 530-ft. level, struck 3-in. vein, Nov. 26, running about 2000 oz. Drill started toward it on 400-ft. level; no work done below 530-ft. level to ascertain depth of deposit.

ALGOMA CENTRAL & HUDSON BAY RY. announces 2000 square miles of lands held in reserve during construction of road now open for public prospecting. No license required; staking, recording and assessment work practically as on government lands. Perpetual mining rights obtainable under renewable leases on easy royalty. Lands in alternate blocks with government areas also open for prospecting. Lands lie along northeast shore of Lake Superior south of Michipicoten iron district.

SOUTH AMERICA

Chile

CHILE COPPER CO. has aranged for shipment of last of machinery contracted in Germany; construction at Chuquicamata having been going on without any material delay, expected regular operations will begin before middle of 1915 or about on schedule time as laid out by engineers.

The Market Report

Metal Markets

Copper, lead, zinc and tin were all reactionary during the last week, but business was small in volume.

Copper, Tin, Lead and Zinc

Copper—High-water mark was touched about Dec. 15. Purchases by consumers had been on a diminishing scale with the rise in the market, and at the beginning of our last week of record came to a full stop. The principal producers were quite unconcerned about this, having previously sold freely and having expected a lull in buying as a natural development. Consequently they, for the most part, maintained their prices of 13⅜@13½c., regular terms, previously asked, but certain of the first hands appear to have done some fishing to find a market. The latter was chiefly an affair of the second hands and dealers. By virtue of the operations of interests who want to sell all the time and offer copper in an unwilling market, prices declined rather rapidly. However, the volume of business was so small that quotations were rather nominal. During the last two days copper was offered at below 13c., regular terms.

The alleged bids of 35c. for copper in Germany, talked about last week, are not regarded seriously, but it is believed to be a fact that copper is now worth about 28c. per lb. there. Reports about the tearing down of trolley wires, etc., are simply moonshine, but it is believed that the Mansfeld mines are being worked very strenuously.

Copper sheets, base price is now 18½c. per lb. for hot rolled and 19½c. for cold rolled. Usual extras charged and higher prices for small quantities.

Exports from New York, week ended Dec. 12, as reported by Department of Commerce: To France, 4,771,000 lb.; Sweden, 1,994,000; Great Britain, 1,069,000; Canada, 112,000; Cuba, 1000; total, 7,947,000 lb., or 3548 long tons.

Exports of copper from Baltimore for the week ended Nov. 17, were 906 long tons.

Tin—On the decline in London, the market here became dull. Consumers have been buying sparingly for future deliveries, but their buying has now stopped. Spot tin is scarce and at a premium.

The output of Federated Malay States in November was 3788 long tons. For the 11 months ended Nov 30, the total was 45,513 tons in 1913, and 44,110 tons in 1914; decrease, 1403 tons.

H. A. Watson & Co. report arrivals of tin concentrates at Liverpool in November as follows: Bolivia, 789 tons, equal to 473 tons tin; Nigeria, 519 tons, 363 tons tin; South Africa, 192 tons, or 134 tons tin; total, 1500 tons concentrates carrying 970 tons metallic tin.

Arrivals of tin at Pacific Coast ports in October were 139 tons; for the 10 months ended Oct. 31, they were 1438 tons, being 123 tons less than last year.

Lead—This market has been stronger, especially at St. Louis. In the New York market no business below 3.80c. was reported. Some further large sales for export were made.

Spelter—Business amounting to a few hundred tons daily was done both for export and for home consumption, but from neither quarter was the demand satisfactory, and there was a general tendency among sellers to shade prices in order to consummate business. At the close spelter was offered at 5.40c., St. Louis.

The railroad rates on spelter from St. Louis or East St. Louis to New York were advanced on Dec. 16 from 15½c. to 17c. per 100 lb. The same advance applies also to pig lead.

Exports from Baltimore for the past week included 504,001 lb. spelter to Glasgow.

Reports from correspondents in Kansas indicate that the stock of spelter at works in Kansas and Oklahoma on Dec. 1 was only about one-sixth the amount on hand on July 1. Important export shipments have been made to Europe by way of Montreal. A lot of 500 tons recently went to Japan.

Other Metals

Aluminum continues dull and there is little change in conditions. Quotations are 18¾@19c. per lb. for No. 1 ingots, New York.—**Antimony** has continued quiet, with no special feature. Ordinary brands are fairly steady at 12½@13½c. per lb. Cookson's is easier, 15@15½c. being asked.—**Quicksilver** has been in moderate demand only and is a little easier at $50 per flask of 75 lb., New York. The foreign market is strong; London price is £11 10s. per flask.—**Nickel**—Ordinary forms—shot, blocks or plaquettes—are 40@45c. per lb., according to size and terms of order. Electrolytic metal is 5c. per lb. higher.

Minor Metals—Current sales of **Bismuth** have been at $2.75 per lb., New York. **Selenium**—Quotations are $2@3 per lb. for larger quantities; $4.50@$5 per lb. for smaller lots.

DAILY PRICES OF METALS IN NEW YORK

Dec.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
17	4.8713	49⅜	*13.00 @13 10	34¼	3.80	3.60 @3.70	5.67½ @5.70	5 50 @5 52½
18	4.8700	48⅞	*12.90 @13 00	34¼	3.80	3.60 @3.65	5.65	5.45 @5.50
19	4.8675	48⅝	*12.90 @13.00	34	3.80	3.60 @3.65	5 65	5.45 @5 50
21	4.8563	49⅜	*12.85 @12.95	33¾	3.80	3.60 @3.65	5.65	5.45 @5.50
22	4.8525	48¾	*12.75 @12.85	33¾	3.80	3.60 @3 65	5.60	5 40 @5.45
23	4.8525	48⅞	*12.75 @12.85	33⅝	3.80	3 60 @3 65	5.55 @5.60	5.40

*Nominal.

The quotations herein are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. and is subject to discounts, etc. The difference between the price delivered and the New York cash equivalent is at present 0.15 to 0.20c. on domestic business and 0.25 to 0.37½c. on European. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are; St. Louis-New York, 17c.; St Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

LONDON

Dec.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
17	22⅝	57¾	12.55	58	*	148	146½	19	4.13	27⅝	6.00
18	22⅝	57½	12.49	57¾	*	147	145¾	19	4.13	27½	5 97
19	22½	....	....	.....	....	..	.....	...	.....	.....	.....
21	23	57⅜	12 46	57⅝	*	145¾	144	19¼	4.16	27⅝	5.95
22	22⅞	57	12.38	57⅜	*	144	142¼	19¾	4.18	27⅛	5.89
23	22½	57	12.38	57⅜	*	144½	142½	19¾	4.18	27	5.87

*No quotations.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0 925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c ; £15 = 3.26¼c ; £20 = 4 35c.; £30 = 6 52c.; £60 = 13 05c Variations, £1 = 0 21¾c.

Gold, Silver and Platinum

Gold imports in Great Britain, 11 months ended Nov. 30, were £50,067,108; exports, £30,071,352; excess of imports, £19,995,756, against £10,544,364 last year.

Gold and Silver Movement in the United States, 11 months ended Nov. 30, as reported by the Division of Statistics of the Department of Commerce:

	Gold		Silver	
	1913	1914	1913	1914
Exports	$81,226,017	$222,485,232	$58,319,092	$46,291,181
Imports	58,631,475	53,278,678	33,057,451	23,219,995
Excess, exports	$22,594,542	$169,206,554	325,261,641	$23,071,186

Exports of merchandise for the 11 months are valued at $1,867,879,583; imports, $1,674,619,401; excess of exports, $193,260,182. Adding excess of exports of gold and silver gives $385,537,922 as the total export balance.

Iridium—This metal is scarce and in demand. Prices are rather irregular, sales being a matter of negotiation.

Platinum—The market is rather dull, and demand is small. Sales are reported at $41@42 per oz. for refined platinum. Hard metal is $46@50, according to grade.

Our Russian correspondent writes that the position of the market is essentially without change. In Petrograd there have been no sales and no prices can be given. At Ekaterinburg no large sales have taken place, but some small lots have been sold at 7.30 rubles per zolotnik—$27.45 per oz.—for crude metal, 83% platinum.

Silver—The market shows a slight declining tendency owing to the approach of the holiday season. The apathy of former years at this time is accentuated by the unfavorable trade conditions that continue to exist between London and the East.

Exports of silver from London to the East, Jan. 1 to Dec. 10, values, as reported by Messrs. Pixley and Abell:

	1913	1914	Changes
India	£9,606,000	£5,219,500	D. £4,386,500
China	755,000	42,000	D. 713,000
Total	£10,361,000	£5,261,500	D £5,099,500

Imports of silver into Great Britain, 11 months ended Nov. 30, were valued at £10,831,251; exports, £10,343,094; excess of imports, £488,157, which compares with an excess of exports of £1,243,358 last year.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Dec. 19

The base price paid this week for 60% zinc ore was $47@50 per ton. The base price paid for 80% lead ore was $45@46 per ton.

SHIPMENTS WEEK ENDED DEC. 19

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	3,563,430	......	174,200
Year	163,771,770	4,998,890	31,421,850

Shipped during week to separating plants, 4,435,280 lb. zinc ore.

JOPLIN, MO.—Dec. 19

Blende, high price, $53; assay base, $48@52; metal base, $47.50@48.50; calamine base, 40% zinc, $23.50@27.50; average all grades of zinc, $47.32 per ton.

Lead, high price, $48.50; base, $47@48 per ton, 80% metal content; average, all grades of lead, $46.92 per ton.

Beginning last Sunday with offerings of $49@50 assay base on the best ores, it required effort to prevent a wild impulse from seizing the market, but prices were generally kept down to $48@51, except two sales for next week's delivery, made at $52. Three blizzards this week, beginning late last Saturday night, another Wednesday and one Friday night, put the calamine and lead producers with handjigs out of business the entire week.

SHIPMENTS, WEEK ENDED DEC. 19

	Blende	Calamine	Lead	Values
Totals this week	9,212,940	325,000	1,268,590	$255,480
Totals this year	501,815,750	37,589,070	$6,696,400	12,583,680

Blende value, the week, $221,370; 51 weeks, $10,117,590.

Calamine value, the week, $4330; 51 weeks, $443,530.

Lead value, the week, $29,750; 51 weeks, $2.022,110.

Iron Trade Review

NEW YORK—Dec. 24

The better feeling in the iron and steel trades is beginning to be justified by some increase in orders, notwithstanding the close approach of the holiday season.

The movement is more active in plates, bars and shapes. Structural steel is rather slow, few heavy building contracts being reported. Sheets and tinplates are fairly active.

Export business is reported on the increase, some considerable contracts having been closed, while others are pending. Most of this business is for early delivery.

There is considerable talk of a general reduction in wages. Nothing has been actually done about it, but the matter is reported to be under discussion by the larger steel companies. With regard to wages, President Gary, on Dec. 22, issued the following statement: "After giving careful consideration to the subject, it has been decided to make no general reduction in the wages of the employees of the United States Steel companies at this time. There will probably be some readjustments in the amounts paid for skilled labor or piece work, depending upon special conditions."

Pig iron continued to show fair buying, especially of foundry and basic iron. The better prospect has stimulated coke and some large contracts for 1915 are reported.

PITTSBURGH—Dec. 23

Trade prospects continue to improve and there is actually a betterment in most directions. The improvement in sentiment begun, as has been noted, nearly a month ago; actual increase in buying did not show until later, but it is now in evidence. There is no doubt that the turn in the market has come; the question is now how long the improvement will last and how far it will go. Under present conditions nobody looks for a boom, but a steady market with better prices is rather confidently expected.

There has been no change in prices, but present quotations are rather more firmly held than they were:

Pig Iron—Nothing big is noted but there has been quite a fair demand for foundry and basic. Quotations are about the same: Bessemer, $13.75; basic, $12.50; No. 2 foundry, $12.75@13; malleable, $12.75@13; gray forge, $12.50@12.75, at Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese — The ferromanganese market remains quiet. We quote prompt and contract at $68, Baltimore.

Steel—Negotiations are still forward on contracts for billets and sheet bars for next year's delivery. For early deliveries we quote billets at $18.50 and sheet bars at $19, at maker's mill, Pittsburgh or Youngstown. Rods are $24.50@25, Pittsburgh.

United States Foreign Trade in Iron and Steel, 10 months ended Oct. 31, is valued as below by the Department of Commerce:

	1912	1913	1914
Exports	$238,971,131	$251,676,318	$169,232,670
Imports	23,885,776	28,292,118	24,947,236
Excess, exports	$214,085,355	$233,384,200	$144,285,434

As compared with 1913 there are in 1914 decreases of $82,443,648, or 32.8%, in exports; and of $3,344,882, or 11.8% in imports.

IRON ORE

The total water shipments of iron ore from the Lake Superior region for the season of 1914, as corrected, were 32,021,897 long tons, against 49,070,488 in 1913. Of these shipments 25,402,655 tons were delivered to Lake Erie ports. Shipments to furnaces from Lake Erie docks were 21,976,941 tons, against 35,747,800 in 1913; stocks on docks Dec. 1, were 9,345,871 tons, being greater than on Dec. 1, 1913, by 83,995 tons.

COKE

Connellsville—The contracting movement is about over for the present, with about 250,000 tons a month placed under contract, all within five or six weeks, at about $1.75. Prompt furnace coke is quiet at $1.60, prompt foundry remaining at $2@2.20 for miscellaneous brands while contract foundry, for best brands, is nominal at $2.35@2.50 at ovens.

Chemicals

NEW YORK—Dec. 24

All indications are that the year will close on a dull market. It is, moreover, still rather disorganized by the war, and the difficulty of obtaining some products from abroad.

Arsenic—The market is extremely dull with sales few. Supplies are more than sufficient for present demand. Quotations are $3.75@4 per 100 lb. for both spot and futures.

Copper Sulphate—On a moderate business prices are unchanged. Quotations are $4.35 per 100 lb. for carload lots and $4.60 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is quiet, as usual at this season. Quotations are steady at 1.85c. per lb. for all positions. Supplies are good.

Mining Companies—United States

Name of Company and Situation		Shares		Dividends		
		Issued	Par	Total	Latest	Amt.
Acacia, g	Colo	1,454,304	$ 1	$ 122,004	Jan. '11	$0.01
Adams, s.l.c	Colo	1,438,989	10	778,000	Dec. '09	0.04
Ahmeek, c	Mich	80,000	25	2,400,000	July '14	2.00
Alaska Mexican, g	Alas	50,000	5	3,417,381	Nov. '14	0.20
Alaska Treadwell, g	Alas	180,000	25	14,885,000	Nov. '14	0.75
Alaska United, g	Alas	200,000	5	1,738,930	Nov. '14	0.20
Am. Zinc, Lead & Sm	U. S	180,200	25	983,320	Jan. '14	0.50
Anaconda, c	Mont	168,640	25	92,579,375	Oct. '14	0.25
Argonaut, g	Calif	4,992,500	5	1,560,000	Dec. '14	0.10
Arizona Copper, pf	Ariz	200,000	1.20	2,009,744	Nov. '14	....
Arizona Copper, com	Ariz	1,426,120	1.20	16,815,497	July '14	0.24
Bagdad-Chase, g., pf	Calif	1,519,896	5	202,394	Jan. '09	0.10
Baltic, c	Mich	84,819	25	7,950,000	Dec. '13	2.00
Bingham N. H., c	Utah	100,000	5	385,695	Apr. '14	0.10
Bonanza Dev., g	Colo	228,690	1	1,425,000	Oct. '11	0.20
Brunswick, g	Calif	395,287	1	106,727	Oct. '14	0.06
Bunker Hill Con., g	Calif	300,000	1	761,000	Dec. '14	0.05
Bunker Hill & Sul., l.s	Ida	200,000	10	15,710,250	Dec. '14	0.25
Butte-Alex Scott, c	Mont	327,000	10	148,000	Oct. '13	0.50
Butte & Ballaklava, c	Mont	74,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c	Ida	250,000	1	182,350	Dec. '14	0.01
Calumet & Arizona, c	Ariz	617,385	10	20,941,522	Dec. '14	0.50
Calumet & Hecla, c	Mich	616,758	25	124,250,000	June '14	5.00
Camp Bird, g.s	Colo	100,000	5	10,207,544	July '14	0.24
Centen'l-Eur., l.s.g.c	Utah	1,100,051	5	4,050,000	Apr. '14	1.50
Center Creek, l.z	Mo	100,000	10	510,000	Oct. '14	0.05
Champion, c	Mich	100,000	25	8,400,000	Oct. '13	1.00
Chief Consolidated, s.g.l.	Utah	871,384	1	262,969	Aug. '14	0.05
Chino, c	New Mex.	777,458	5	4,081,120	Dec. '14	0.50
Cliff, g	Utah	864,820	1	90,000	Jan. '13	0.10
Cliff, g	Alas	300,000	1	210,000	Oct. '13	0.01
Colo. Gold Dredging	Colo	100,000	10	650,000	Sept. '14	1.00
Colorado, l.s.g	Utah	100,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s	Utah	1,000,000	5	226,832	Oct. '07	0.20
Commercial Gold	Ore	285,540	1	43,750	Dec. '10	0.00½
Con. Mercur, g	Utah	1,000,000	1	3,445,313	July '13	0.03
Continental, z.l	Mo	22,000	25	319,000	July '14	0.50
Copper Range Con., c	Mich	393,692	100	13,986,746	Oct. '13	0.75
Daly Judge, s.l	Utah	300,000	1	900,000	Dec. '14	0.15
Daly West, s.l	Utah	180,000	20	6,606,000	Jan. '13	0.15
Doctor Jackpot, g	Colo	3,000,000	0.10	45,000	Mar. '11	0.00½
Doe Run, l	Mo	65,783	100	3,550,969	Dec. '13	0.76
Eagle & Blue Bell, g.s.l.	Utah	893,146	1	304,601	Oct '14	0.05
Elkton Con., g	Colo	2,500,000	1	3,479,460	Nov '14	0.02
El Paso, g	Colo	490,000	5	1,707,545	Feb. '14	0.10
Ernestine, g.s	N.M	300,000	5	120,000	Dec. '12	0.05
Fed. M. & S., com	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf	Idaho	120,000	100	8,986,946	Dec. '14	1.00
Florence, g	Nev	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g	Nev	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g	Colo	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g	Calif	200,000	2.50	258,000	Oct. '14	0.02
Frontier, z	Wis	1,250	100	146,202	Nov. '13	2.00
Gemini-Key'ne, l.g.s	Utah.	5,000	100	2,305,000	Dec. '14	10.00
Gold Chain, g	Utah.	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor.	Colo	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con	Colo	2,500,000	0.10	100,000	Dec. '12	0.00½
Gold King Con., g	Colo	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g	Colo	1,500,000	5	3,375,000	Nov. '14	0.20
Golden Star, g	Ariz	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g	Nev	3,558,367	10	27,398,214	Apr. '14	0.30
Grand Central, g	Utah.	500,000	1	1,620,750	Sept. '14	0.05
Granite, g	Colo	1,650,000	1	270,000	Nov. '12	0.01
Hazel, g	Cal	900,000	1	971,000	Dec. '13	0.01
Hecla, l.s	Idaho.	1,000,000	0.25	2,190,000	Dec. '14	0.02
Hercules, l.s	Idaho.	1,000,000	1	5,550,000	Dec. '13	...
Homestake, g	S. D	218,400	100	36,482,174	Dec. '14	1.00
Horn Silver, l.s.z	Utah	400,000	25	5,642,000	Sept '07	0.05
Iowa, g.s.l	Colo	1,666,667	1	233,499	Aug. '14	0.00½
Iowa-Tiger Leasing g.s	Colo	12,655	1	9,250	Dec. '14	1.00
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	2,170,000	Oct '14	0.10
Iron Silver, s.l.g	Colo	500,000	20	4,950,000	Dec. '14	0.10
Jamison, g	Cal	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g	Colo	2,500,000	0.10	187,500	Nov. '14	0.01
Kendall, g	Mont	500,000	5	1,505,000	July '14	0.06
Kennedy, g	Cal	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g	Ariz	200,000	1	396,000	Aug '09	0.12
Klar Piquette, z.l	Wis	20,000	1	187,500	Apr. '13	0.50
Knob Hill, g	Wash	1,000,000	1	70,000	Oct. '13	0.00½
Liberty Bell, g	Colo	133,552	5	1,559,179	Sept. '13	....
Little Bell, l.s	Utah	300,000	1	75,000	Mar. '11	0.05
Little Florence, g	Nev	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c	Utah.	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g	Colo	1,309,252	1	1,169,308	July '14	0.02
May Day, g.s.l	Utah	800,000	0.25	156,000	Oct '14	0.03
Mexican, g.s	Nev	201,600	2.50	161,910	June '14	0.75
Miami, c	Ariz	746,759	5	3,712,249	Aug. '14	0.50
Modoc, g.s	Colo	500,000	1	275,000	Dec. '11	0.01
Mohawk, c	Mich	100,000	25	3,275,000	Aug. '14	2.00
Monarch-Mad'a, g.s.l	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g	Nev	921,865	1	488,588	Dec. '12	0.10
Mountain, c	Cal	250,000	25	4,216,250	May '08	0.44
National, g	Nev	750,000	1	570,000	May '11	0.10
Nevada Con., c	Nev	1,999,524	5	16,226,911	June '14	0.37½
New Century, z.l	Mo	330,000	1	237,600	Oct. '09	0.01
New Idria, q	Cal	100,000	5	1,680,000	Apr. '14	0.10
North Butte, c	Mont	410,000	15	11,890,000	July '14	0.50
North Star, g	Cal	250,000	10	4,537,040	Dec. '14	0.70
Old Domin'n, M. & Sm.	Ariz	162,000	25	3,807,000	Dec. '14	0.50
Ophir, s.g	Nev	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah.	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging	Cal	700,000	5	1,553,136	Aug. '14	0.12
Osceola, c	Mich	96,150	25	12,179,675	July '14	1.00
Parrot, c	Mont.	229,850	10	7,428,235	Nov. '14	0.15
Pearl Con., g	Wash	1,909,711	0.05	181,122	Dec. '10	0.02
Pharmacist, g	Colo	1,500,000	1	7,500	Feb. '10	0.00½
Pioneer, g	Alas	5,000,000	1	2,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l	Iad	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g	Nev	2,790,000	1	771,200	July '14	0.02
Portland, g	Colo	3,000,000	1	9,757,080	Oct. '14	0.02
Quilp	Wash	1,500,000	1	67,500	Feb. '12	0.01
Quincy, c.	Mich	110,000	25	20,897,500	Dec '13	1.25

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares		Dividends		
		Issued	Par	Total	Latest	Amt
Ray, c	Ariz	1,482,436	$ 10	$3,266,796	Sept. '14	$0.37½
Republic, g	Wash.	1,000,000	1	170,000	Nov. '12	0.01½
Rochester, l.z.	Mo	4,900	100	190,846	July '12	0.50
Round Mountain, g.	Nev	866,426	1	363,365	Aug. '13	0.04
Seven Troughs Coal., g	Nev	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l	Mo	1,472,252	10	9,122,240	Dec. '14	0.05
Shannon, c	Ariz	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	Ariz	350,000	10	2,100,000	July '14	0.50
Silver King Coal., l.s.	Utah.	1,250,000	5	2,534,085	Apr. '14	0.15
Sioux Con., s.l.g	Utah.	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal	1,000,000	5	365,000	Oct. '14	0.01
Snowstorm, c.g	Ida	1,500,000	1	1,192,103	Oct. '13	0.02
South Eureka, g	Calif	299,981	1	386,881	Nov. '14	0.07
Standard Con., g.s.	Cal	178,394	10	5,274,407	Nov. '13	0.25
Stratton's Ind., g	Colo	1,000,000	0.60	516,375	Dec. '14	0.03
Success, z	Ida	1,500,000	1	930,000	June '13	0.02
Superior & Pitts., c	Ariz	1,499,792	10	8,578,820	Dec. '14	1.00
Tamarack, c	Mich	60,000	25	9,420,000	July '07	4.00
Tennessee, c	Tenn	200,000	25	4,306,250	Oct. '14	0.75
Tomboy, g.s	Colo	310,000	4.85	3,634,065	Dec. '14	0.48
Tom Reed, g	Ariz	909,555	1	2,264,764	Dec. '14	0.06
Tonopah Belm't, s.g.	Nev	1,500,000	1	6,893,000	Oct. '14	0.25
Tonopah Ext., g.s	Nev	943,433	1	636,817	Oct. '14	0.07½
Tonopah of Nev., s.g	Nev	1,000,000	1	12,100,000	Oct. '14	0.25
Tri-Mountain, c	Mich	100,000	25	1,450,000	Dec. '13	2.00
Tuolumne, c	Mont	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l	Utah.	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c	Wash.	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.) g	Colo	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c	Ariz	23,000	10	2,127,500	Dec. '14	7.00
United Verde, c	Ariz	300,000	10	34,597,000	Nov. '14	0.75
Utah, s.l.	Utah.	100,000	10	281,860	Dec. '10	0.02
Utah, c	Utah.	1,624,290	10	24,589,446	Sept. '14	0.75
Utah Con., c	Utah.	300,000	5	8,550,000	Dec. '14	0.50
Valley View, g	Colo	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l	Utah.	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g	Colo	1,500,000	1	3,082,000	Dec. '14	0.03
Wasp No. 2, g	S. D	500,000	1	461,966	Oct. '14	0.01
Wellington Mines, g	Colo	10,000,000	1	350,000	July '13	0.00½
Wolverine, c	Mich	60,000	25	7,980,000	Dec. '14	2.00
Yak, s.l	Colo	1,000,000	1	1,757,685	Mar. '14	0.02
Yankee Con., g.s	Utah.	1,000,000	1	167,500	Jan. '13	0.01
Yellow Aster, g	Cal.	100,000	10	1,154,789	July '13	0.03
Yellow Pine, l.z.s	Nev	1,000,000	1	453,008	Dec. '14	0.03
Yukon Gold, g	Alas	3,500,000	5	6,622,000	Dec. '14	0.07½

Iron, Industrial and Holding Companies

Amalgamated, c	Mont	1,538,879	100	$90,125,988	Nov. '14	$0.50
Am. Sm. & Ref., com	U. S.	500,000	100	27,333,333	Dec. '14	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	50,458,333	Dec. '14	1.75
Am. Smelters, pf. A	U. S.	170,000	100	9,945,000	Oct. '14	1.50
Am. Smelters, pf. B.	U. S.	300,000	100	14,375,000	Oct. '14	1.25
Greene Cananea	U. S.	450,642	100	4,371,646	June '14	1.00
Guggenheim Expl.	U. S.	380,315	25	20,200,227	Oct. '14	0.87½
Inter'l Nickel, com	U. S.	115,826	100	14,846,438	Dec. '14	2.50
Inter'l Nickel, pfd.	U. S.	89,126	100	8,224,802	Nov. '14	1.50
National Lead, com	N. Y.	206,554	100	8,415,884	Dec. '14	0.75
National Lead, pf	N. Y.	243,676	100	29,266,672	Dec. '14	1.75
Old Dominion, c	Ariz	293,245	25	5,853,713	Dec. '14	0.50
Phelps, Dodge & Co	U. S.	450,000	100	35,096,527	Sept. '14	2.50
U. S. Steel Corp., com	U. S.	5,083,025	100	222,360,438	Dec. '14	0.50
U. S. Steel Corp., pf	U. S.	3,602,811	100	370,293,336	Nov. '14	1.75
U. S. S., R. & M., com	U.S.-Mex	486,348	50	6,362,181	July '14	0.75
U. S. S., R. & M., pf.	U.S.-Mex	351,114	50	14,667,393	Oct '14	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s	Mex.	50,000	$ 5	$ 212,500	Oct. '12	$0.25
Amparo, g.s	Mex.	2,000,000	1	1,520,884	Nov. '14	0.03
B. C. Copper	B. C.	591,709	5	615,198	Jan. '13	0.15
Beaver Con., s	Ont	1,996,490	1	469,868	July '14	0.03
Buffalo, s	Ont	1,000,000	1	2,757,000	July '14	0.03
Canadian Goldfields, g	B. C.	600,000	0.10	290,000	July '14	0.001¼
Chontalpan, g.s.l.z	Mex	7,000	25	57,750	May '14	0.75
Cobalt Townsite, s	Ont.	45,000	1	1,042,259	May '14	0.10
Coniagas, s	Ont	800,000	5	6,640,000	Nov. '14	0.30
Con. M. & S. Co. of Can	B. C.	58,052	100	1,709,589	Oct. '14	2.00
Crown Reserve, s	Ont	1,768,814	1	5,960,902	Dec. '14	0.02
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dos Estrellas, g.s	Mex	300,000	0.50	10,335,000	Dec. '13	1.50
El Oro, g.s	Mex.	1,147,500	4.85	8,947,261	July '13	0.24
Esperanza, s.g	Mex.	455,000	4.85	11,996,303	Jan. '14	0.24
Granby, s.l.c	B.C.	148,496	100	5,533,457	June '14	1.50
Greene Con., c	Mex	1,000,000	10	9,544,400	May '14	0.50
Guanajuato D., pf., s	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold	B. C.	120,000	10	1,524,000	Dec. '14	1.00
Hollinger, g	Ont	600,000	5	2,610,000	Dec. '14	0.15
Kerr Lake s	Ont	600,000	5	5,520,000	Dec. '14	0.25
La Rose Con., s	Ont	1,498,627	5	4,974,997	Oct '14	0.25
Le Roi No. 2, g	B. C.	120,000	24.30	1,472,580	Jan. '13	0.36
Lucky Tiger Com., g	Mex.	715,337	10	2,698,275	Dec. '14	0.09
McK.-Dar. Sav. s	Ont	2,247,692	1	4,338,040	Oct. '14	0.03
Mines Co. of Am. (new)	Mex.	1,700,000	10	*1,215,000	July '13	0.12½
N. Y. & Hond. Ros., g	C. A.	150,000	10	3,550,000	Oct. '14	0.30
Nipissing, s.	Ont	1,200,000	5	12,390,000	Oct. '14	0.25
Peñoles, s.l.g	Mex	80,000	25	6,361,688	June '13	1.25
Peregrina M. & M., pf.	Mex	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	840,000	Oct. '13	3.00
Right of Way Mns† s	Ont	1,685,500	1	219,115	Nov. '14	0.02
Rio Plata, s	Mex.	374,518	5	345,745	Feb. '13	0.05
San Rafael, g.s	Mex.	2,400	25	1,442,380	Jan. '14	0.50
San Toy, g.s	Mex.	5,750,000	1	530,000	July '13	0.01
Sorpresa, g.s	Mex.	19,200	20	3,979,240	Jan '11	34.00
Stand'd Silver-Lead.	B. C.	2,000,000	1	1,550,000	Sept. '14	0.02½
Timiskaming, s.	Ont	2,500,000	1	1,384,155	Apr. '13	0.06
Tem. & Hud. Bay, s	Ont	7,761	1	1,940,250	Nov. '14	3.00
Trethewey, s	Ont	1,000,000	1	1,061,998	July '14	0.05
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	637,465	Oct '13	0.05

*Previous to reorganization, $5,258,881.

†Previous to January, 1910, $324,644

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev.	Jan. 5	Jan. 27	$0.03
Atlantic, Ida.	Nov. 28	Dec. 28	0.0005
Beaver Copper, Utah.	Dec. 3	Dec. 22	0.005
Caledonia, Nev.	Dec. 8	Dec. 31	0.05
Century, Utah.	Jan. 2	Feb. 2	0.01
Clear Grit, Ida.	Jan. 12	Jan. 29	0.0015
Con. Imperial, Nev.	Dec. 23	Jan. 15	0.01
Crown Point, Nev.	Dec. 8	Dec. 29	0.05
Darby, Ida.	Dec. 14	Jan. 14	0.001
Dfd. Bk. Butte, Nev.	Dec. 1	Dec. 30	0.01
East Hercules, Ida. (post.)	Dec. 1	Jan. 2	0.001
Emerald, Utah (three instal.)	....	June 9	0.01
Exchequer, Nev.	Dec. 21	Jan. 11	0.03
Gold Bond, Utah.	Nov. 24	Dec. 24	0.001
Grt. Copp. King, Utah.	Dec. 21	Jan. 21	0.001
Gypsy Qn., Nev.	Jan. 12	Feb. 16	0.01
Hale and Norcross, Nev.	Dec. 14	Jan. 4	0.03
Hilarity, Ida. (post.)	Oct. 12	Dec. 23	0.003
Hope, Calif.	Dec. 15	Jan. 11	0.05
Hypotheek, Ida.	Dec. 17	Jan. 11	0.006
Id.-Mont, Ida. (post.)	Nov. 2	Jan. 8	0.001
Lehi Tintic, Utah.	Dec. 17	Jan. 16	0.0025
Lynn Big Six, Utah.	Nov. 21	Dec. 26	0.005
Majestic-Idol, Nev.	Dec. 15	Jul. 20	0.005
Mammoth Gold, Nev.	Nov. 23	Jan. 4	0.02
Maxfield, Utah.	Dec. 9	Dec. 30	0.0016
New Yerington, Nev.	Dec. 23	Jan. 13	0.01
O. K. Silver, Utah.	Dec. 14	Dec. 31	0.00167
Oreano, Ida.	Dec. 26	Jan. 25	0.00075
Overman, Nev.	Dec. 22	Jan. 11	0.05
Phoenix, Ida. (post.)	Nov. 26	Dec. 26	0.005
Potosi, Nev.	Jan. 12	Feb. 4	0.02
Reindeer-Qn., Ida. (post.)	Sept. 21	Dec. 26	0.002
Rainbow, Ida.	Nov. 30	Dec. 31	0.002
Raven, Ida.	Dec. 30	Jan. 30	0.0003
Rexall, Utah.	Dec. 1	Dec. 21	0.002
Riverside, Ida.	Dec. 20	Jan. 20	0.001
St. Francis, Calif.	Dec. 8	Dec. 28	0.0025
Seg. Belcher, Nev.	Dec. 16	Jan. 11	0.02
Sheba, Utah.	Jan. 12	Feb. 24	0.05
Sonora, Ida.	Nov. 30	Dec. 30	0.002
Sunshine, Ida.	Nov. 23	Dec. 22	0.001
Syndicate, Ida.	Nov. 26	Dec. 28	0.001
Tarbox, Ida. (post.)	Nov. 25	Dec. 28	0.0025
Tuscumbia, Ida. (post.)	Nov. 20	Dec. 21	0.002
Umatilla, Nev.	Jan. 4	Feb. 8	0.01
Utah-Yerington, Nev.	Jan. 2	Jan. 23	0 0006
Utah Zinc, Utah.	Dec. 7	Dec. 28	0.0025
Wheeler, Utah.	Dec. 21	Jan. 11	0.01
Wisconsin, Ida.	Nov. 16	Dec. 21	0.003
Yankee Con, Utah.	Dec. 17	Jan. 4	0.01
Zuma, Utah.	Dec. 21	Jan. 12	0 0025

Stock Quotations

COLO. SPRINGS Dec. 21		SALT LAKE Dec. 21	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.03¼	Beck Tunnel	.05
Cripple Cr'k Con.	.05¼	Black Jack	.03
C. K. & N.	.08¾	Colorado Mining.	.10¼
Doctor Jack Pot.	.08¾	Crown Point.	.01
Elkton Con.	.44½	Daly-Judge.	4 60
El Paso.	1.90	Gold Chain.	.08¼
Findlay.	.01¾	Grand Central.	64
Gold Dollar.	.04	Iron Blossom.	1.10
Gold Sovereign.	.04½	Little Bell.	.10
Isabella.	.13¼	Lower Mammoth	.04
Jack Pot.	.06½	Mason Valley.	1.37½
Jennie Sample.	.02	May Day.	.13¼
Jerry Johnson.	.03	Opohongo.	.01¼
Lexington.	.006	Prince Con	.21
Old Gold.	.007	Seven Troughs	.03½
Mary McKinney.	.40	Silver King Coal'n.	2.47½
Pharmacist.	.01	Silver King Con.	1.75
Portland.	1.12	Sioux Con.	.02¼
Raven B. H.	03¼	Uncle Sam.	.04
Vindicator	1 19	Yankee.	.02

TORONTO		Dec. 21	
Bailey.	.01¼	Foley O'Brien.	.18
City of Cobalt.	.30	Hollinger.	20.00
Coniagas.	5.50	Imperial.	.01
Peterson Lake.	.28	Jupiter.	.09
Right of Way.	02¼	McIntyre.	.22
T. & Hudson Bay.	35 00	Pearl Lake.	.02½
Timiskaming.	.00¼	Porcu. Gold	.00¼
Wettlaufer-Lor.	04	Preston E. D.	.01
Big Dome.	6 50	Rea.	.15
Dome Exten.	08¼	Seneca Superior.	‡1 75

SAN FRANCISCO		Dec 18	
Comstock Stocks.		Misc. Nev. & Cal	
Alta.	.04	Belmont.	4 50
Belcher.	.60	Jim Butler.	79
Best & Belcher.	.04	Lone Star.	.12
Caledonia.	.29	MacNamara.	.01
Challenge Con.	.04	Midway.	09
Confidence.	.16	Mont.-Tonopah.	.37
Con. Virginia.	.11	North Star.	.18
Crown Point (Nev.)	29	Rescue Eula.	07
Gould & Curry.	.04	West End Con.	.60]
Hale & Norcross.	.01	Atlanta.	41
Julia.	.02	Booth.	15
Mexican.	.27	C.O.D. Con.	07
Occidental.	.85	Comb. Frac.	10
Ophir.	.08	Jumbo Extension	2 37½
Overman.	06	Pitts.-Silver Peak.	.35
Potosi.	‡ 01	Round Mountain.	39
Savage.	04	Sandstorm Kendall.	13¼
Sierra Nevada.	.01	Silver Pick.	10
Union Con.	05	Central Eureka.	20
Yellow Jacket.	39	So. Eureka	‡1 80

N. Y. EXCH. Dec. 21	
Name of Comp.	Clg.
Amalgamated.	53
Am.Sm.&Ref.,com.	57¼
Am. Sm. & Ref., pf.	100
Am. Sm. Sec., pf. B.	‡78
Anaconda.	26
Batopilas Min.	⅞
Bethlehem Steel, pf.	86
Chino.	33¼
Colo. Fuel & Iron.	23¼
Federal M. & S., pf.	28
Great Nor., ore., ctf.	25
Guggen. Exp.	45¾
Homestake.	113
Inspiration Con.	16
Mex. Petroleum	52
Miami Copper.	18¼
Nat'l Lead, com.	43
National Lead, pf.	104
Nev. Consol.	12
Ontario Min	2
Phelps Dodge	‡175
Quicksilver, pf.	1¼
Ray Con.	15¼
Republic I&S, com.	19
Republic I&S, pf.	75
SlossSheff'd, com.	22
Sloss Sheffield, pf.	‡82
Tennessee Copper.	31¼
Utah Copper.	47¾
U. S. Steel, com.	49¾
U. S. Steel, pf.	104¾

N. Y. CURB Dec. 21	
Name of Comp.	Clg.
Beaver Con.	.22
Big Four.	.07
Blue Bell.	.06
Braden Copper.	6
B. C. Copper.	.50
Buffalo Mines.	⅞
Can. Cop. Corpn.	1¼
Can. G. & S.	.04
Cariboo.	.63
Chambers Ferland.	.13
Con. Ariz. Sm.	⅜
Coppermines Cons.	1¼
Davis-Daly.	.75
Diam'field-Daisy.	.08
Dia. Black B.	.07
Ely Con.	‡.01
Florence.	.63
Goldfield Con.	1 9/16
Goldfield Merger.	.37
Greene Cananea	24
Kerr Lake.	4⅜
La Rose.	⅜
McKinley-Dar-Sa.	.56
Mines of Am	2½
Mutual Min., pf	‡2½
Nevada Hills.	.31
New Utah Bingham	‡7/16
Nipissing Mines.	5⅜
Ohio Copper.	.10
Oro.	.14
Pacific Smelt	1/16
Stand'd Oil of N.J.	404
Standard S. L.	1⅜
Stewart.	1¼
Tonopah.	7 13/16
Tonopah Ex.	2¼
Tonopah Merger.	.37
Tularosa.	3/16
West End Ex.	04
Yukon Gold.	2¼

LONDON Dec. 8	
Name of Comp.	Clg.
Alaska Tre'dwell	£7 17s 6d
Camp Bird.	0 6 0
El Oro.	0 11 0
Esperanza.	0 10 0
Mexico Mines.	3 17 6
Oroville.	0 7 6
Santa Gert'dis.	0 10 0
Tomboy.	1 1 10½

BOSTON EXCH Dec. 21	
Name of Comp.	Clg.
Adventure.	1
Ahmeek.	255
Alaska Gold M.	24¾
Algomah.	.80
Allouez.	.37
Am. Zinc.	15½
Ariz. Com., ctfs.	3½
Bonanza.	‡.51
Butte-Ballaklava.	2¼
Butte & Superior.	34½
Calumet & Ariz.	55¼
Calumet & Hecla.	360
Centennial.	15
Cliff.	‡1
Copper Range.	32
Daly West.	2½
East Butte.	8½
Franklin.	4½
Granby.	60
Hancock.	13¾
Helvetia.	.30
Indiana.	3½
Island Cr'k, com.	44½
Island Cr'k, pfd.	86½
Isle Royale.	18
Keweenaw.	3
Lake.	5
La Salle.	3¼
Mass.	3¾
Mayflower.	4½
Michigan.	.75
Mohawk.	47
New Arcadian.	6
New Idria Quick.	‡3½
North Butte.	22¾
North Lake.	1⅛
Ojibway.	.75
Old Colony.	3¾
Old Dominion.	44
Osceola.	67
Quincy.	52
Santa Fe.	1¼
Shannon.	5
Shattuck-Ariz.	19¾
Superior.	23½
Superior & Bost.	1½
Tamarack.	25¼
Trinity.	3
Tuolumne.	.25
U. S. Smelting	26¾
U. S. Smelt'g, pf.	44
Utah Apex.	2
Utah Con.	10
Victoria.	1½
Winona.	2¼
Wolverine.	35
Wyandot.	50

BOSTON CURB Dec 21	
Name of Comp.	Bid.
Alvarado.	60
Bingham Mines.	‡4.04¾
Boston Ely.	21
Butte & Lon'n Dev.	.23
Calaveras.	.93
Calumet-Corbin.	.08
Chief Con.	.75
Corbin.	1
Cortez.	.20
Crown Reserve.	.72
Eagle & Blue Bell	.95
First Nat. Cop.	1 5/16
Houghton Copper.	2
Iron Cap Cop., pf.	‡5
Majestic.	16
Mexican Metals.	16
Nevada-Douglas	.55
New Baltic.	1⅜
Oneco.	85
Raven Copper	10
Smokey Dev.	‡ 25
So. Lake.	04¼
Tonopah Victor.	.19
Trethewey.	.15
United Verde Ext	1 13/16

‡Last Quotations.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61 642	57.506	27.190	28.357	26 573
March	58.375	57.870	58.067	26.875	26.669	26 788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	58.175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25 948
July	60.654	58 721	54 678	27.919	27.074	25.210
August	61.606	59.293	54 344	28.375	27.335	25.979
September	63 078	60.640	53.290	29.088	27.986	24.260
October	63 471	60.793	50.654	29.299	28.083	23.199
November	62.792	58.995	49.082	29.012	27.263	22.703
December	63.365	57.760	......	29.320	26.720	......
Year	60.835	59.791	......	28 042	27 576	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	71.741	64.304	77.750	69.488
February	14.971	14 491	65.519	65.259	71.575	70.188
March	14.713	14.131	65.329	64.276	70.658	69.170
April	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.996	68.807	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14.190	13.223	64.166	60.540	69.446	64 955
August	15 400	*	69.200	‡	74.313	‡
September	16 328	*	73.125	‡	78.614	‡
October	16.337	*	73.383	‡	79.250	‡
November	15.182	11.739	68.275	53.227	73.825	*
December	14.224	......	65.223	.....	69.583	.....
Year	15 269	......	68 335	.....	73 740	.....

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50 298	37.779	238.273	171.905
February	48.766	39 830	220.140	181.556
March	46.832	38.038	213.615	173.619
April	49 115	36.154	224.159	163.963
May	49.038	33.360	224.143	150.702
June	44.820	30.577	207.208	138.321
July	40.260	31.707	183.511	142.517
August	41.582	*	188.731	‡
September	42.410	32.675	193.074	‡
October	40.462	30.284	184.837	‡
November	39.810	33.304	180.869	139.391
December	37.635	....	171.786	.....
Av. year	44 252	....	206.279	.....

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4 048	4.175	3.937	16.550	19 606
March	4.327	3.970	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3 688	17.597	18.225
May	4.342	3 900	4.226	3.808	18.923	18.503
June	4.325	3.900	4 190	3.810	20.226	19.411
July	4.353	3 891	4.223	3 738	20.038	19 051
August	4.624	3.875	4.550	3.715	20.406	‡
September	4.698	3.828	4.579	3 658	20.648	‡
October	4.402	3.528	4.253	3.384	20.302	‡
November	4.293	3.683	4.146	3.585	19.334	18.500
December	4 047	......	3.929	......	17.798	......
Year	4.370	.....	4 238	......	18 743	.....

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5 228	25.338	21.413
March	6.078	5.250	5.926	5 100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5 074	5.256	4.924	24.583	21.393
June	5.124	5 000	4.974	4.850	22.143	21.345
July	5.278	4.920	5.128	4.770	20.592	21 568
August	5.658	5 568	5.508	5.418	20.706	‡
September	5.694	5.380	5.544	5.230	21.148	‡
October	5.340	4.909	5.188	4.750	20.614	‡
November	5.229	5.112	5.083	4.962	20.581	25 016
December	5.156	......	5 004	....	21 214	....
Year	5.648	......	5.504	....	22.746	.....

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14.94	$17.35	$13.23	$18.59	$13 99
February	18.15	15.06	17.22	14.12	18.13	14.08
March	18.15	15 07	16.96	13.94	17.53	14.10
April	17.90	14.90	16.71	13.90	16.40	14.13
May	17.68	14.90	15.80	13.90	15.40	14.27
June	17.14	14.90	15.40	13.90	15.10	13.96
July	16.31	14 90	15.13	13.90	14.74	13.90
August	16.63	14.90	15.00	13.90	14.88	14.90
September	16.65	14 90	15 04	13.90	14.93	14.03
October	16.60	14.84	14 61	13.75	14.80	13.97
November	16.03	14.59	13.91	13.43	14.40	13.83
December	15.71	.....	13 71	.....	14.28	......
Year	$17.09	.....	$15 57	.....	$15.77	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported ‡ London Exchange closed.

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